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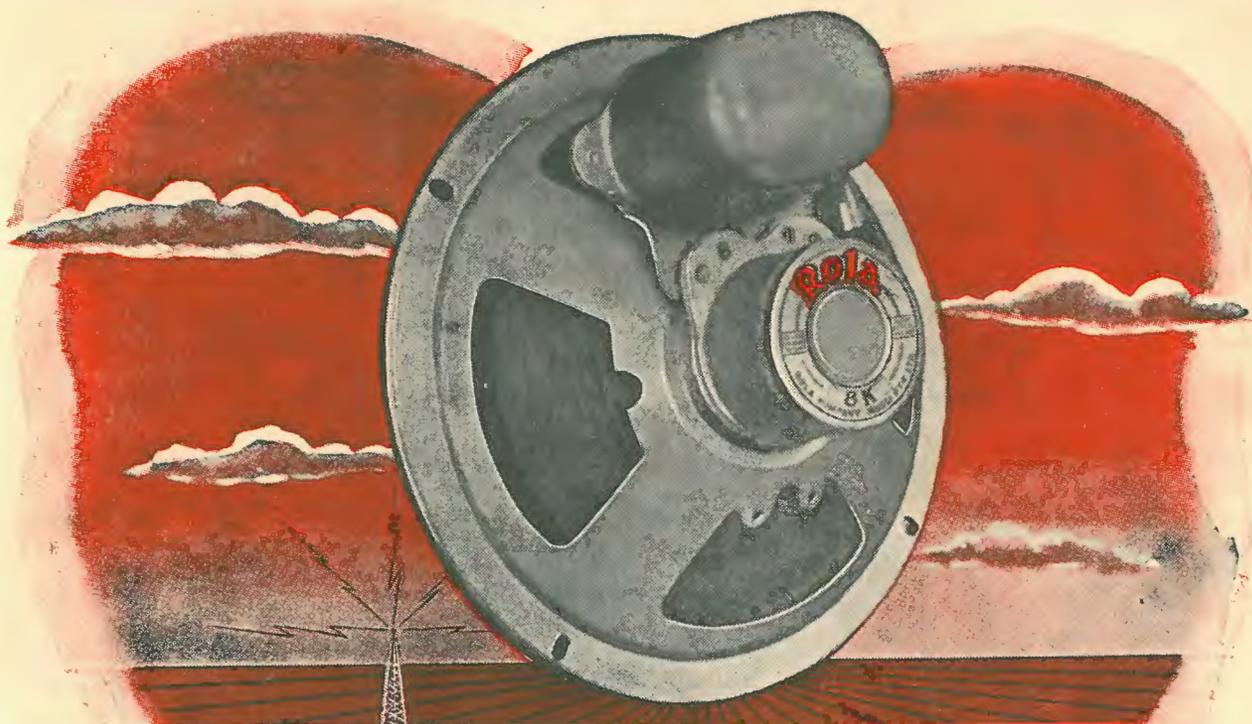
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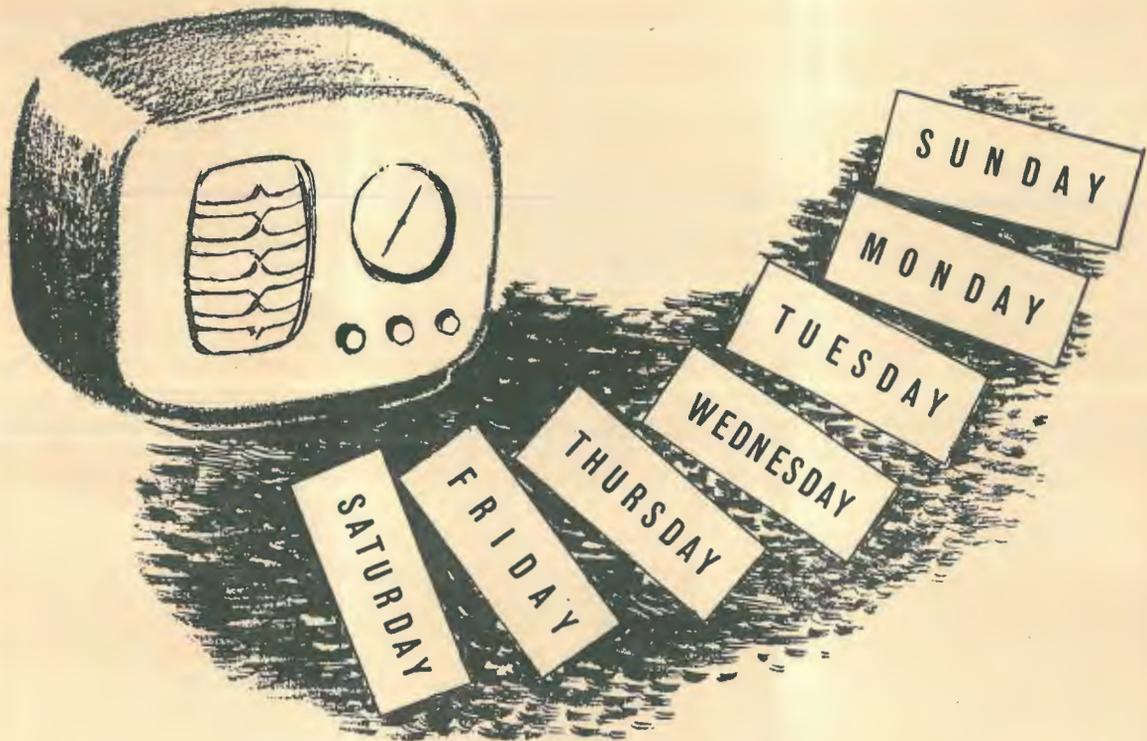
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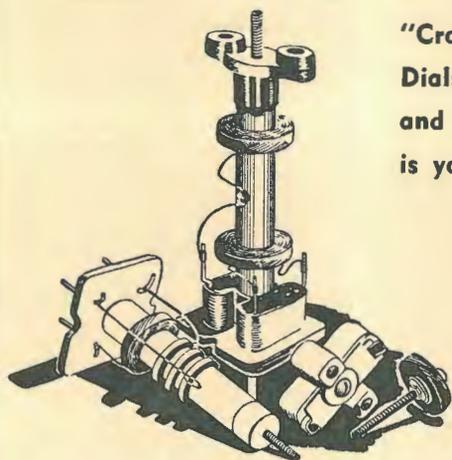
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★ EDITOR
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A. G. HULL

336 Waverley Rd., East Malvern,
Vic.

★ SHORT-WAVE EDITOR—

L. J. KEAST

3 Fitzgerald Road, Ermington,
N.S.W.

★ HAM NOTES By—

D. B. KNOCK (VK2NO)

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EDITORIAL

A number of readers are annoyed at the slow progress being made towards the introduction of communications-type receivers on the Australian market.

Just before the war we had occasion to mention this subject several times, without much success.

Then came the war and several local factories made communications receivers to the order of the Ministry of Munitions. The local receivers were excellent in every way, quite up to world standard. Now many short-wave enthusiasts can't understand why these receivers cannot be bought for love or money.

Enquiry reveals that in most cases the communications-type receivers that were manufactured in local factories were complete projects of the Ministry of Munitions. The Ministry stood the initial cost of the development and tooling up for these receivers and it is not possible for the factories concerned to use this equipment for ordinary commercial set production.

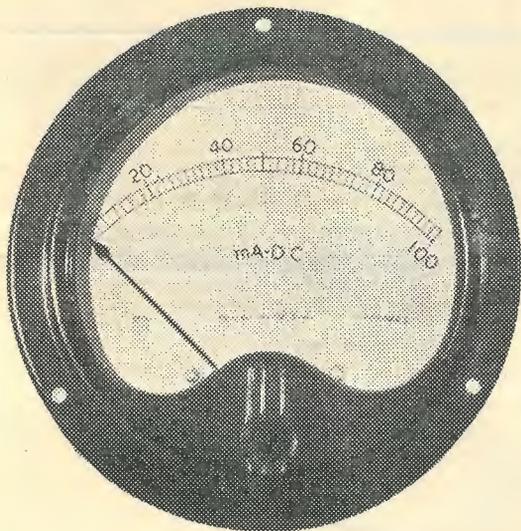
Eventually the special tools, dies and jigs may be declared as surplus to the requirements of the Ministry, then handed over to the Disposals Commission for sale, and finally come to be put to good use in the production of communications-type sets for ready sale to our many eager enthusiasts.

In the meantime, one possibility is the indenting of English receivers of this type, which appear to have been considerably improved as a result of war-time research. They are available in England at comparatively easy prices and can be imported without much trouble.

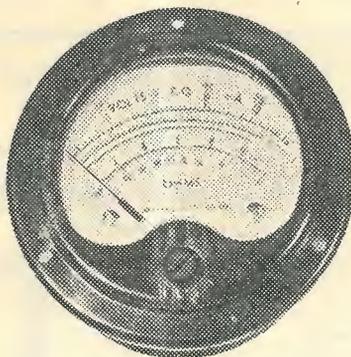
—A. G. HULL.

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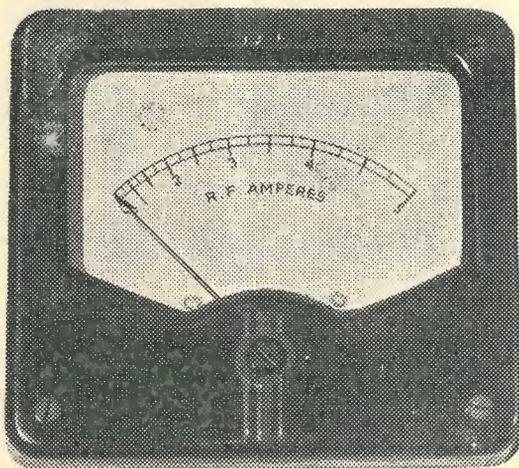
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35	Square	3 1/2"	3 1/2" x 3 7/8"	2 1/8"	2 3/4"
35	Round	3 1/2"	3 1/2" Dia.	2 1/8"	2 3/4"
400	Square	4"	4 1/2" x 4 3/4"	3 1/8"	2 3/4"
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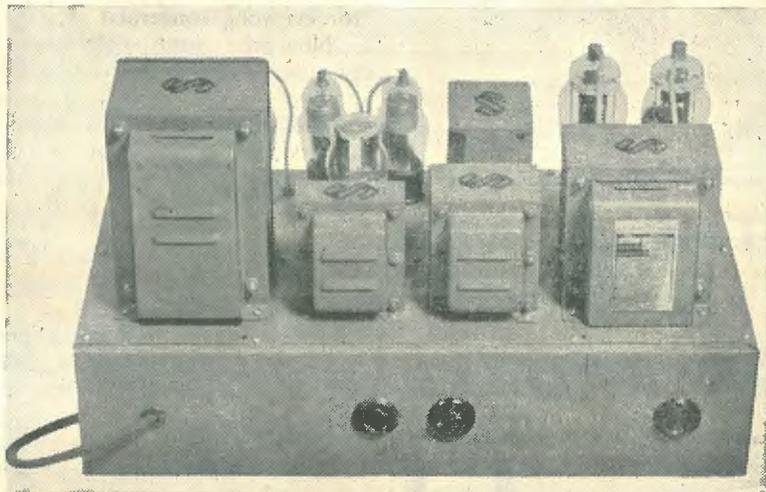
A REALLY GOOD AMPLIFIER

The Inside Story of its Development

FOR the past seventeen years I have been an ardent amplifier enthusiast. Ever since the day I first heard an electrically-recorded recording reproduced through a direct-coupled amplifier, I have taken the keenest interest in everything to do with amplifiers and high-fidelity reproduction.

By
A. G. HULL

Like many of my readers, I have been baffled in the past by the limitations of amplifiers in general. You can make up an amplifier which sounds fine. You are thrilled. You turn it up loud. It sounds fine. Then you listen to a "live" orchestra or an individual pianist or violinist. You start to doubt the peerless quality of your reproduction. You are not satisfied. You change it from transformer coupling to resistance-capacity coupling. It sounds better, but a few weeks later you go over the same routine again and change it back to transformer-coupling. Then you decide that the speaker must be the weakest link in the chain. And so it goes. The amplifier enthusiast is a restless fellow, always straining to achieve satisfactory reproduc-



Photograph of the completed amplifier which will be described in detail in next month's issue.

tion; never quite understanding why his amplifier sometimes sounds fine and sometimes fails to soothe his furrowed brow.

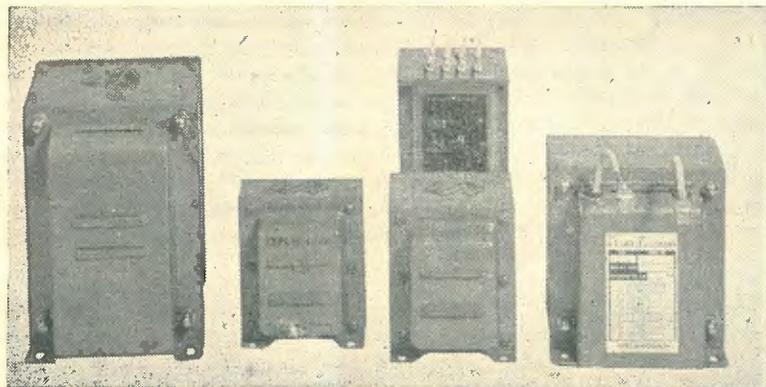
Anyway, that is how it has been with me and with lots of other fellows I know personally and thousands more that I know only from their letters.

MODERN TRENDS

As I remarked in an editorial some months ago, the life of a

technical editor is much more difficult these days than it was fifteen or twenty years ago. In the "Blooperdyne" days it was so easy to "invent" a new circuit. Today the stage has been reached when it is realised that it is not much use wasting time trying to get out a crystal circuit which will amplify. It seems far better to put the available time and effort into organising things for the benefit of radio enthusiasts in general. At the moment component parts are scarce, and so this policy of organisation has shown its merits in the way in which we co-operated with the Aegis Manufacturing Company to get kit-sets on the market. The hundreds of the "Little Companion" and "Metropolis" kits which have been sold is undoubtedly proof of the soundness of this policy. In last month's issue the "Connoisseur" foundation kit was still another phase of this trend in development, providing, as one unit, the necessary base to suit almost any style of popular five-valve set, together with ready-aligned dual-wave coil kit and a gang condenser

(Continued on next page)



Some of the special components for the amazing amplifier which have been made available by Swales and Swann.

Radiokes

Radiokes

AMPLIFIER

(Continued)

fitted with a dial matched to ensure proper station calibration.

Co-operation with Kingsley Radio and their Ferrotune units has also been most happy in every way for everyone concerned.

Now the same policy of co-operation brings to our readers the amplifier design which answers many of the questions which have troubled them in the past.

Following a conference with Mr. Swales, of the firm of Swales & Swann, about six months ago, a great many hours of effort have been expended by L. A. Davies, a member of the design staff of this firm, which specialises in the production of high-fidelity audio equipment and transformers in general.

Now Mr. Davies is able to explain why ordinary "high-fi" amplifiers of the past have been unable to satisfy, and at the same time provide an amplifier design which embodies many unusual features, but everyone of them backed up by clear reasoning which you cannot fail to appreciate if you read Mr. Davies' articles in this issue.

Co-operation goes still further. For our part we will give full constructional details, diagrams and photographs for the building of this amplifier in our next issue. For their part, Swales & Swann will make available all the specialised components which have been developed to make it possible for this amplifier to be built by any reader with a small amount of practical knowledge.

To make quite sure that there could be no doubt about the possibility of repeating the performance of the original amplifier, a kit of parts was obtained from Swales a few weeks ago. An amplifier was built up roughly; just the way that we would expect a raw novice to build it. This amplifier was then put through an exhaustive laboratory test. The layout of the components was juggled about; the alterations in results carefully logged. All the problems that arose were carefully ironed out and duly noted.

As a result, we have no hesitation in saying that the article by Mr. Davies in this month's issue, coupled with the constructional details in next month's issue, will set a completely new standard in technical radio journalism.

THE AMPLIFIER

In his article, Mr. Davies tells you the ins and outs of the design of the amplifier and the work which went into its development. Without using any mathematics or Greek formula, he tells a tale which will stand the most thorough analysis. Some of his sentences are long; some of the words are long, too, but even if you have to read each sentence twice over to grasp the full importance of the statements made, you will not have wasted your time.

To sum up the design in a few words, or rather to point out its most striking features, we must first refer to its performance, which has been checked and re-checked under strict laboratory conditions. It delivers 45 watts of clean power, essentially flat from 25 cycles to 15,000 cycles, without appreciable distortion. Calculated on the same basis the average 4.5 watt amplifier would rate about a third of a watt!

Two points in the design are of special interest: the use of beam power valves *without* inverse feedback, and a push-pull audio transformer with a four to one *step-down* ratio.

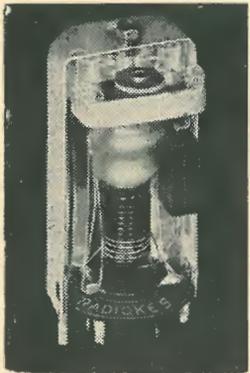
Five valves are used in the amplifier itself, and two rectifiers.

To those who will feel like collapsing at the thought of 45 watts of power, we hasten to point out that one of the most attractive features of the design is the way in which this amount of power can be tamed down to feed a single 12-inch speaker or a pair of dual speakers, to give ideal high-fidelity reproduction for home use.

A WARNING

Amplifier circuits come and amplifier circuits go, but before any of our readers start to decry this effort as "just another amplifier," it is suggested that they should study Mr. Davies' article carefully, and then take another deep breath.

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MORE RESTRICTIONS FOR AMATEURS

"Ici en parle Francais" used to be a slogan you could put on your QSL card if you so desired. All at once, the chief international language, together with Hebrew, Arabic and the lesser used, is banned from use by the amateur. This comes as some surprise, especially in a country where Gaelic (shades of Mr. Kisch) comes as second nature to our tongues.

Despite Mr. Webster, French is

no longer a plain language. I wonder what the Alliance Francais will say to that? What will the French Consul think? I can envisage international complications.

Recent interpretations by the Chief Inspector, as published in last month's "Wavetrap," have caused much discussion and turning over of rule books. This is all to the good, as I have long advocated the amateur should take

more interest in regulations and their making.

Amateurs in general agree that at least four of the rulings are not a fair thing, and I must say that, though the points have no immediate interest to me, I am with them (the amateurs) all the way. The fact of the matter is that here, in the guise of rulings, we have in fact **NEW REGULATIONS**, for they are new restrictions which no amateur heard of before.

The points at issue are not very important, though I understand the one relating to 813's (and presumably to valves of like size) has been implemented with dismay to the owners of the said prized bottles. There are, however, some vital principles at stake.

IS IT DEMOCRATIC?

It all boils down to this. Can an official make the law? And, if so, does the democratic system still function? The answer is two Noes multiplied by two.

The recent regulations covering amateur radio became the law on November 29, 1945, but not before they had been table in the House, agreed upon by the Federal Executive Council (Cabinet) and MADE above the signature of HENRY, Governor-General.

The AOPC is a worthless bit of paper if it cannot be used by the holder to operate ANY amateur station at ANY time.

If an 813 constitutes "components which will enable him to readily increase the power authorised," I'll eat a straw decker on the top of VIP.

I made the point quite early in post-war amateur radio that there are already too many restrictions and regulations. The scope of the present regulations is so wide that their literal interpretation would put EVERY amateur off the air.

(Continued on next page)

Some Departmental Rulings on Regulations

The following letter was received from the Superintendent of Wireless, G.P.O., Perth:

"Dear sir,—Certain points regarding the conditions of operation of experimental stations which were raised by members of an Advisory Committee and which were subsequently referred to the Chief Inspector (Wireless) are with the respective Departmental rulings given hereunder:

(1) *Can a person speaking into a microphone speak in French or any other language?*

All radiotelephone conversations from experimental stations must be in English.

(2) *Can a person who has an A.O.C.P. but no licence be permitted to operate a friend's transmitter whilst the owner is not present, but with the permission of the owner?*

In exceptional cases the Superintendent (Wireless) may grant approval to a qualified person to operate a station for specific tests for a limited period. The licensee of the station and the operator for the time being will be held equally responsible for observing the conditions of the licence. This only applies to C.W. transmission, unless the qualified person has served the necessary probationary period of six months.

(3) *What method is required by the Department to indicate to the experimenter that he is overmodulating?*

The licensee under Rule 55 has the choice of several methods. If an efficient limited device is used with the transmitter, separate provision in the monitor will not be necessary.

(4) *Would the inclusion of a 250-watt valve, such as the 813 type be permitted in an experimental station?*

Before any valve with a rating in excess of the power permitted by the licence may be used in an experimental transmitter, approval must be obtained from the Superintendent (Wireless).

(5) *Could a Class B Licensee install with his original transmitter components permitting expansion to 100 watts, in anticipation of being granted the higher power when suitably qualified?*

No.

Yours faithfully,

(Sgd.) E. L. GREIG,
Supt. (Wireless), Perth.

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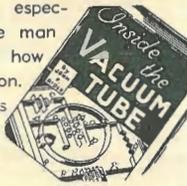
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HAM RESTRICTIONS

(Continued)

And yet up until quite recently, you met the complacent individual who said, "What's wrong with them, anyway?"

The recent "on the spot suspension" of amateur licences in South Australia (which, I understand, was successfully challenged) and more recent happenings locally have caused a display of more interest in these matters. Personally I was hoping that every amateur would get instructions to "At his own expense" paint his mast in seventeen different colours and install a beacon light every six inches, a request which would be quite possible under the wide scope of Reg. No. 53. It might have at least removed a little of the complacency.

Now, do you still believe the amateurs' regulations are all right? I don't, and it's to the standing disgrace of organised amateur radio



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in this country that they were ever made.

The Department is fast denying the experimenter the right to experiment at all and if amateur radio is to survive it must meet the challenge now, and anything done to that end by anybody should merit your immediate support.

It is quite evident that the regulations under the W/T Act are not drafted with a view that "he who runs may read." They are, in fact, designed to confound the individual and give the widest scope in the protection of a Government monopoly: the right to use the ionosphere.

—VK6MU.

NEW HOME FOR "RADIO WORLD"

AS announced in last month's issue, a new home is being built for "Australasian Radio World" and its proprietor-editor, A. G. Hull.

High on the side of Beleura Hill, overlooking Mornington, bay-side holiday resort, about thirty miles out of Melbourne, a site has been chosen, and considerable progress has already been made.

It is expected that the job will be finished shortly before Christmas.

The choice of such a site may come as a surprise to many, but to Mr. Hull it is the realisation of an ideal way of life which he worked out many years ago.

RECIPE FOR HAPPINESS

As anyone who has taken things easy for a while, you probably have already learnt that there is not much in life if you just sit around taking things easy. On the other hand it is no fun working at a job you don't like, or under circumstances which are irksome.

But if you can work at the sort of thing you like doing, and under ideal circumstances, well, that is worth striving for.

Mr. Hull is a country lad, spent his childhood on the lonely plains of Victoria's Western District. On many a cold and windy Sunday afternoon he roamed far afield over those plains with his brother Ross. The two lads were filled with the keenest ambition, and their shared day-dreams stopped at nothing less than world fame. "Someday we'll walk down Broadway together," said Ross quite often.

By 1936 both had achieved their ambition and walked down Broadway, fortunately without any forebodings of the tragedy which fate held in store. A couple of years later, Ross was accidentally electrocuted whilst carrying out television experiments in his cottage-laboratory in Connecticut.

At the time this tragedy was a terrific blow to all who knew Ross Hull, but, as time soothed the wound, it is realised that even if



Mr. Hull lends a hand on the attic floor joists of the new home for "Australasian Radio World." Over the tree tops in the background can be seen the town of Mornington, with the Bay beyond.

Ross lived a short span in years, at least he filled every living moment and did more in his time than many people will do if they live to be a hundred.

To A. G. Hull this death was one of a series, starting with the sudden deaths of both Mother and Father, then Ross, shortly afterwards another very dear and close friend, then another brother. Then the war and the R.A.A.F. provided glory and death to nephew Bill (who had considerable resemblance to Ross) and to five other close friends. Is it any wonder that under such circumstances A. G. Hull has strengthened his resolve to "give unto each fleeting hour something to hold in store"?

But how can a country lad ever feel really at home in the hustle and bustle of high-pressure business in a big city? How can anyone work for 16 hours a day without getting worn out?

A. G. Hull thinks he has the solution: a country home and office combined, with an ideal den and laboratory built into a cozy attic with inspiring views from each of its six "landscape" windows.

And so we come to the Mornington project.

Lots of other people want homes, too, and it is no easy task

to achieve such an ideal. But an ideal is worth fighting for, so you can guess who steps in to fill the breach when someone is needed to wheel the barrow to pour the concrete foundations. Likewise a bricklayer is obtained, but no bricklayer's labourer. You can have another guess as to whose fingers get rough and cracked. But up go the walls!

So, for the moment poor old "Radio World" has to struggle along as best it can under the circumstances. However, there is a good time coming. A. G. Hull is getting plenty of time to think up further ideas and ideals while he carries the bricks. In about three months' time these plans should take the form of a most energetic technical development programme.

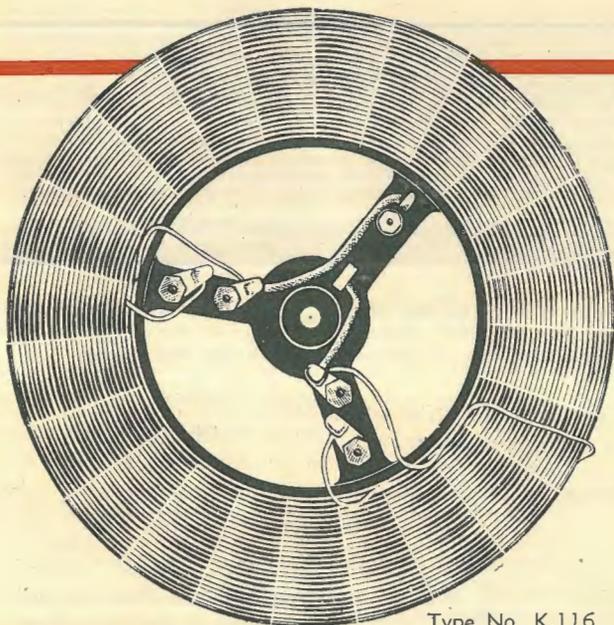
In the meantime it is indeed fortunate that Mr. Hull has so many friends in the game who are only too keen to make the most of his technical policy of co-operation.

In this regard the December issue will be outstanding, with three major feature articles, each dealing with entirely different subjects, each of the highest standard in its class.

Then follows 1947 and it should be a truly "Red-letter" year for "Australasian Radio World."

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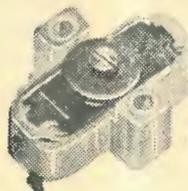


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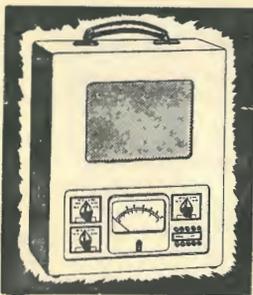
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speaker socket.



A new "University" five-
band oscillation for the
alignment of all types of
radio receivers.

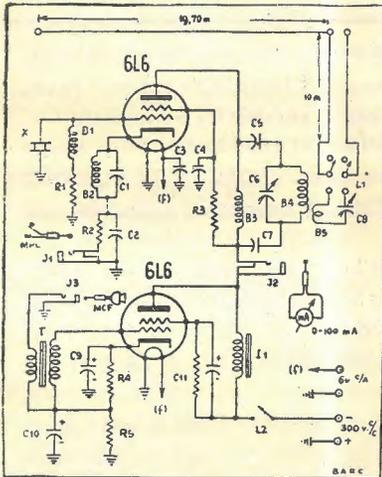
TECHNICAL RADIO IN SOUTH AMERICA

FROM Buenos Aires came, the other day, three copies of "Radio Revista," a magazine "devoted exclusively to technical radio" like "Radio World," but printed in Spanish.

Not being able to read Spanish, we have not been able to study these magazines carefully, but it is obvious that there are lots of radio enthusiasts in South America of just the same type and style as the radio enthusiasts of Australia.



Radio supply stores in Buenos Aires are up-to-the-minute, as shown by this picture of one of them.



With a knowledge of French and a smattering of German, it becomes fairly easy to get a good idea of what the Spanish is about, especially when there are so many universal radio terms, such as 6 volts, 30 watts, push-pull 6L6 "clase" B. And then it doesn't take much imagination to know what they are writing about when they say that it is "magnifico en

Some interesting circuits from South America. Above, a simple ham transmitter. Below, a t.r.f. set of unusual design and a superhet for the V.H.F.

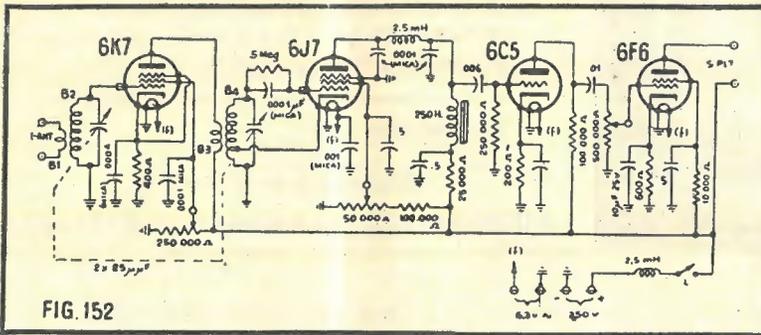


FIG. 152

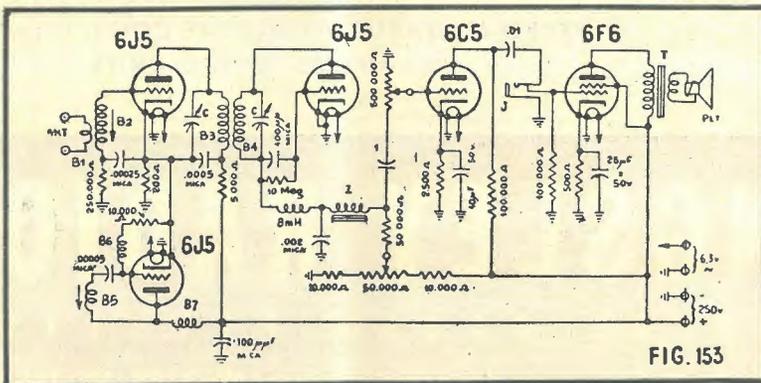


FIG. 153

rendimiento." It sort of gives you the impression that they are trying to say that it is magnificent in its rendition.

In the "Abril" issue (you can easily guess that means April), the greatest amount of space is devoted to a feature article entitled "Concurso de Amplificadores de Alta Fidelidad," which sounds like something to do with a race for amplifiers of high fidelity. And sure enough we find that "Australasian Radio World" is mentioned and also the name of our esteemed contributor, Mr. J. W. Straede. Closer study reveals that the story is all about one of Melbourne's amplifier contests and the successful amplifiers that were used.

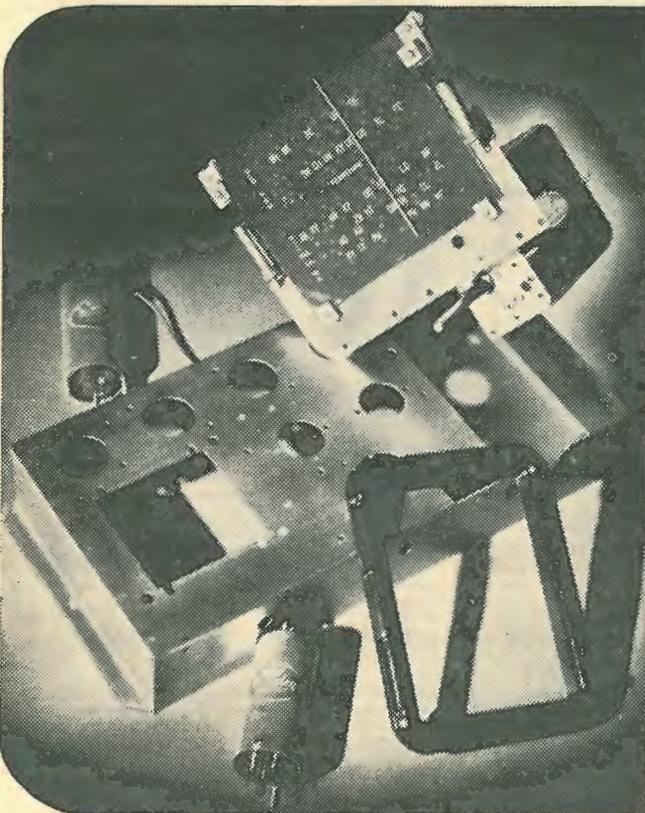
Turning a few more pages of the same issue a circuit appears which seems familiar, and, on closer inspection, proves to be the push-pull job detailed by A. G. Hull in one of Q.S.T.'s issues in 1936, reprinted with due acknowledgment.

Of course, there are also many circuits of South American design and these are of especial interest, as they reveal plenty of originality.

A suggestion from the editor of "Radio Revista" that South America and Australia should exchange circuits and ideas has been readily accepted by "Australasian Radio World" and it is hoped that in future we will feature, from time to time, reprints of technical articles from "Radio Revista."

KKI

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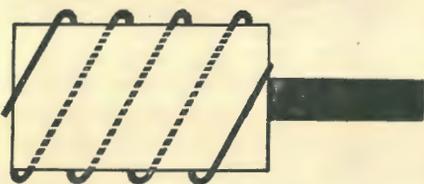
1. The outstanding FERROTUNE ferromagnetic gangless tuning unit—it covers the broadcast band and includes tuning mechanism, straight line dial, padding and trimming, etc. It does not need further alignment.
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FERROTUNE

(Continued)

Then the dial which is supplied with the kit is not only an effective dial but its station calibrations must be perfect. A pair of specially selected intermediate transformers completes the kit, making it not only a great convenience but also a splendid business proposition. The difference in price between the kit and buying each component individually, even if you could do so, would not amount to more than a matter of pence, but the saving in time and trouble and the guarantee of satisfactory results makes the kit a better proposition even if it costs pounds more.

EFFICIENT DESIGN

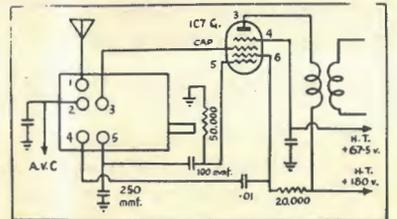
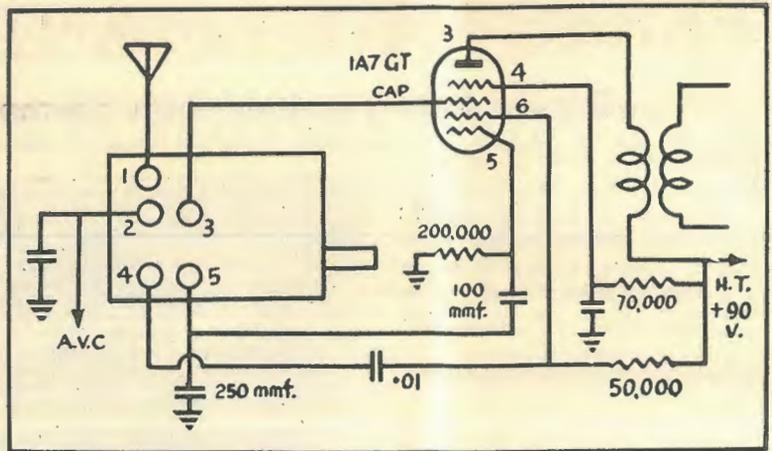
We have already detailed the standard "Ferrotune" set, also the special "Reinartz" model, which has already leapt into popularity. Now we come to a mantel model which has been thoroughly engineered to give completely satisfactory results with only four valves

Ferrotune units can be used with battery-operated valves. Here are the correct circuits for use with types

in all, even in the worst locations or under the most difficult conditions.

The circuit is without frills but provides for using the high-gain

Philips valves to best advantage, with a carefully thought out auto-



**A
B
A
C**

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AMPLIFIER
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matic volume control arrangement, but nothing fancy in the way of tone control or inverse feedback. Such items are out of place for a mantel model which, even at the best, can only hope to have a nicely-balanced tone.

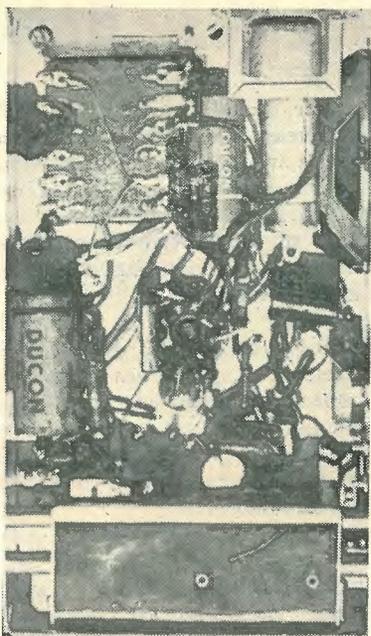
VALVE LINE-UP

As will be seen from the circuit diagram the valve line-up is as follows: the well-known and practically standard 6J8G as converter, followed by the new Philips release, the EBF35, the diode-pentode which is rapidly displacing the EBF2G as the most popular valve to give high performance at i.f., together with detection and a.v.c. efficiency. Audio output from the detector circuit of this valve is fed to the grid of the highly-sensitive EL3NG without further amplification. No attempt has been made to attempt reflexing, but results are surprisingly good. Ample range is available to give good interstate results in the evening.

BIAS ARRANGEMENTS

It will be noticed that back bias has been used in a simple scheme to ensure highest performance, yet allow the cathodes of all the receiver valves to be directly earthed. This saves quite a few by-pass condensers and gives better all-round stability. It is always an attractive feature for a mantel model to be as compact as is reasonably possible without cramping the layout or making the components inaccessible. The Ferrotune mantel model is of handy size, the base measuring about 10 inches long, 5 $\frac{3}{4}$ inches wide and 1 $\frac{3}{4}$ inches deep. These measurements make it ideal for fitting into a cabinet of handy size, and efforts are at present being made to arrange for the supply of a special cabinet to suit the chassis.

The procurement of a kit of parts for any receiver is rather a difficult problem these days, but the position is gradually getting better. Kingsley production of "Ferrotune" units is still well behind orders, but is steadily maintained



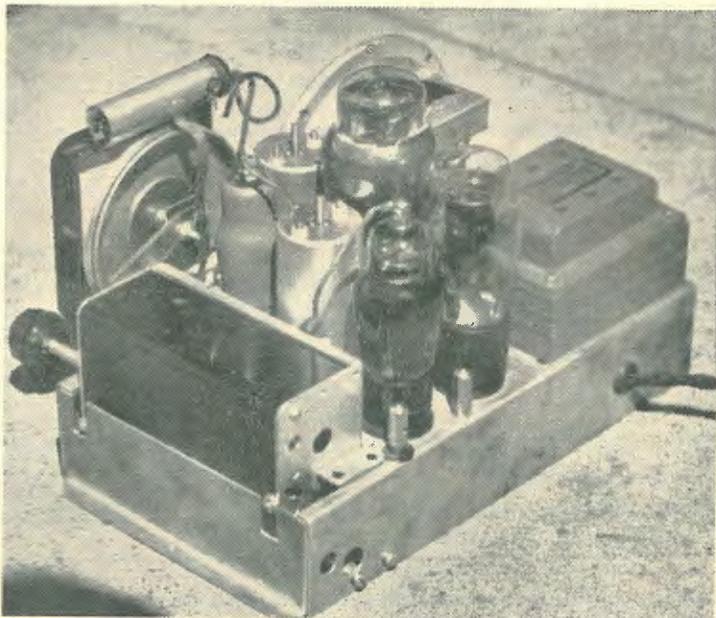
and the results widely distributed throughout the continent. If you want to build a mantel model we feel sure that you will find it quickest in the long run to order a kit.

Among the components necessary to go with the foundation kit

in order to make up the complete chassis, the most difficult to obtain will be the speaker, which calls for a Rola type 5C. This speaker, like all speakers, is in short supply at the moment, but it is one of Rola's most popular models and one upon which they concentrate the most pressure to ensure a large quantity production, so it should be one of the earliest models to ease when the speaker supply position starts to right itself. Other components hard to obtain are electrolytic condensers, but, on going into this position fully, we find that most stores are operating a sort of unofficial rationing. If you buy the rest of the parts, then smile nicely and ask for a pair of electrolytics, it is almost certain that a pair will be brought to light from under the counter.

ALIGNMENT INSTRUCTIONS

The simple process necessary to ensure proper alignment of "Ferrotune" units has been adequately covered in recent issues and so we feel that there is no need to dwell on it at length again. If you want a copy of an issue containing these details you can obtain one from our Back Dates Department for 1/- post free.



A FULL FREQUENCY RANGE AMPLIFIER

Application: The amplifier is designed to raise high-fidelity signals on a wide audio band to a level satisfactory for the purpose of reproduction, or modulation, without the introduction of appreciable distortion. The adoption of the output capacity of 45 watts may appear to be an error on the side of safety

By
L. A. DAVIES Ph.B.

In association with the Design Staff
SWALES AND SWANN
2 Coates Lane
Melbourne

until the following is considered and a perspective on fidelity sound is developed, as distinct from the accepted practices in the field of restricted range and medium fidelity.

Firstly, in standard practice, a power amplifier is rated on a test of power developed at the plate or plates of the output stage at 400 c.p.s. for some selected distortion

value, usually greater than 5%, whereas, for electrical quantities to have any significance in association with the units of acoustical science they must be referred to the voice coils of the reproducer units and the reproducer translation efficiency kept in mind. Secondly, where the allowable distortion on single tone is high, the listener must be prepared to accept the beats, both consonant and dissonant, of the harmonics introduced to each of several tones fed to an amplifier as well as the sum and difference beats of the fundamentals.

Turning to the quality instrument, we find that, having determined the power required at the voice coils, we can derive the amount of plate power required to provide this without any increase of distortion on multiple signals over the fundamental plate distortion of the amplifier on a single sine tone.

Take a familiar combination as a basis, that of the modern console receiver with a single tetrode having a rated output of 4.5 watts at 8% total harmonic distortion. Should only three tones of this

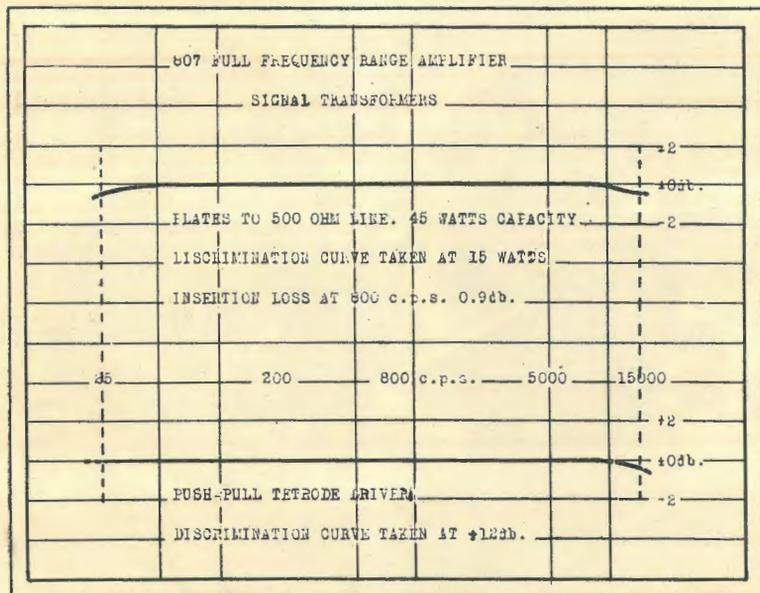
power and distortion be required simultaneously, an output of 41 watts at less than 2.7% harmonic distortion is necessary, so to obtain the undistorted power over a wide range on music that is quoted for a single signal, requires a reserve amplifier power capacity of approximately 10 times the single signal power even if not more than three simultaneous signals are considered. With 45 watts available and intermodulation on three signals considered, 5 watts can be obtained at the plates. Now, it is a very good output transformer that will cover the range from 25 c.p.s. to 15,000 c.p.s. at 45 watts without appreciable iron distortion and less than 0.5 db. discrimination without insertion loss greater than 1.5 db. Therefore, we can expect, with a good unit, 3.55 watts at the secondary, and allowing a modest 0.5 db. loss in filters to differentiate for reproducers necessary to cover this wide range, and a further 1.0 db. for transformers to match each voice coil to the differentiators, we have achieved 2.5 watts of sensibly undistorted wide-range sound at the reproducer.

SOME COMPARISONS

Allowing the 4.5-watt job a normal 2.0 db. transformer loss, it still delivers 2.8 watts at the voice coil, or, according to conventional rating methods, 12% more power than the 45-watt machine correctly rated.

This does not mean that the 45-watt amplifier does not perform better at 45 watts than the 4.5-watt unit at 4.5 watts; it is better by the difference between 8% and 2% of distortion. The 4.5-watt unit would be correctly rated at 0.31 watts at 8%, assuming that the beats of prominent harmonics have subsided below the threshold of audibility, and this is by no means likely even at the low output level involved.

Derivation: For apparatus to develop the 45 watts of clean signal, push-pull 807's in fixed bias AB1



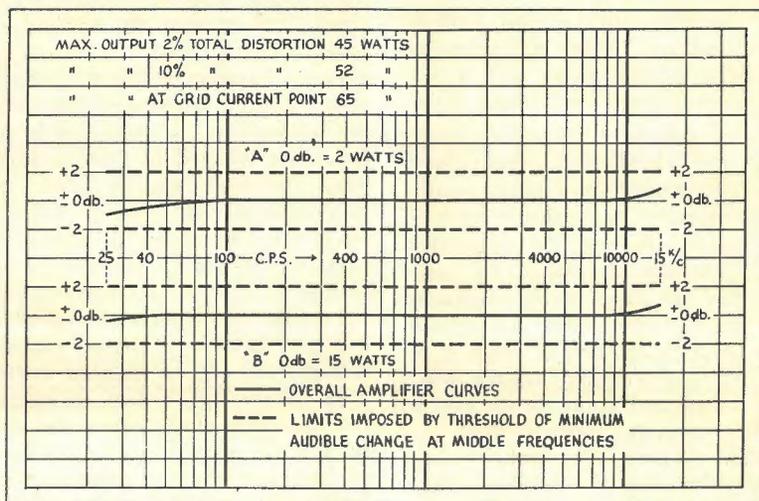
Curves showing the splendid frequency characteristics of the special "Red Line" transformers produced for this amplifier.

TO DELIVER FORTY-FIVE WATTS

condition, and suitably driven, were decided upon. Two facts led to a decision to use two medium current power supplies in preference to one voltage supply for bias and a heavy duty supply for all else. One was the wide difference between 807 plate and screen voltages and the screen voltage similarity to the plate voltage of the driver tubes, the other was the screen voltage regulation effect on quality and the high order of screen current change with signal level. Hence, one choke-input type of supply, completely floating, is used for the plates and is returned directly from the 807 cathodes. The remaining supply is of the condenser-input type to obtain superior smoothing for driving stages and stabilised by a moderate bleed resistor, a tap on which is used to polarise the 807 cathodes by the amount of bias required, so that the grid circuit may be grounded, and the bias be independent of plate current.

NO FEEDBACK USED

The output stage constants were selected to give a maximum output in I.C.A.S. ratings for less than 2% distortion. This critical output lacks the output for much higher distortions by a few percent only, as the transition into the distortion region is abrupt, even though no negative feedback is used. Feedback is desirable in some cases for the reduction of harmonic distortion at middle frequencies, but its effect on the extension of the pass band tends to invite underdesign of output and matching transformers with the resultant heavy increase in intermodulation when signals of even modest proportions appear in these artificially extended bands. The high frequency end need not be considered deeply in this respect, as high powers of mixed frequencies do not often occur here, although difference components so developed, when added to a transient which makes them, produce a quite obvious hollowness. At the



Overall frequency characteristics of the amplifier showing practically flat response from 25 to 15,000 cycles.

low end, however, the intermodulation components are so pronounced that they often mask the fundamentals entirely, especially as the ear response and the efficiency of most reproducer systems fall in the extreme low region. To the listener, this obtrudes itself as an apparent rise in bass with output level, out of all proportion to the normal ear scaling at different levels; actually it is a shifting of part of the bass power to its intermodulation sum frequencies which occur in a more efficient reproducer-aural band, hence feedback often gives a false, richly modulated bass which is not unpleasant for short periods, but far from true fidelity.

PROBLEMS OF FEEDBACK

The damping virtues of feedback are also lost more often than not at the frequencies where they are most required, by copper losses, phase-rotation and coupling losses in the matching equipment and voice coil lead inductances, so in a really good system, the reproducers themselves should have inherent damping and, if any extra is required, it should be added right at the voice coils.

Generous drive to the 807's is provided by push-pull 6J7G tri-

odes, transformer coupled, and capable of delivering the required 55 peak volts across 10,000 ohms grid to grid. Transformer coupling was found necessary to minimise the drifts of constants due to the wide variety of grid current values met in 807's. Push-pull excitation of the drivers is obtained by use of a further 6J7G triode as a phase-splitter worked at positive grid potential to neutralise hum and to enable sufficiently low load resistors to be used to reduce the high note losses in one half of the split output due to heater-cathode capacity. In fact, these resistors were reduced until the percentage distortion curve rose in approximate sympathy with that of the drivers. Input to the phase splitter is depolarised and varies between 0.25 megohm impedance at low frequencies and 0.225 megohm at 15,000 c.p.s. An input of 2.0 volts or -26 db. (0 db = .006 watt) is required to run the amplifier to full output.

PARASITICS

A preliminary examination of the tendency to parasitic oscillation in high sensitivity power tubes indicated that something more than

(Continued on next page)

45 WATTS

(Continued)

the current hit or miss suggestions for its elimination would have to be developed. With 807's coupled through a transformer with a pass band extending well into super-sonic frequencies, the screen isolating method was not even capable of preventing continuous oscillation in tubes of moderate to high screen current, and had little effect on parasitics developed by tubes selected for their screen alignment. It did, however, aid in suppression up to 20 watts output when a resistive load was used on the selected tubes, and approximate grid to plate capacity neutralisation applied. When a reproducer load was connected, the level at which parasitics appeared, reverted to 1.6 watts, although full output was now possible if other than harmonic distortion was ignored.

Appreciating the tolerance of beam tetrode constants, an aggressive method of suppression was re-

sorted to in order that as wide a variety of conditions, both of load and screen current, might be accommodated without a necessity for precise adjustments for individual cases. It consists of a discriminative negative current feedback arrangement between the screen and cathode of each output tube, and has its values selected to form a high pass resistance-capacity filter of time constant suitable for the reduction of the screen to plate amplification factor to something approaching unity at a frequency below that at which appreciable energy from space charge pattern disturbances can be coupled to the grid. With this system in operation no trace of parasitics was detectable for any impedance or phase of load and for any power output including outputs in excess of the distortionless capacity of the amplifier. This is achieved at the expense of a small percentage of otherwise available power output over the entire audio band, without attenuating the high frequency end.

The next problem was the ex-

clusion from the amplifier of radiation originating in shock excitation from the interruption of the current cycle of the high voltage rectifier. The greater amount of this appears on the rectifier heater and is transferred to the amplifier heater windings, which must be centre tapped and grounded near the power transformer, while all heater wiring should be arranged with a neutral magnetic field.

An output transformer which performed according to the requirements stated when resistive terminated, was included, together with a high impedance driver transformer that was essentially flat from 20 c.p.s. to 20,000 c.p.s. on resistive load. The overall response of the amplifier at 15 watts output in the line was found to be -0.5, +0.5 db. from 25 c.p.s. to 15,000 c.p.s. and at 5 watts to be -1.2, +0.7 db., taking 800 c.p.s. as the base frequency, this being near the logarithmic centre of the audio band. Curves "A" and "B" supplement this information. Curve "C" indicates power output *to the line*

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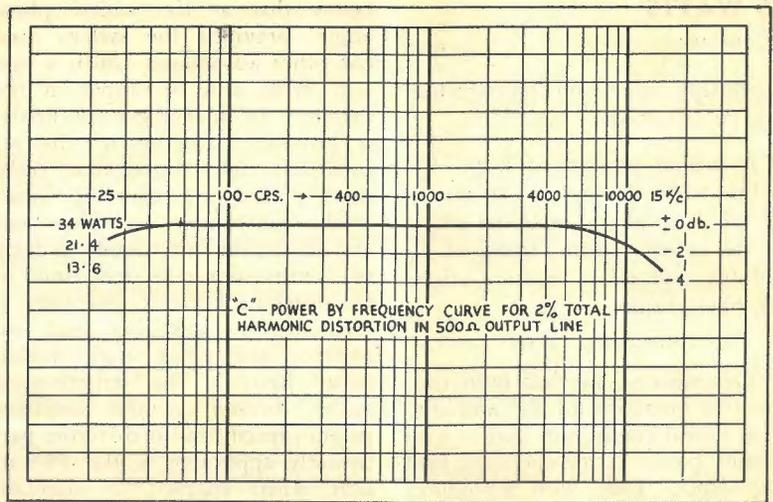
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for 2% total harmonic distortion at different frequencies. While the curve "A" would give the impression that the maximum power would be available at all frequencies it must be remembered that the output transformer is down 1.5 db. at 15,000 c.p.s. but the amplifier shows a rise, indicating that tuning effects in the primary are present. This reduces the critical power in several ways; one, the leakage reactance has caused the system to operate at other than unity power factor, therefore, reduced the efficiency of the generators; two, the load resistance has been increased beyond the optimum value; three, the primary tuning reaches resonance at a frequency that is crossed by lower order harmonics as the signal frequency is increased; hence the output circuit shows considerable selectivity to the distortion components and as the frequency is increased so the power must be reduced to bring the values of low order harmonics down to those of the higher and less dominant orders.

INAUDIBLE DISTORTION

It could, with advantage, be mentioned here that a determination to adhere to strict distortion limitations is of more academic interest than practical value, when

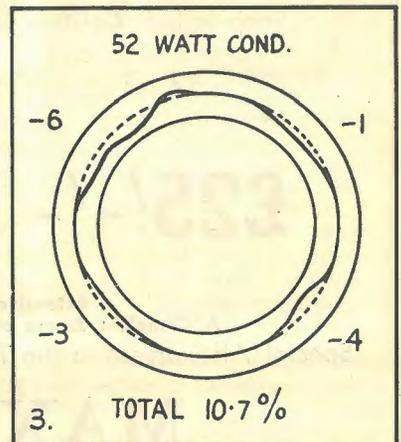
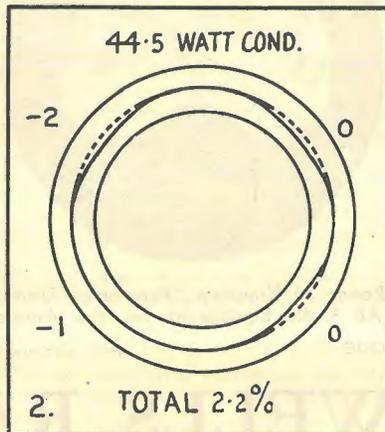
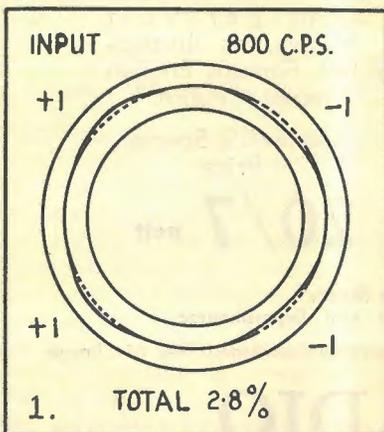


Curve "C," showing power output to the line for 2% total distortion.

dealing with the high frequency end of the spectrum. The reason for this is that as the frequency of the fundamental rises so the various harmonic orders have passed into superaudible bands and can be individually disregarded until 8,000 c.p.s. is reached, when even the second harmonic is inaudible. However, if these harmonics occur in a band where the amplifier has become non-linear, differential detection results and a considerable portion of the energy contained in these harmonics is returned to the audible band and is the cause of quite a lot of the tonal hardness complained of in amplifiers of sometimes remarkable bench performance. To cure this it is neces-

sary to attenuate the slope of any non-linear regions as far as possible and one way to do this apart from ensuring a wide marginal response outside the audible band is to reduce the "Q" of the resonant circuit formed by the leakage reactance of the output transformer and a capacity made up of its distributed capacity and the plate circuit capacities. The dynamic resistance of triodes is an advantage in reducing the "Q" and a lot of the popularity of triodes can be traced to this virtue without detracting from their more obvious ability to damp and regulate very poor reproducers to a degree where

(Continued on next page)



Vector analysis (polar optical trace system) showing (1) the distortion in the input signal; (2) the distortion in output at 44.5 watts and (3) the increased distortion at 52 watts. All are represented in their true phase relationships.

45 WATTS

(Continued)

reasonably appealing reproduction can be obtained.

A further product of high "Q" is that when it occurs in an amplifier of sharp phase rotational effects in the earlier circuits, transient instability and other parasitic effects are likely to occur.

SPEAKER LOAD

Treatment so far has been confined to operation of the amplifier under ideal conditions, that is with a unity power factor aperiodic load impedance. Even with reproducer systems of the most specialised type, the reflected load is far from aperiodic and also subject to phase variations amounting at some frequencies to 80 degrees or more. The elliptical load line so produced at the plates so severely curtails the available output that we can consider any system for overcoming this which does not reduce the output efficiency over the whole band

below that at the widest phase angle, provided the system used has other advantages. Such a system exists and is simple in the extreme. Its advantages are, firstly, it provides damping of the reproducers right at the voice coils, thereby removing damping losses in the transformers and filters and also distortion introduced by delay or transmission-reflection time in the matching network. Secondly, it maintains the amplifier load impedance and phase angle within close limits. The effectiveness varies directly as the amplifier power capacity and is therefore particularly applicable to the 45-watt unit when coupled to standard speakers assembled as a wide range reproducer. A load angle of 80 degrees is usual at the bass resonant frequency sidebands of a speaker when unity matched and greater than this when matched to tetrodes, so it was decided to adopt a four-to-one mismatch at the voice coils and shunt them with sufficient resistance to consume 75% of the power. This loss corresponds ap-

proximately to that sustained when operating the amplifier at 74 degrees phase angle at optimum matching impedance, but it must also be remembered that in this band of low power factor speaker impedance has risen to many times the nominal value and further losses are incurred; so we have lost much less power by this method than normal speaker phenomena cause us to lose at certain critical frequencies. The resistive load so provided maintains the output impedance and power factor within close limits and provides a three-to-one damping factor right at the voice coils over and above the usual plate damping. Plate damping is effective within limits at the bass resonance but has little effect on the multiplicity of sharp transmission and compression peaks found in all cone speakers above the piston frequencies, whereas the direct method has a marked smoothing action in the band of diminishing cones area, when used on magnetically saturated speakers.

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expected 1.5 db. plate to line transformer loss, so with full appreciation of the magnitude of this loss, an attempt was made to reduce it. By tolerating an attenuation of 0.8 db. at 25 c.p.s. it was found possible to cut the loss to 0.9 db., thereby reclaiming 4.7 watts. At 25 c.p.s. the ear response is down 18 db. for the average listener at loud room level, so 0.8 db. is a trifling 1.92% increase of attenuation. To the outdoor man who wants all the sound available, the foregoing is of special interest because, with typical commercial amplifiers using the same output tubes in 30-watt semi-fixed bias condition and a modest output transformer with an insertion loss of the usual two to three db., no more than 19 watts can be expected and then only between about 150 c.p.s. and 5000 c.p.s. With the engineered unit over 36 watts are available with considerably less distortion for the same power dissipated in the tetrode plates. Added to this there is freedom from parasitics which are found in the transition and overload region of almost all tetrode and pentode amplifiers.

EXTRA POWER FOR P.A.

Primarily the prototype amplifier was adjusted to give maximum output with 2% total distortion as the limiting factor. It was found that transition to the distortion region was abrupt, so an alternative adjustment was developed for optimum output with 15% total distortion as a limit, 15% being almost undetectable on speech and 30% the lowest which is disagreeably noticeable. Under the 15% adjustment, while the output for 2% was less than 17 watts, the transition band was extended so

that over 53 watts at the plates was achieved and 65 watts for noticeable speech distortion.

CRITICAL VOLTAGES

Too much stress cannot be laid on the necessity for extreme care in the adjustment of the output stage conditions of the amplifier. The secondary power supply which provides bias as well as screen voltages has been carefully developed around a controlled lack of regulation to provide synchronised changes of the correct proportion in both cathode and screen conditions of the output tubes with change of signal level. Load resistance being fixed, the required adjustments for 2% condition are to set the overall value of the secondary power supply bleed re-

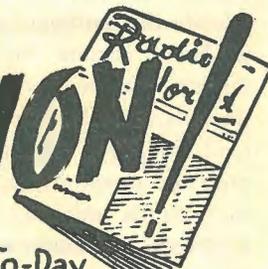
sistor until the screen to ground voltage is 330 volts when the cathode to ground potential is 27 volts at zero signal. When sufficient signal is applied to produce full output the screen current should not exceed 18 milliamps total; if this is the case, a warped tube is indicated and should be replaced with one which operates closer to strict beam tetrode conditions. To align the amplifier for 15% conditions the same procedure is adopted, with the desired screen and cathode potentials being 335 volts and 29 volts respectively. From these figures it is clear that the difference between a high fidelity amplifier and a speech amplifier, from a distortion point of view, is 2 volts at the cathode and 5 volts static screen potential.

SUITABLE SPEAKERS

It is comforting to know we have an amplifier which conforms to Frequency Modulation standards which are being internationally adopted, but it must be capable of use in conjunction with apparatus available to the average user in this country more or less on demand, hence a 12-inch and an 8-inch per-

(Continued on next page)

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45 WATTS

(Continued)

mag speaker for which high efficiency claims are made, were chosen. Several factors then entered into the determination of the most suitable crossover frequency, the bands of best response of each speaker taking second place to considerations of speaker intermodulation and frequency modulation effects. Added to this was the difficulty of phasing which requires special treatment at the higher frequencies. On high-quality speakers, as used in theatre installations, 800 c.p.s. has become the accepted crossover frequency as it lies on the high side of the logarithmic centre of the audio band, yet is low enough to allow a small amount of latitude in mounting and baffling. It does, however, call for a good low frequency speaker capable of handling the necessary bass power without amplitude modulating the low-middle register, but with the local unit it was found more satisfactory to cross at 400 c.p.s. and tolerate the harmonic generated by it, being content to remove the intermodulation effects of its non-linearity. In an endeavour to extend the lower band in which appreciable power could be handled, the 12-inch unit was loaded with a 17-foot air column and to reduce peaks in the 8-inch unit, considerable doping of the cone housing was resorted to, to break up reflection paths. Also, a closed baffle

of 300 c.p.s. first cutoff was used on the treble unit so that it could be mounted as close as possible to the bass speaker for best acoustic phasing without suffering mechanical modulation from that source except in the attenuation bands of the crossover network.

ACOUSTICAL PHASING

The crossover network was inserted in the 500 ohm line, at which impedance quite convenient units of inductance and capacity were possible and reasonably high "Q" factors obtained. With the highest possible "Q" consistent with size, the insertion loss per stage of the filters amount to about 0.5 db., on the low frequency side, so a single stage parallel network was used having a discrimination of 12.5 db. in the first octave either side of the crossover frequency and corrected for constant phase angle and image impedance. This type of network has the additional advantage of maintaining a constant 180 degrees rotation between the two outputs at all frequencies, so nothing elaborate is required in the way of acoustical phasing, although it must be remembered to reverse the input to one speaker after determining the connections to produce parallel in phase operation of the two.

MULTIPLE SPEAKERS

Reference has been made to frequency modulation as applied to speakers; that is, the rise and fall in frequency in the media of a high frequency tone reproduced by

a speaker which is also reproducing a lower frequency tone. It is a manifestation of the Doppler Effect, as the high tone is being set up in the media by a diaphragm which advances and retreats from the listener in sympathy with its low frequency vibrations, thereby raising and lowering the apparent frequency of the high tone. So it is obvious that the smaller the range covered by each speaker, the smaller the audible effect of the phenomenon, and a multiplicity of units appear to be the solution. On the other hand, network losses and especially phasing problems when a number of speakers are used, demand that a minimum of band subdivision be resorted to or the transient response of the system is lost. Shortening the band over which a speaker works requires that the crossover band be correspondingly shortened, demanding sharp cut-off filters and close tolerances on speaker mounting and sound path lengths, up to the point where it is impossible to design acoustic filters or traps of sufficiently sharp attenuation to eliminate acoustic modulation of one cone by another, at which point nothing is achieved by the greater number of subdivisions of the band except a loss of power. Theatre systems in this country both of local and overseas manufacture, all use a single division of the band, although the two most prominent American theatre equipment organisations have developed commercially practicable two division or "Tri-phonic" reproducers.

OTHER APPLICATIONS

The amplifier also finds application in the recording field, as the reserve of power, in conjunction with a cutting head of good efficiency and response, permits of the preferred system of post-equalisation with ample monitoring output available to overcome scale distortion and consequent poor adjustment of equalisation on the part of the operator.

Under speech conditions it is capable of fully modulating the highest input powers to amateur transmitters allowed in this country.

AMPLIFIER ENTHUSIASTS

If there are any points in this article which you do not clearly understand you are invited to drop us a line so that they can be elucidated in an article being prepared for next month's issue.

LADS WILL NOT BE EXAMINED

I WISH to congratulate you on your article, "Politics of Ham Radio," which appeared in the July issue of "Australasian Radio World," in which you criticised the regulation which prevents young Hams owning and operating their own transmitters. For eighteen months I have been "swotting" with text books and a correspond-

By
B. FIELD
TASMAN STREET
ALBANY, W.A.

ence course, with an ambition to obtain my "ticket" as soon as possible to join the local Hams after the war. Recently I was visiting Perth and was examined (for morse code) and was told I was O.K. for the "ticket." I saw four recent papers for the A.O.C.P., and considered them quite easy, so, with much enthusiasm, I hurried home

to Albany and filled in the application form and posted it. A few days later I received an envelope which contained another form with the words, "Candidates under the age of seventeen years will not be examined" printed across it in large letters. Wouldn't it?

So I can't sit for the exam and have a nice big certificate to hang in my room on display, let alone have the transmitter. Surely it is not too much to let us young future Hams at least sit for the "ticket."

What is the reason for preventing us youths from having a transmitter? Why not let us have a flea power, restricted to 50 megacycles and higher, where surely we can do no harm with a few peanut tubes? It would keep us provided with plenty of scope for much experimenting and would eliminate the temptation to "play pirates."

There must be many boys in my position. I know of at least one who is only waiting to reach eighteen and who, like me, will be

ready to have his rig on the air a few days after getting a licence.

Well, Mr. Hull, I guess you are sick and tired of hearing complaints like this, so I will say no more. I was very pleased with the July issue of your excellent magazine. It gave me a thrill to see VK6's mentioned in the Ham notes. It seems to me that not many people realise that there are about 250 licensed Hams in W.A. We have been left out in the cold as regards Disposals bargains. A few 109 transmitters and RX's have, I hear, been auctioned in Perth, but you have to be on the spot to get one. However, being a country bumpkin, I suppose a lot goes on which I don't hear about, but the Subiaco Radio Society has not mentioned any bargains. I was pleased to see that you receive our club magazine, "Wavetrap," and that VK2NO is a member of our club. Congrats to him (Don) for the Ham notes, which I think are excellent.

U.S. Manufacturers Support Hams

In U.S.A., radio amateurs, "the only hobbyists on earth who need a government licence," can now look forward to the close cooperation and support of the industry they had a hand in establishing. Amateur activity in America is at a high peak, and with numbers expected to reach half a million within a few years, the Radio Manufacturers' Association has formed a new Amateur Radio Activities section, with W. J. Haligan as chairman.

Purpose is to act as a clearing house of information concerning new products needed by amateurs; to establish standards of good en-

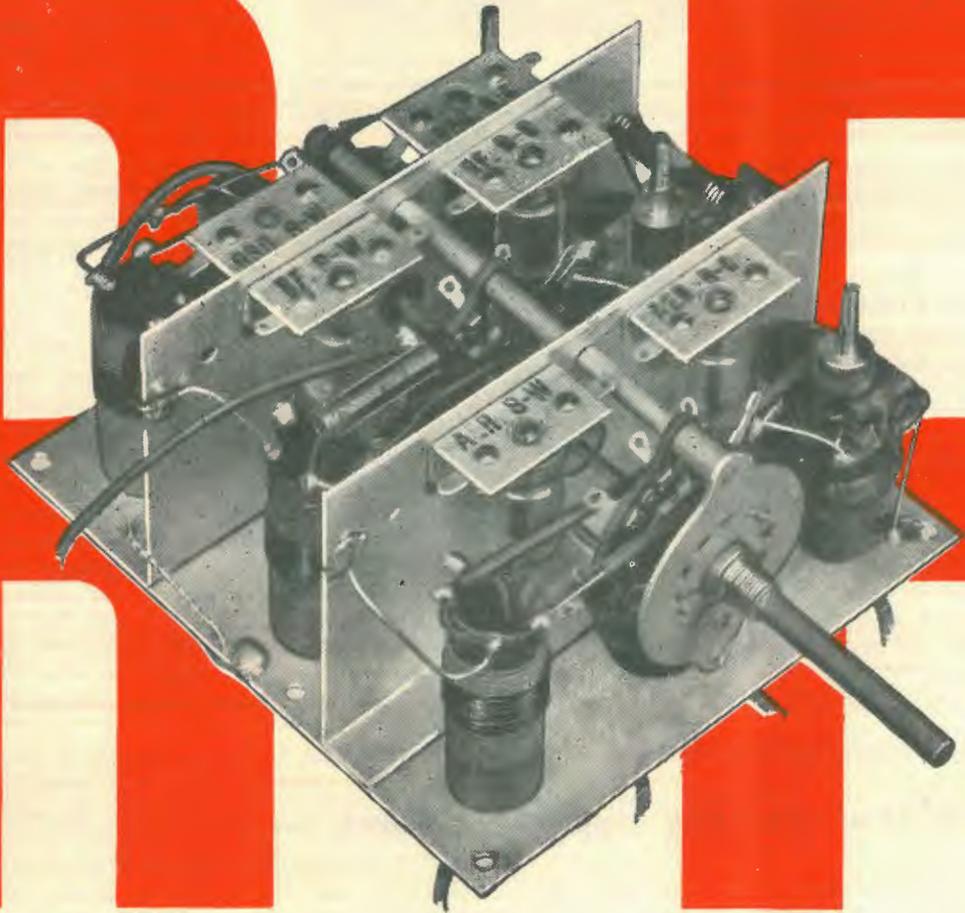
gineering practice relative to amateur radio equipment, and to work closely with the American Radio Relay League in the support of amateur radio in legislative and regulatory matters. The Section has been divided into sub-committees to deal with different phases, including equipment, parts, frequency and power regulations, and promotion and development of amateur radio in foreign lands. Once again America takes a lead in amateur radio, and it is certain that this wide support by radio manufacturers will have considerable effect on the future of amateur radio internationally.

—D.B.K.

During the war I went aboard a ship which was unloading here, to "snoop around" the wireless room and see the gear. I was told the wireless operator was not in, so I peeped in the window of the wireless cabin and saw that it looked very much like a really enthusiastic Ham's shack. There were books and radio gear which obviously was not the usual marine gear. One of the crew warned me that if I mentioned radio to "Sparks" I would have to stand an earbashing, so I decided to come back next day.

Next day I met the "Sparks." The discussion got around to "A.R.W." and he told me that he wrote articles for that magazine. I guessed straight away that it was Charles Aston. I think he took the earbashing. I asked questions all afternoon.

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DON'T TAKE ANY RISKS

Carelessness with High Tension tempts Death!

THE ignorant, foolhardy and careless homebuilder, by treating the electric receiver and associated electrical equipment on his workbench in his characteristic indifferent manner, not only exposes himself to the risk of burns and shock but tempts even death itself. The newcomer to the fascinating hobby of radio must realise that the "juice" is dangerous unless properly controlled, but electrical apparatus can be rendered perfectly safe and foolproof, if a few fundamentals are learnt and applied with care.

The cardinal rule for safety is "Switch the receiver off before working on it." This may appear

By

IAN M. BROWN

too obvious to mention and, yet, many a novice, in his enthusiasm, has rushed headlong to alter some connection or other and found to his sorrow that the power was still connected and it packed a terrific punch.

It is the wisest plan to withdraw the plug from its socket. This is particularly advisable in old buildings. Regulations state that the "live" wire of the house wiring must be broken by a switch. This effectively "deadens" the socket controlled by this switch. However, in old houses and in those which have been at the mercy of "amateur electricians," the wiring is often reversed, with the result that the live wire does not pass through the switch at all, but is connected straight through the socket and plug to the apparatus attached thereto. Although the receiver will not operate under these conditions because the return wire of the house circuit is broken by the switch, one terminal of the power transformer nevertheless is alive and a potential difference of the

full 240 volts exists between this terminal and the chassis or earth, as will be explained later. Therefore, unless you are absolutely certain of the correctness of the house installation, REMOVE THAT PLUG.

In many cases, of course, it is necessary to leave the receiver switched on, as for instance when taking a meter check under actual performance conditions. Under these circumstances the safety rule to bear in mind is WATCH THAT CHASSIS.

It is the common practice in electrical reticulation systems to have the return wire earthed at the point of supply. Consequently the full 240 volts can be obtained anywhere along that system from the live wire to earth, as well as between the live and return wires. Thus, when the chassis of a receiver is earthed, a voltage of 240 exists between the live terminal of the power transformer primary and chassis and it is the simplest thing in the world for a careless and unthinking mechanic to get his hand, wrist or screwdriver across these points. It should now be clear why danger exists, as previously mentioned, when the receiver is inadvertently alive due to incorrect house-wiring. "Very well," you say, "make the chassis safe by removing the earthwire." Certainly that would take away part of the risk, but remember—240 volts exists from the live terminal to any earthed point and if your workshop floor happens to be concrete or the bare ground, you will receive a shock without touching the chassis at all. When working on a live receiver in an earthed situation, it is a wise plan to stand on a non-conducting surface such as a low wooden platform or rubber mat. This is no protection from an earthed chassis, so remember WATCH THAT CHASSIS.

The question of the workshop floor brings up the matter of the electric soldering iron with which

the mechanic is working. To be perfectly safe this should be wired with a three-cored flex so that its frame is solidly earthed. Many unwise homebuilders plug their irons into the nearest light socket, with the result that the frame is un-earthed. Should a leak develop to the frame, the mechanic will receive a shock when simultaneously applying solder to the tip of the iron and touching the chassis, or earthed floor. The insulated floor minimises the risk from a leaky iron. Always see that the length of the iron cord is adequate so that no undue strain is placed on the light socket. Ensure that the cord is in good condition, because a frayed cord rubbing against the sharp edge of the chassis can give rise to a serious flashover and consequent blowing of the house fuse.

Flashovers in both the AC and DC circuits of the receiver can easily take place when test-prods, screwdrivers, etc., are carelessly handled and it is unwise to peer closely into an upturned live chassis while working. An unexpected flash close to the eyes can do irreparable damage. Exercise caution when handling the tools and judge a safe working distance from the set, with respect to the eyes.

No homebuilder is ready to graduate from the receiver to the transmitter class unless he has learned by experience that it pays to be careful, for the extra high potentials present in transmitters are not to be trifled with, while the effects of inductance and capacity must be fully understood. The large condensers employed particularly provide a dangerous trap for the unsuspecting, because they hold their charge after the current has been switched off. Always discharge the innocent-looking condenser before touching it.

A little knowledge is a dangerous thing when dealing with radio and electrical apparatus, so be wise—learn the fundamentals and apply them rationally.

SOME NOTES ON THE CARE OF BATTERIES

IT is remarkable how little attention is paid to that overworked servant, the battery. A little care given to this sadly neglected component will be repaid by added life and efficiency.

How much thought is given to that plain, uninteresting-looking object, the battery? Not much, I am afraid, by the majority of users. They are usually satisfied so long as it continues to start the car, blow the horn, light the headlamps, work the windshield wiper, continue to supply the radio with power night after night, and a thousand other jobs. The fact is that you do not realise what an overworked and reliable piece of apparatus it is, until one day it packs up from sheer exhaustion, its life cut short by absolute neglect.

How does a battery do all this work so regularly and faithfully? No doubt many of you will say that "when all is said and done it is only a reservoir that you put electricity into so that it may be used when wanted—that is why it is called a storage battery."

Such is not the case, however. The so-called storage battery does not store electricity. All it stores are the acid and its own parts. The plates and the acid in conflict set up chemical action which starts when you switch the battery on and ceases when it is switched off.

As the battery depends on chemical action for its life, quite certainly—as even the schoolboy chemist knows—it is self-destructive, as is all chemical action. Destruction starts as soon as the battery is charged, and upon the rate of destruction depends the life, in hours, of your battery. The rate of destruction you can control, advance or retard according to your treatment of the battery. Unless the instructions of the manufacturer are carried out, that rate of destruction will be rapid.

Competent authority tells us

that 85 per cent. of battery casualties are caused by neglect, which falls broadly under three headings—under-charging, over-charging, evaporation.

Let us investigate this, and for the purposes of our investigation, concentrate on the car battery. Car batteries are the most frequently abused because they are out of sight, they wear out slowly and generally give the owner every opportunity to take mean advantages.

UNDER-CHARGING

First then, under-charging. This means that, for one or more reasons, your car battery does not receive the electric charge from the generator, for a sufficient length of time, to keep the chemicals functioning properly. It may be through a faulty or dirty generator, but two of the likely reasons are that you do not use your car frequently enough, or that you do not take it for long enough runs. That is quite easy to understand. A battery is charged with electricity to keep the chemicals active, and the generator on your car should do, in a somewhat less degree of intensity, what the initial and subsequent booster chargers at the service stations do. To keep this progress going satisfactorily, you should take your car for occasional runs of 50 miles or so. During this time the battery is really on charge, and the effect obtained is very like a long drink to a thirsty man.

That is worth remembering, because it has a close parallel. If you had only a few sips of water every hour or so you would in time be very thirsty indeed. Your battery becomes "thirsty" on short runs. It simply must have that occasional long drink of "juice" and woe betide you if it doesn't get it. The plates will buckle, they will become loaded with a layer of sulphate, and their efficiency will drop and drop until the horn squeaks, the indicators develop the droops and the lamps just glimmer.

If you are unable to make such long runs, your battery must be taken out of the car and given an independent charge. If you are not equipped to do this yourself, the nearest battery service station, or garage, is your best friend.

Over-discharging has a similar effect. But this is caused by extensive use of the electrical accessories on your car, or too much night driving—or both. You are, in effect, taking too much out of your battery to balance what your generator can put in. Again—and even more imperative this time—it must have an independent charge.

Still considering these two causes of frequent battery failure, put it this way! If a tank holding 80 gallons of water receives from a supply pipe 15 gallons a minute, and loses through a waste pipe 15 gallons a minute, the water in the tank will keep pretty level. That would be similar to the state of a battery could it receive from the generator the exact charge necessary to balance its output. But if the tank water supply drops to 10 gallons a minute while the waste pipe overflow remains at 15, it is only a matter of time before the tank empties—that is under-charging. Now, supposing the supply pipe remains at 15 gallons, but a tap is opened in the water system drawing off a further five gallons a minute, again, in time, the tank will empty—that is over-discharging. Two causes with but a single effect.

EVAPORATION

Finally there is the question of evaporation. The acid in your battery to which we have already referred, and which is known as the electrolyte, contains a good proportion of lead sulphate. If you allow the electrolyte to fall low enough for the plates to become exposed, sulphate of lead will be deposited upon those exposed parts and just that proportion of your battery will be ruined beyond redemption. Even

though you cover the plates again with distilled water, once sulphation has taken place the battery can never be the same again. So if you allow the electrolyte to fall so low as a third of the way down the plates, one-third of your battery will never work again.

You can stop these faults developing, that is the thing to bear in mind. You can watch your battery and slow down that very disintegrating process by which you get electricity because you are not left to guess what condition your battery is in. There is, indeed, a very handy tool which will tell you all you want to know—the hydrometer. Keep this in mind, that with a hydrometer, conscientiously used once a month, you have the remedy against battery failure and all its attendant irritations.

The hydrometer is a simple thing. It is, to look at, very much like the old fountain-pen filler enlarged. Inside the barrel there is the hydrometer scale which, in turn, looks something like a clinical thermometer with an enlarged end. All that has to be done is simply to

unscrew the stoppers from the different cells of the battery, insert the rubber piping at the end of the instrument and suck up the electrolyte by the usual method of squeezing and releasing the rubber bulb at the top.

When you have thus sucked up the electrolyte until the scale floats, like a fishing float, you can take a reading. That reading will be the exact specific gravity of the electrolyte—the tell-tale clue to the state of your battery. If the reading you take is 30 or more points below that specified on the label, or tag, supplied with your battery—it must have an independent charge.

Usually, it will be necessary to test only one cell of any battery to ascertain the condition of all of them, but if you are inclined to feel a little conscientious, by all means try them all; you may find something different which would be an indication of a fault in one of the cells. This is only likely to occur in a battery which has been badly treated.

USE, IN RADIO

So far we have discussed the bat-

tery in use on a car, but no less care should be taken with your radio battery. Although you are not likely to be worried by overcharging and evaporation to the same extent, you will get less indication of the battery running down than when used on a car, due to the comparatively low current drain, or load. A battery that is in such poor condition that it would hardly blow the horn on a car would perform for a time quite as good as a new one, on a radio.

Many people have received a shock when, after having installed a new battery and run it on their radio until it is so badly sulphated that it is of no more use. To avoid this condition it is a good idea not to allow the specific gravity to fall below half before having the battery re-charged.

It is not a wise thing to purchase a battery with a too-high ampere rating for use on a radio, like a car battery for instance, as they are designed to give maximum effici-

(Continued on next page)

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BATTERIES

(Continued)

ency for their particular work. The heavier the rate of charge and discharge they are designed for, the larger is the ampere rating. There are also other factors, of course, which need not be considered here.

This does not mean that you cannot use a car battery for a radio; but if you do, it is a wise plan to give it a bit of heavier work now and again, say, by using it in your car.

DRY BATTERIES

The so-called "dry" battery or non-storage battery derives its power from the chemical action that goes on within just as a storage battery does, but unlike the latter the process cannot be reversed by the application of an outside current—in other words, it cannot be recharged. It is therefore useless once chemical action ceases. Periodical tests can serve no other purpose than to indicate that the battery needs replacing. As this will be indicated by the falling off of the performance of the receiver (or whatever appliance the battery

is used for), such a test need be made only when this condition exists. It is necessary then, to ascertain that it is the battery, and not some other fault that it causing the trouble.

Care can be taken to get the longest life possible by carrying out the following instructions:

In the first place, make sure that the batteries are not of old stock when you purchase them, as a certain amount of deterioration takes place even when they are not in use. This is usually termed the "shelf life." Many makers stamp the date of manufacture as a safeguard. You are usually quite safe in this regard if you purchase them from a reliable dealer.

Choose a cool dry place in which to keep them—a good idea is to pack them in a wooden box with straw.

When more than one battery is used, it is inadvisable to connect a new one with any old ones that you may decide are still in good condition. Particularly does this apply to radio sets.

Make sure there is no leakage of

current when the radio (or other appliance), is switched off; also make sure that the current consumed when it is switched on is not greater than it should be, due to some fault having developed.

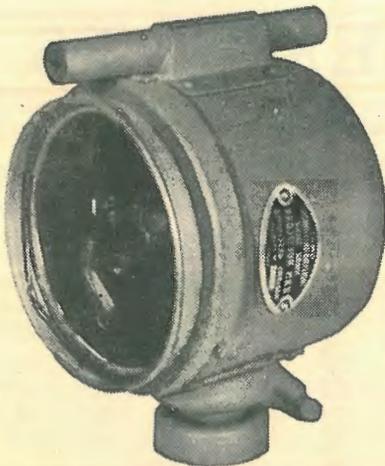
If you are unable to do this yourself you may find it worth while to have it checked over by a competent mechanic. Make sure that all leads are well insulated from one another. The higher the voltage, the more important of course is the insulation. This is particularly so regarding the high tension battery of a receiver (which may be anything up to 120 volts) as the leads to this battery usually are found to be tangled up, making it very easy for shorts to occur once the insulation gets worn.

Do not be tempted to test the battery or any other component by means of short circuiting, even for the minutest duration. You may be able to get away with this drastic form of checking with a storage battery for a time without noticing any serious results, but it will settle a dry battery in a very short time.

—Broadcaster (W.A.).

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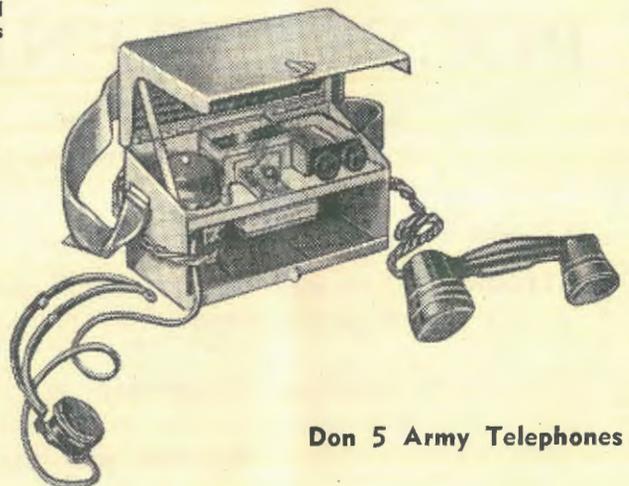
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MAIL ORDERS CAREFULLY ATTENDED TO

CALLING CQ!

By DON B. KNOCK

Lots of things have been happening in this part of the Pacific area regarding frequencies, although much may have passed unnoticed to the average Ham. Reason for that is the passing of a period of time before news gets around. For some undefined reason, news that *should* originate from official sources doesn't emanate thus but takes a leisurely journey to Ham ears by what seems to be virtually a "grapevine" method. What prompts the foregoing remarks is the way that "80" suddenly sported a few VK signals from the evening of Sunday, September 1, and how the news got around that the band was opened from that date for VK's, between 3500 and 3800 Kc/s. As I pen these words, I have just been talking to two Sydney Hams who hadn't the faintest idea that "80" had been restored, and from their incredulity I imagine there must be many more lads with similar lack

of information. The reason? Nothing had appeared in circular form from official sources, even ten days after September 1. Four days after my own ears had told me that the band was occupied by a few VK3's and 5's, a fellow Ham telephoned me to say that he had received a telegram from a pal in Melbourne to say that it was O.K. to start up again on "80." Evidently it was all in order, but I had no *official* information! Now across the Tasman to our ZL friends, who have for weeks been making hay with the sun shining on restoration of the full band-widths as in pre-war days. Something seemed too good to be true, and I sensed a nigger in the woodpile. The nigger seems to have turned up in the form of Service "narks" somewhere, as the following shows. One night recently I hooked up per CW on "20" with a ZL3 who volunteered this information: All ZL's had that

day received a circular from their licensing authority to the effect that "as from September 9 amateurs in New Zealand will fall in line with the 14 and 7 Mc/s band allocations as now in force in Australia, Great Britain, the U.S.A. and the rest of the United Nations." This doesn't mean only that the ZL's don't continue to enjoy the full span of 14,000 to 14,400 Kc/s and 7,000 to 7,300 Kc/s . . . it has a special importance for VK's so far as "40" is concerned. The new ZL allocation ". . . falling in line with the rest of the United Nations," is the same as for Australians on "20," but on "40" is from 7,100 to 7,300 Kc/s. That being so . . . and the span corresponds to the British, American, and other allocations . . . the question is: "Who sold the Australians a pup by decreeing that they fight for breath in a skimpy little 50 Kc/s jammed in the middle of the band? In case anybody thinks that I am invoking criticism of the PMG Department, let me emphasise that the PMG's Wireless Branch merely administers the regulations . . . it does not have much say in the allocation of frequencies at the present time; that is, amateur frequencies. The snag lies elsewhere—at the door of frequency-suffused Service Signal Officers, who in this post-war era, seem to have a flair for crippling amateur radio as much as possible. What else could be expected from a committee of Service people appointed in the dying days of the recent war to decide frequency allocations . . . when on that committee there was no member with

Fleecing the Beginners

IF anything makes my gorge rise, it is the unscrupulous nature of the dealing of some radio "dealers" where schoolboys are concerned. It may be "clever" to "take-down" an affluent-looking "mug" with plenty of the necessary to splash around, but when a school lad comes along with his painfully-saved pennies for a crystal detector or a pair of headphones, it is verging on the criminal to overcharge him grossly for something that is of little or no real use to him. The other day a lad I know of purchased in an Arcade area of Sydney a 0 to 100

milliamperes meter. He was charged £2/17/6 for this monstrosity which was nothing more or less than one of the pre-war cheap, nickel-cased variety for which the top 1939 price was 7/6. I told him that he had been fleeced and he tried to get the "dealer" to take it back . . . not on your life! And so a youngster goes disillusioned, and I am only sorry now that I broke the news to him that he had fallen for a trickster. I take comfort, however, that in future years he may benefit by his experience with so-called "business men."

(Continued on next page)

HAM NOTES

(Continued)

amateur interests at heart? When the United Kingdom, America, and even those small nations who sat on the neutral fence, give their amateurs due recognition and a reasonably square deal, it is in keeping with a lot of bureaucratic handicaps in this country that the Australian amateur gets Cinderella-like consideration. Perhaps these people with the SAY have the idea

that frequencies might be wanted again soon for grim purposes. I wonder?

* * *

Says VK4ER: "Congrats on your Ham Notes in 'A.R.W.' July issue, page 35. A pity that every Ham hasn't a bit more of the spirit of tolerance toward those who haven't gone quite as far in the game. I've been playing around with radio for 25 years, and have held a ticket for 15 but I still get plenty of pleasure from receiving QSL and SWL

cards, even if they are only from the next street. One of my greatest pleasures these days is to look through old cards and recall memories. Quite a few SWL's of a few years ago are now well-known amateurs. As for the VK2 who suggested the SWL's should leave him in peace . . . QST's OM had a fitting treatment: sprinkle sawdust on the squirt and sweep him out the back door! He, also the Very Important Person who said no Ham should be allowed on phone if he doesn't have a 'scope, plus a few of those 45 w.p.m. speed maniacs, should, as T.O.M. said, 'be made into sacks of low-grade fertiliser.' If T.O.M. were still with us he would today say truly, 'The listening I've been doing lately fills my soul with a thirst for blood.'" Yes, 4ER, I have many SWL cards sent to me in earlier days by loudly-assertive present-day people who would blush before their mikes were I to produce them. They were once themselves senders of humble reports, and Very Important gentry today. But evidently you *have* heard some of them. It is a sad but sorry fact—the grand old game of amateur radio has suffered badly at the hands and mouths of many selfishly-disposed types. I know one Ham of long experience who takes these things to heart so much that he keeps a "black-list" of callsigns handy of stations he has "had." These have offended his sense of right and wrong in some blatant manner . . . so they are off his "visiting list," come what may. The offenders don't know it any more than does a broadcaster on whom one clicks the switch, so little results from the action. I prefer personally, where a station makes obvious errors of good taste or technicalities to tell him so. If it is done in the right spirit, the recipient of the advice will take it the same way. Nobody is immune from technical fault. The other evening a station called me on "Six" and told me I had parasites around my carrier. His information was correct. I would have been much more concerned if

Some Thoughts on Power QRM

When power leaks break loose and hash up my reception, sometimes on any frequency range, I take comfort in the thought that at least they are temporary affairs, and not always in evidence. When I speak of power "leaks" I refer to any form of radio-inductive QRM, from such sources as vacuum cleaners, sewing machines, electric shavers, electric jugs, radiators, and/or anything with a loose or faulty connection. I had two really annoying experiences with power leaks in my radio life. The first was in 1926, at the station shown in the photo of A2NO in "A.R.W." August issue. Just near the 90-foot high antenna were 30,000-volt lines. A so-called insulator went leaky and the corona kicked up the dickens for three solid weeks. The receiver was, in the light of present-day sensitivity standards, just a hunk of parts, with three 201A's therein (but it snagged the DX). Every time I switched on, the deafening roar was there, with 'phones on the table. Mounting tempers resulted in a shanghai expedition, and the brute was spotted on a rainy night. The power people simply *had* to renew it after a few well-aimed shots. In these days, information to the R.I.'s turns the trick, but in 1926 broadcasting was an infant and Hams hadn't even been heard of by power companies, etc. Next occasion was in the nature of a ro-

tracted ordeal. My job as radio-engineer operator at Wyndham Meatworks (North-west Australia) would have been lots of fun from a DX angle but for the fact that, when the works reason started, there were 50-odd D.C. motors driving machines of all kinds, and all within 100 yards or so of the operating room. Even if I had possessed the filter condensers to deal with those fire-ringed commutators, the electrical chief would have looked askance at the radio bloke who wanted to put gadgets on his motors. Need must when the Devil drives, and communication *had* to be effected from that station. It was, and by a simple expedient. It was the first time I had encountered the twisted pair doublet, which in this case was erected with one half vertical and the other in the form of a horizontal ring about eight feet above ground and immediately underneath the vertical portion. It worked wonders and enabled VIX and VK6NK to work with R5/6 signals over an R4 noise background. Receiver? It was a tuned R.F. job, all aluminium construction, with Philips A442 R.F. Mullard PM4DX detector (Schnell type) and a couple of 4-volt audio valves of some kind I have forgotten. So, if you think you are hard beset with power QRM troubles, you haven't had it on your own.

—D.B.K.

the transmission had gone on *ad lib* in such manner without my knowledge. Just a matter of re-neutralising the final . . . and it can happen to anybody.

* * *

Mr. J. Lunn, of Dunedin, N.Z., writes to correct an error, his own, in July issue of "A.R.W." N.Z. Hams didn't hold a convention on Labour Day; it was on the occasion of the King's Birthday. He intends making a special RX for "Six" to see what can be done about VK signals on the band over there. The more listeners the merrier, because what "Six" suffers from in this part of the world is lack of population. Mr. Lunn is hearing lots of American Hams on 70-metre phone between 5 and 7 p.m. his time. In pre-war years I have heard one or two W's on that band in Sydney, but always under the usual noisy conditions. DX work on "80" is a matter for the Ham in a country area, well away from power lines and other sources of noise. Despite the noisy characteristic, "80" is a mighty useful band to have up one's sleeve for a lot of things.

* * *

As I start to pen these notes of doings on the band, mainly from a Victorian angle, I am informed that RAAF ionosphere findings say that at the present time of the year (mid-September) the MUF may extend over 48 Mc/s and that a peak period should be around 4 p.m., E.A.T. Here's hoping. In Sydney about four stalwarts are on the band, and the others are gripped by the fascination of "One and three-quarters." There have been attempts to get signals from VK2NO to VK2CI (Merewether, N.S.W.) and to hear something from VK2KQ (Toronto, N.S.W.) but results have been completely negative. Failure to pop signals to 2CI doesn't quite make sense, as in prewar times he could receive VK-2NO at R7 on "Five." The nigger will no doubt be chased from the woodpile in the end, but the signal path should be more favourable at 50 Mc/s than at 56 Mc/s. A few Sydney stations may, as a result of

Hints about Crystal Sets

Another word of advice for youngsters making a start in the hobby of radio. Frequently I see schoolboys buying the bits and pieces to make up the humble but still fascinating crystal detector type of receiver. There's nothing wrong with the idea provided that essential factors are taken into consideration. First consideration is that of the headphones. If you purchase a pair of those undoubtedly brand-new ex-Service phones to be seen in profusion around town for 7/6, you are courting disappointment. Those are low resistance types and as such are not usable with a crystal rectifier unless a matching transformer is included. You *must* have high resistance phones directly in a crystal detector circuit because the detector itself offers a high impedance, and, although low resistance phones *are* usable with a suitable coupling transformer, the high resistance ones are much better. When I say high resistance, I mean that each earpiece should show a D.C. resistance of at least 2000 ohms. If it is 4000 ohms so much the better, but you may not obtain a pair of 8000-ohm phones readily in these times. They are not normally applied in modern apparatus. In my youthful days . . . in the pioneering days of radio communication, I was once the proud possessor of a pair of 8000-ohm Brown Reed type phones. They were given to me by an indulgent elder, but the market purchase price was five guineas. Next point about satisfaction with crystal detector reception is that

you *may* be in a favourable location, reasonably close to a fairly powerful broadcast transmitter. In that case quite an ordinary aerial system may suffice to give you comfortable headphone reception. But if you are some distance away from even a powerful regional, say 30 miles, you need something better than a few feet of wire strung to a fence. There is then the need for at least 80 feet of well-insulated wire suspended in the clear, and as high as possible. There is also the absolute necessity for a good earth connection, and that doesn't mean just a metal rod driven into the ground. Proper connection to the waterpipe system will give a satisfactory earth in a metropolitan or suburban area. All of the foregoing is to emphasise that there is more to good crystal detector reception than "finding a good spot with a 'cat's whisker'." Long-distance reception *is* definitely possible. More than 25 years ago I was receiving telegraphy signals over distances of 3000 miles quite regularly, but you should have seen my aerial system and what went with it! A huge T-shaped "sausage" aerial with eight heavy-gauge wires weighing goodness knows and about 80 feet above ground, with a fan-shaped earth-screen (counterpoise) to boot. Anyway, young fellow, *you* aren't interested in telegraphy stations thousands of miles away, but you *can* hear broadcasters a few miles distant if you pay attention to the points I have emphasised.

* * *

study of overseas DX achievements, change antennas from vertical to horizontal polarisation. VK3's have been having a fine old time on "Six" with mobile and portable gear, their efforts not being altogether in vain. VK3NW, who supplies the information, was well in the picture, and tells the story as follows: "Latest stations to

get 3 or 4 element beams going are VK's 3HK, 3GG, 3YJ, 3LS, 3KU and 3BW. All of these are using either good superhet receivers or converters. A popular combination is the RL7 as RF, with EF50 or ECH35 mixer into a good super. My new RX uses 954 RF, 954 Mixer, 955 osc., two 6K7's at 1600
(Continued on next page)

HAM NOTES

(Continued)

Kc/s I.F., 6B6G second det., 6J5 B.O., 6V6G audio, and VR150 voltage regulator. It works nicely and rakes them in wholesale.

"Our latest portable work was done at Ballarat (70 miles) and

Mt. Buningong, just out of Ballarat, and 60 miles to the centre of Melbourne. On August 31 we ran tests from Ballarat, but with completely negative results. No trace of signals was heard at either end, although at least eight Melbourne stations were 'beaming' on me. Ballarat is 1,400 feet above sea

level, but in a saucer-shaped depression. Even on Black Hill, about 400 feet above Ballarat, no sign was heard of any signal. However, VK3IV, a local Ballarat amateur, who was on Buningong, worked with several Melbourne stations at R8 each end during the afternoon. On Sunday morning, therefore, I went up to Buningong (about 2,200 feet) and kept the 10 a.m. sked from there. Results were excellent. I had no trouble in contacting 3MJ at R8, and he gave me R7; 3RW, Portarlington, R8/9; he gave me R8; 3GG, R7, and he gave me R5; 3HK (about 75 miles) gave me R6 and he was R7. I also heard 3ABA on MCW at R7/8. The outfit was the same old MOPA with 3 watts to the 807 and a doublet antenna 12 feet high. The new RX worked admirably. Of course, the reception on Buningong only checks with all the results the Sydney gang have been obtaining with the Blue Mountains area. Apparently the waves won't bend to any great extent to get down to Ballarat. I suppose that, assuming that they bend somewhat as our results from Red Hill show, they are then rapidly attenuated in the hills and hollows before getting to Ballarat. The band is really quite active in Melbourne now. Regular stations with good equipment include VK's 3NU, 3KU, 3MJ, 3GG, 3YJ, 3HK, 3AFQ, 3LS, 3ABA, 3BW and 3NW. Also operating are 3QO and one or two others. 3IZ, Red Hill, is expected on the band at any time. Keith Ridgway, VK3IV, at Ballarat, has a nice little portable crystal-controlled outfit with 15 watts to an 807. With screen modulation, it appears to be about 80%. The receiver is a re-vamped Radar affair using 4 acorns, 4 stages of I.F., with 1852's run with low plate load to keep the gain to a reasonable level. It is his intention to find out by means of portable tests just why signals evade Ballarat. Have just found full details of 3IV's performance from Buningong. He worked 3MJ and 3GG; also 3ABW, whose whereabouts at the moment are in doubt. It appears that 3ABW is in Ballan, about 10

VK2OC Hears VK2NO on "Six"

Sunday, October 13, 1946, was, throughout N.S.W., a day of blazing temperatures and duststorm weather. Sydney, normally subject to cooling sea air, came in for its share of the furnace, the temperature at VK2NO running to 94.6 at midday. In the early morning, it was noticed that a long low-lying layer of smoky cloud was extending over the sea in a northeasterly direction, and the idle conjecture was made that possibly it betokened temperature inversion and possible extended working on 50 Mc/s. After which the conclusion was . . . what would be the use anyway? . . . stations using "Six" in and around Sydney are few and far between . . . since "one sixty-six" became a major attraction. In accordance with schedules established months ago, VK2NO was started up on auto CW/MCW on 50.4 Mc/s at 11 a.m., running until noon. Nothing resulted from this session, despite the fact that the old faithful ground-plane antenna had been discarded and a new and more carefully matched version erected. This is about 45 feet high, and is an earth potential quarter-wave type, mounted on a length of waterpipe, which is earthed, together with the stub and radials. In the afternoon a QSO was held with VK2AFO, Katoomba (70 miles), with visitors VK's 4RY and 2AHF being present at VK2NO. Careful coverage of the receiver dial throughout the afternoon revealed no sign of DX signals. That night at 8 p.m., another contact was held with VK2AFO. Immediately after the QSO concluded, a telephone call from Owen Chapman (VK2OC) at Wyong, N.S.W., broke the news

that he had been sitting back there listening to the whole of the telephony transmission from VK2NO at S4 R7, but that no sign could be heard of the Katoomba station. The interesting point about this reception in Wyong is this. The distance is only around 50 miles from Sydney, but the screening is very complete. Wyong sits on the other side of the hills from Gosford and those hills are a normally dense barrier for VHF from Sydney. In pre-war days, there had been attempts on the old "five-metre" band to get signals from Sydney to VK2TX at Wyong, but all tests gave negative results. Circumstances associated with this reception by VK2OC are, of course, more favourable. Much more effective equipment is in use at both ends. Plenty of RF is piped by coax line to the new ground-plane antenna at VK2NO, and the receiver in use at VK2OC is a high-grade commercial overseas product, designed especially for AM and FM coverage between 27 and 145 Mc/s. These factors, together with undoubted bending of the signal because of localised temperature inversion, contributed to the unexpected reception over this difficult path. Also, there is the undoubted degree of horizontal polarisation additional to vertical as provided by the particular type of G-P antenna. It has been found overseas that VHF signals are likely to pop into seemingly impossible places when horizontal polarisation is employed. Vertical polarisation seems to be the thing for strictly line-of-sight working. Who now will be the next distant observer to hear VK2NO on 50.4 Mc/s.?

—D.B.K.

DOGS IN THE MANGER!

miles from Buningong, or else the call sign was confused with 3ABA, who is in Melbourne. A word of appreciation is due for VK3SE, of Ballarat, who erected a co-ax doublet and also a 4 element close-spaced array for the test. It was bad luck that he didn't hear anything in Ballarat."

Thus the latest on "Six" from VK3, and those concerned are to be congratulated on the amount of enthusiasm so obviously displayed. It's a fine example of team work, which, I regret to record, is not at present extant around Sydney, where it is a case of "let George do it," with a small number of stations consistently on the job. Time will tell.

* * *

If we haven't yet succeeded in hearing anything of ZL's on "Six," it isn't for the want of trying. The ZL's are well on the job, as may be seen by reference to their FB magazine, "Break-in." In the issue for September, '46, the editorial touches upon the achievements of ZL2PD and others. ZL2PD has had his signals heard 121 miles distant and there are other reports of over "line of sight" reception. We heard a VK saying the other day on "20": "If you *do* work a ZL on 50 Mc/s, so what?" To which we answer: "Nothing much OM., but if you don't like the idea, we *do*!" It takes all kinds to make up this planet.

* * *

In N.S.W. and Victoria, enthusiastic groups are making full use on "Six," and if they ever do, some stations are seldom, if ever, heard on "Ten." Reason is not hard to seek: the higher H.F. band calls for a little more exercise of technical ability in getting gear to function nicely, and there is a bond of amity about "Six" reminiscent of pre-war "Five."

One reason for popularity of "Six" with its habitués is, in my opinion, because "radioese" is absent from operation. You know what I mean — "okay about my sigs being okay over there," — "Hi, Hi" — and "Kay someone please!" These things haven't happened yet

September issue of the New Zealand "Break-in" carries an announcement about alteration of frequencies for ZL's, effective, as we were told on "20" by a ZL3, from September 9 last. The editors of "Break-in" comment thus:

"We believe the Department was most reluctant to retract its previous liberal treatment of N.Z. amateurs, *but had no option in the matter owing to overseas pressure.*" Which is just the conclusion we arrived at long ago.

Perhaps it wouldn't be too arduous to guess from whence came the "overseas pressure"! If ZL's think they are "done wrong by"—what price VK's with the stingy 50 Kc/s so grudgingly doled out on "40" by Navy panjandrums who don't care a hoot whether or not amateur radio in Australia swims or sinks? Our guess is that as in U.S.A., the radio industry, realising that amateur radio is *business* as well as a hobby, will some day bring pressure to bear on those who seek to cripple it. Progress along any scientific pathway cannot be retarded, especially in a popular scientific hobby such as amateur radio. In a few years the amateur population of the world will run into vast figures. Those who wish to use privately-owned and operated radio equipment will be numerous enough to warrant *extended*, not *restricted* frequencies. And it's up to the wise radio manufacturer and trader to get behind this idea and to make a noise about it, industrially and politically. First matter that should be cleared up is the question of just who the frequency allocating and regulating authority *is*. In this part of the Pacific the P.M.G. in the two

Dominions doesn't seem to have much to do with the present unsatisfactory position.

The trend of thought outlined by Mr. Urquhart (VK6MU) in "A.R.W." for September, 1946, is a step in the right direction. An "Amateur Radio Act" *would* certainly curb the bureaucratic form of control under which we suffer at present. Again—we emphasise; the radio *industry* can play a vital part in all this. Neither the W.I.A. nor any other amateur organisation can get along *without* that support. There should be established without delay a liaison committee to confer with the leaders of the radio industry—to place amateur radio problems before them, and to bring home to these people the importance of amateur radio to the mutual benefit—and that means *financially*—of those concerned. The more licensed VK's, the better for the manufacturer who will produce the goods needed if the demand is there. But the more the number of licences—the more the number of Kc/s needed to function in. The radio trade organisation can play a big part in hammering home at Canberra and elsewhere the importance of wider frequency bands for amateurs. Otherwise, we feel that if licences are issued in thousands over a period of years, an ants' nest will have nothing on the seething population inside the present bands. In fact, asphyxiation would be the result. Amateur radio will be of sufficient international importance *financially* to warrant equal frequency consideration with *other* communication interests. No longer will it be possible to treat amateur radio as the poor relation. —D.B.K.

on "Six," and if they ever do, the wrath of the Gods will be akin to the London Club greybeard, whose copy of *The Times* was in absentia!

"Six" is a technical discussion band where lads with a flair for the unusual can learn a lot from their fellows and vice versa. More about

"Six" later; I want to break a little ice about "1 $\frac{3}{4}$ metres" — i.e., 166 to 170 mC/s. According to "Amateur Radio," W.I.A.'s magazine, there are two stations around Melbourne who use this band, and bemoan the difficulty of coaxing

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HAM NOTES

(Continued)

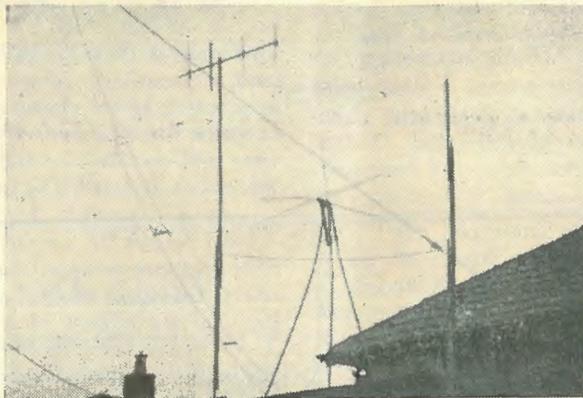
others thereon. In Sydney a few of us have for weeks discussed plans for this next band, but for many reasons didn't get around to using it. Then, at the holiday week-end of 15-17 June, came with almost dramatic swiftness, revelation by VK2NP, Chas. Fryar, Gladesville, N.S.W., of unexpected doings involving a record distance covered. VK2NP has on hand a re-vamped Radar superhet with two Acorn R.F. stages and six I.F. stages (at 30 mC/s.) covering 160 to 180 mC/s. Whilst showing this receiver to a visitor on Saturday afternoon, June 15, 1946, he switched it on to demonstrate A.S.V. signals from local air ports on 176 mC/s., and further up the dial heard "VK2KI calling CQ." First reaction was that this was a 28 mC/s local getting in through the I.F., but VK2NP had a small rig. on $1\frac{3}{4}$ with an RK34. He

A.C. RELAYS

If you have use for A.C. relays — and what Ham hasn't? — think before you throw away old Audio transformers, or speaker output transformers. Many of these are of suitable core laminations to make up low voltage A.C. relays, a job calling for a little hacksaw and drill work. About 200 turns of 28 DSC on the core former will provide for operation between 6 and 12 volts. Of course, that's not all there is to it, a "shading coil" of copper strip must be let in to the pole piece to subdue "chatter." If readers are interested I will describe fully the evolution of such home-built relays.

Oft-times one runs across relays in ex-Service gear, but these are invariably D.C. types with operation from 6 to 30 volts. There is an answer to using these around the shack: A suitable transformer, copper oxide rectifier, LT chokes, and high capacity low voltage filter

—VK2NO.



Some of the antenna arrays in operation at VK2NO.

switched this on and called the station, who at once replied with the information that he was in a car at Lawson (Blue Mountains) 50 miles distant, and using a transceiver on 166 mC/s. Thus came all the old thrill of the 1934 QSO's on "Five" between Sydney and the Mountains, but at much higher frequency. It transpired that VK2KI was on a scheduled test with VK-2YE (West Strathfield) and this station was then heard at full strength. The signals between VK-2NP and VK2KI were around the R7 mark. Other stations appeared subsequently, these being VK's 2AGL and 2DP. The former is a new post-war licensee and prefers VHF's to "jargon!"

Point about this break on 166-170 mC/s. is the low power and simplicity of gear used, but note that transceivers will *not* perform at these high frequencies with standard oscillator valves. Valves in use are definitely of the "acorn" class, or those with "horns," i.e., Plate and Grid on top of the bulb. Such valves can be purchased and I advise those who want to come in on the new band to forget ideas of making do with any old valves; new technique is necessary and what works on "Six" won't do on " $1\frac{3}{4}$ ". If you possess a "miniature" or two, as so many ex-Service VK's seem to do, you have an answer to

most questions. Interest in " $1\frac{3}{4}$ " has been stimulated around Sydney by these events, and it is safe to say that activity will increase. I cannot see the band completely supplanting "Six", but I think there will be alternation between the two. The lower frequency will be useful for checking up on the higher. You will hear lots more about "one and three-quarters" in the near future.

THOSE FS6's

Re those FS6 type ex-Army transceivers that are to be had for a "song" these days. Bob Richardson, VK3ZP, writes of his success in coaxing one to hit the Ham bands. L1, 2, 3 and 4 were made plug-in, and coils were made for 20, 40 and 80. A 100 mmfd. variable midget was used for oscillator band-scatter, and all the moving plates but two removed from the two-gang tuning condenser. Bob suggests that any of the gang requiring information on the FS6 treated thus should drop him a line. His QTH is McGregor Avenue, Black Rock, S9, Vic. VK3ZP also has a bit to say about the bands in general: "Am active on 20m CW, but can hardly get a local QSO . . . most fellows seem to be DX mad or else phone cranks, so I think I shall move to 80 for phone and CW, where life sounds to be much more friendly."

There is much to be said for the social side of the suburban radio club, and it is good to see that throughout Australia there is a revival of many of the pre-war Clubs. Predominant in Sydney is the old Lakemba Club, now flourishing as the Experimental Radio Society of N.S.W. Note that "society" is the correct title, not "Association." The mistake was ours in the June issue. There are some people who look upon Clubs, especially those with a big following, as "break-away groups" from the WIA. Normally, such is not the case. It is the need for more personal contact and harmony between fellows that is virtually responsible for the *raison d'être* of the suburban club. Politics don't interest nine-tenths of the Club members, nor are they interested in cliques. Average member of the Club isn't made to feel that he is outside the Inner Circle of a few 'Shining Lights,' and so the Clubs will attract young and old. Friend Bob Meadows, VK-2ARM (who, by the way, is Technical editor of the number one trade magazine, "Radio and Electrical Retailer of Australia") handed to me a copy of an excellent little Club magazine. It is "The Wave-trap," published by the Subiaco Radio Society. Westralia, and, incidentally, I should state that this is one of the oldest Clubs in VK. I remember it well when I was a VK6 myself at Wyndham in the North-West, and that's a long time ago. This copy does something that is a good move . . . publishes a list as up-to-date as possible, of VK6 licensees. It has an article or two, and news and notes of general Ham interest. Secretary of the Subiaco Club is oldtimer Bert Congdon. VK6BC, and you can take it that he knows his amateur radio. That list of VK6's reminds me . . .

FLASH!

As this is written, a report is circulating to the effect that a well-known New Zealand VHF listener has been hearing VK's on "Six" during the last week or two. The news originated during a QSO between a ZL3 and VK2 on "Forty." Details are awaited with interest by the VK 50 Mc/s gang.

SIX METRE PICTURE FROM VIC.

From Ken McTaggart (VK3NW) comes the latest news on activity on this band in the Southern State: "We listened on the Sunday morning of October 13 and ran a schedule from 1 to 2 p.m., especially for Westralia, but with the usual negative results. This VK6 idea was prompted by a report from VK6HM to the effect that he had heard weak signals on the band at 1 p.m. on Sunday, September 29. This was at the time when I was up at Olinda in the rangcs here, and everything checked quite well (he got no callign), except the frequency, which he mentioned as being about 51.4 Mc/s. My frequency at the time was 53-Mc/s approx. So we keep trying and hoping! Home frequency of VK3NW is 50.51 Mc/s.

"Active on the band around Melbourne have been VK's 3ABA, 3YS, 3MJ, 3HK, 3YJ, 3NU, 3ZD, 3LS, 3QO, 3BW, 3GG, 3XA, 3ABU and 3NW (not forgetting my portable call, 3ANW!). 3NU is using 50 watts to a pair of 807's in a push-pull doubler, feeding a couple of half-waves, and gets out well. 3ABU (portable 3BU) from Geelong is in a poor location at his home QTH, but goes portable with 10 watts to a doubling 807 modulated by a pair of 6V6's into a W8JK antenna with 3 wave feeders. Receiver is a 2-valve squegger. Sunday, September 29, was quite a field day. I had the portable (1.5 watts only at this time from 150 volts of B batteries) up at Olinda, 1,500 feet high and 20 miles from the city. Stations contacted were VK's 3NU, 3MJ, 3HK, 3YJ, 3QO, 3GG, 3ABA, 3LS, 3BW (Portarlington, 60 miles), 3ABU (West Geelong, 69 miles). Everyone was surprised at the signal strength at both ends. All the Melbourne stations were R9 plus and reported signals from my little outfit as being anything from R9

no doubt the PMG will ultimately republish lists as in pre-1939 days, but at this transitory stage with hundreds of applications for licenses pouring in, it isn't considered to be opportune time. Only way, meantime, to determine where all our Hams are located is to talk to them over the air. That's all right so far as locals go on the bands we have, but who is in the country and where, we can only guess. When "40", and, we hope "80", is disorged by the gold braid merchants, it will be like the lifting of a dense curtain. Almost like an exodus from a concentration camp.

to R9 plus 30 db. Anything is possible with strong signals where line-of-sight is concerned, and no obstructions intervene. On the morning of the 29th we did some tests behind the hill at Olinda, and here was noticed the presence of standing waves among the trees. At the mountain top, signals were R9 plus 30 db. We dropped down a third of a mile in a direction straight away from Melbourne and finally ended up 200 feet lower. Signals from both ends were a good R6, so that considerable bending must have taken place. The antennae at all stations taking part in these tests were horizontally polarised. The portable work has stimulated interest among city stations who are planning to do likewise. VK3MJ is building a portable with 6SN7 Peirce oscillator and a 25 Mc/s rock and doubler to an 807 or 815 P.A. VK3YP is building up some gear also.

"However, at the present period there is very little doing on the band at night-time, and, as the DX gets better on Ten, with G's breaking through, Six suffers no consequence. (It suffers in Sydney just now, whether or not there are G's on Ten.—D.B.K.) The pity of it is that we are likely to miss good DX opportunities on Six. Dave and myself and 3HK cannot possibly listen all the time. My portable is shortly to go C.C. with a 12.5 Mc/s crystal, using a 6V6 or maybe an 1852 oscillator/quadrupler. Also, the "one and three-quarter" outfit is on the verge of working with a 955 in a linear oscillator driving an 832. The receiver for that band is the usual 955 squegger and two audio stages. . . ."

After having read through VK-3NW's foregoing report on activities in VK3 on Six, there is no doubt which State is forging ahead. The 69 miles between VK3ANW and 3 ABU runs the Sydney-Katoomba channel very close for distance, and the Victorians have the portable/mobile field well exploited. The lack of stations on the band seems to be a malady afflicting both cities at the present time, but no doubt this will pass and this band will before long come into its own as the Number 1 channel for cross city contact.

STOP PRESS!

Each alternate Saturday, commencing October 19th, VK3IV (Ballarat) will be transmitting from the top of Mt. Buninyong. Frequency is 50.1 Mc/s. In addition to the elevation of the mountain, the equipment is used at the top of an 80-foot steel tower.

Shortwave Review

CONDUCTED BY

L. J. KEAST

NIGHT FOLLOWS DAY

Each week now night reception is getting better and better and with few exceptions most of the daylight winter gems are fading right out. Of course the "Voice of Information and Education" looks after the Pacific and consequently there are many stations that can be tuned. But where we could take in the BBC broadcasts to America up to 2.45 p.m. they are now very difficult and in most instances impossible to copy. However the night stations are excellent and if only those who will use morse on what we have always considered "our channels" find some other spot I am certain there would be more converts to over-seas listening.

* * *

ROCKET MAIL

In September issue I told where Abbott and Costello had actually posted a letter "To the man in the moon". Maybe it was not so crazy as at first appeared. We read that the U.S.A. are building Rockets carrying radio transmitters and will land on the moon within eighteen months. Speeding at 4000 miles an hour the 238,860 miles will take 60 hours. Well my concern at the moment is will it be Arthur Cushen or Rex Gillett that receives the first verie from that quarter.

* * *

SAYS WHO?

"Recent veries are: ZK1AA (Cook Is.); SDB2; YV1RX; WC BN (9650) and KNBX (11790). Recent reports to: WLWL-1 21.65 mc, to Latin America—signs at noon.

CXA3, Montevideo relays CX10, "Radio Ariel" and is very good when opening at 8 p.m.

HJCAB, Bogota 9.69 m.c. gives news in Spanish at 2 p.m.; signs with march anytime between 2.10 and 2.15 p.m. (This is a very fine signal.....slogan of station is "Radiodifusora Nacional" — L.J.K. —Cushen.

HP5H, Panama City 6.122mc. signs at 3.05p.m. "La Voz del Pueblo."—L.J.K.

Miss Sanderson of Malvern, Victoria writes.: "I am pleased to say July and August copies of "Universalite" have arrived and also a detailed list of stations and wavelengths. I am finding these lists very useful and am able to identify some stations that are rather difficult to hear, for instance I have been hearing a station around 35 metres. Noise and morse are very prevalent in this part of the band so identification is hard, but I knew it was an AFRS station and location Amoy so on looking up the "Universalite" log I found it was XUPB."

"The official Dutch station in Bandoeng is being heard before 9p.m. on about 8mc, with the same programmes as on 3.015mc, and 10.06mc. The new outlet is often better than the other channels."—Gillett.

"Notice Radio Macassar has changed wave-length slightly. Heard them a couple of times on 31.90m. (9.405mc.) but now being heard regularly on 9.605mc. 32.4m. Skeds appear to be as previously. —Ern Suffolk."

XERQ, Mexico City 9.615mc. 31.21m. is very good listening round about 3p.m. with a good musical programme and announcements in Spanish. It has a steady signal and on leaving the air says in English, that it will be back on the air at the same time tomorrow.—Miss Sanderson.

"NHK" Nippon Hoso Kyokai of Japanese Broadcasting Corp. heard on 9.505 and 9.555 mc. at 9 p.m. with Jap home programme.—Cushen.

"Have received advice by air mail that PCJ will shortly broadcast a Pacific service on Tuesdays on 16 and 19 metre band in lieu of 25 and 31 metres which are patchy here. The exact starting date will be given well in advnce.—Gillett.

"Voice of America" in North Africa is back on 6.04 mc, 49.67 m. in relay with 9.605 mc., 31.23 m. and heard from 5 a.m. onwards. 11.88 mc. 25.24 m. also heard in line with 11.76 mc. 25.21 m. at 1.30 a.m.

Czechoslovakia on 11.84 mc. 25.34 m. now being logged with fine signals in the afternoon, closing at 6.30 p.m. Do not know for sure what time they open up.

Also heard in English at 7 a.m. instead of 6 a.m. as previously. Both transmissions are good, but afternoons best.—Ern Suffolk.

New York is coming through very fine, nightly, at 9 o'clock. Tune to WOOC 15.20 mc. 19.72 m. or for a slightly better signal, WOOW 11.81 mc. 25.41 m.—L.J.K.

Dr. Gaden writes, "Heard Daventry on its 11 m. outlet one night at very nice strength. Usually it is pretty poor stuff, whereas the 13 m. band is 100 per cent., even so early in the season.

"Radio Australia" sent me a photograph of their Kooka as a reward for a comprehensive report on the 13 m. transmitters. Splendid strength here."

(My suspicions that the Doctor was spending a lot of time on the "Hams" was justified, as in the letter just quoted he gives me a lot of notes that will bring a good many hurrahs from Don Knock.—L.J.K.)

"Radio Sofia" announces they operate on 32.09 m., a frequency of 9.35 mc. Signals seem to be on the improve for their English broadcast commencing at 6.30 a.m. Reports are requested prior to sign off at 6.40 a.m. Address is "Radio Sofia" International Service, Bulgaria.

CKRA and CKCS are both heard on 11.76 and 15.32 mc. respectively until closing at 10.30 a.m. with "O Canada" and "God Save the King." The former is by far the better signal.

"The Allied Forces Radio in Ba-

tavia is stated to operate on 65 and 115.3 m. This information was heard over Singapore 19.64 m. outlet on a recent occasion at midnight. At this time the former station are reported to take a relay of the latter's Voice of Britain programme.—Gillett.

SPECIAL NOTICE

Mr. Kenneth R. Boord, Short-wave Editor, I.S.W. Radio News, in a letter to me says: "Swedish Radio will broadcast special pro-

gramme for Radio News readers on Monday, November 25, from 2—2.30 a.m. This special programme by the Swedish Radio (Radiojanst) Stockholm, will follow the regular broadcast to America which is given from 1—2 a.m. The stations used will be: SBT, 15.155 mc. 19.80 m. and SDB-2, 10.78 mc. 27.83 m.

Details will be furnished later, but make a date on your calendar, NOW."

Mr. Boord will send to readers

of these pages his monthly newsletter if they write to him at 948 Stewartstown Rd., Morgantown, W. Va., U.S.A.

* * *

HELP WANTED

Rex Gillett writes: "Here is a station that has had me tricked for many weeks. It may be tuned on about 12380 kc., with weak signals. The fact that Chinese is the language used until 10.30 p.m. followed by French until sign-off at 10.55 p.m. leads me to believe the station operates from somewhere in Indo-China . . . have you any ideas on this one?" (I have tried once or twice to listen to this station and I find the call-sign is given by a man at 10.15 and it sounded like XPSA. At 10.30 a girl gave the call and this time it seemed like XGSA. Noise and overpowering morse nearby makes it difficult to follow. If before this issue goes to press I cannot determine it, the result will be shown in *Stop Press*.—L.J.K.

* * *

13 METRE BAND IN GREAT DEMAND

I remember when probably the only Overseas station to use the 13 metre band was the BBC and then only for short periods daily for the few weeks they used this band during the summer. But now it has become very popular and the BBC, both the East and West Coast of America and Australia can be heard often and well on this part of the dial. Here are a few that come to my mind:

GVR , London	21.675 mc, 13.84m
11.30 pm—1.30 am to India	
GRZ , London	21.64mc, 13.86m
9.00 pm—Midnight to Burma, etc.	

(Continued on next page)

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NEW STATIONS

YSF. San Salvador 9.25 mc, 32.44 met.: Arthur Cushen reports hearing this new Central American station. He says that they close at 2.03 p.m. after giving news in Spanish. (I note in "Universalite" this station uses the slogan "Radio Vanguardia" and address is Apartado 396.)

.....? Batavia 12.42 mc, 24.15m Rex Gillett is hearing a station using Dutch at 9 p.m. which he thinks may be the Netherlands East Indies. Difficulty is experienced in identifying the call, if given, owing to morse on the same frequency. News in Dutch was heard at 9 o'clock followed by the popular Yank show, "G. I. Jive." Programmes are distinct from the official Dutch station in Bandoeng.

.....? Tokyo 4.91 mc, 61.09 m.: A new Jap outlet has been logged at 8.15 p.m. carrying the home service in relay with JWV, 7.258mc, according to Rex Gillett.

.....?, Fredrikstad 6.13 mc, 48.94 m.: This Norwegian which was referred to in October issue has been heard by Rex Gillett at good level in relay with 6.20 mc. (Klofta) at 7 a.m. An interval signal of about 10 notes is used between programmes. (According to my records call-sign is LJK-2—L.J.K.)

XUPB, Amoy 8.338 mc, 35.38m.: And here is a new one reported by Miss Sanderson of Victoria. Identification is difficult due to the usual noise on this part of the dial and morse adds its quota of inter-

ference. However she knew it was an AFRS station and caught the location, Amoy. On referring to "Universalite" she was able to get the call-sign. Unfortunately Miss Sanderson has not supplied the time she heard them.

XOPD, Hanchow 9.555 mc 31.40 m.: Arthur Cushen reports this new frequency for XOPD. They were on 7.40 mc. Opens at 8.30 p.m. but is badly mixed with Jap. Address is 46 Yin Tye Street. Power is 600 watts.

VLB—5, Shepparton 21.54 mc. 13.94 m.: This 100 KW addition to the "Radio Australia" transmitters commenced operations on 21st October and can be heard in parallel with VLA-6, VLC-9 and VLG-5 from noon - 2 pm daily in programme to forces in Pacific, Japan and Asia. On Saturdays only, gives special Sporting programme for the Forces from 1.15 - 5.29 p.m. On closing at this hour on October 26 no reference was made to call sign or frequency, simply, "Raymond McDonald says good bye from "Radio Australia" and wishing you all the best of luck."

Many changes in Frequencies have been made in "Radio Australia" transmissions so a complete new list is given elsewhere in these pages.

Also note that transmission from North America (East) and Canada now commences at 10.15 a.m. and closes at 11.30 a.m. but the same transmitter, VLA-9, 21.60 mc, is employed.

COMMONWEALTH OF AUSTRALIA

"RADIO AUSTRALIA"

OVERSEAS SHORTWAVE SERVICE OF DEPARTMENT OF INFORMATION

VLA (Shepparton): 100 KW.		VLC (Shepparton): 50 KW			
m.	mcs.	m.	mcs.		
VLA	41.21	7.28	VLC2	30.99	9.68
VLA3	50.99	9.68	VLC4	19.59	15.32
VLA4	25.49	11.77	VLC5	31.45	9.54
VLA6	12.74	15.20	VLC6	31.2	9.61.5
VLA7	16.85	17.80	VLC7	25.35	11.84
VLA8	25.51	11.76	VLC8	41.21	7.28
VLA9	13.89	21.60	VLC9	16.82	17.84
			VLC10	13.84	21.68
			VLC11	19.72	15.21

VLB (Shepparton): 100 KW.		VLG (Lyndhurst): 10 KW.			
m.	mcs.	m.	mcs.		
VLB	31.45	9.54	VLG	31.32	9.58
VLB2	30.99	9.68	VLG3	25.62	11.71
VLB3	25.49	11.77	VLK4	25.35	11.84
VLB5	13.94	21.54	VLG5	25.25	11.88
VLB6	19.74	15.20	VLG6	19.69	15.23
VLB7	16.85	17.80	VLG7	19.79	15.16
VLB8	13.89	21.60	VLG9	25.21	11.90
VLB9	31.2	9.615	VLG10	25.51	11.76

Times: Aust. East. Stand. 10 hours ahead of G.M.T.

6.30—9.30 am—VLA4	25.49: To British Isles and Europe.
7.15—9.30 am—VLA4	25.49: To Forces in Pacific, Japan and Asia.
	VLB6 19.74: To Forces in Pacific, Japan and Asia.
	VLC10 13.84: To Forces in Pacific, Japan, and Asia.
10.15—11.30 am—VLA9	13.89: To Nth America (East) and Canada (till 11.30).
	VLC9 16.82: To Nth America (East) and Canada (till 11.30).
12.00—2.00 pm—VLA6	19.74: To Forces in Pacific, Japan and Asia.
	VLC9 16.82: To Forces in Pacific, Japan, and Asia.
	VLB5 13.94: To Forces in Pacific, Japan, and Asia.
	VLG5 25.25: To Forces in Pacific, Japan, and Asia.
1.15—5.30 pm—VLB5	13.94: To Forces on Saturdays only
2.45—3.45 pm—VLA4	25.49: North America (West)
	VLB8 13.89: (Not on Saturday)
	VLC4 19.59: (Not on Saturday)
	VLG7 19.79: (Not on Saturday)
4.00—4.45 pm—VLC4	19.59: Tahiti in French
	VLG3 25.62: To Tahiti in French
5.00—6.15 pm—VLA9	13.89: To British Isles (till 6.00 pm). Not used on Sat.
	VLB3 25.49: To British Isles (till 6.00 pm). No used on Sat.
5.30—6.45 pm—VLC4	19.59: To New Caledonia in French
	VLG3 25.62: To New Caledonia in French
6.30—11.00 pm—VLB8	13.89: To Forces in Pacific, Japan, and Asia.
	19.24: To Forces in Pacific, Japan and Asia.
6.45—9.30 pm—VLA6	19.74: To Forces in Pacific, Japan, and Asia.
	VLC4 19.59: To Forces in Pacific, Japan, and Asia.
	VLG5 25.25: To Forces in Pacific, Japan, and Asia.
8.00—10.00 pm—	
	VLG5 25.25: To Asia in Chinese, Dutch and Malay
	VLC4 19.59: To Asia, in Chinese, Dutch and Malay.
10.00—11.00 pm—VLA8	25.51: To Asia and Forces
	VLG5 25.25: To Asia and Forces
	VLB8 13.89: To Asia and Forces (VLB8 to 10.30 pm) (VLC4 to 10.45 pm).
	VLC4 19.59: To Asia and Forces (VLB8 to 10.30 pm). (VLC4 to 10.45 pm).
11.00—12.15 am—VLB	31.45 To Nth America (East) and Canada.

VLC7	25.35: To Nth America (East) and Canada.
	VLG5 25.25: To Indo China in French
11.00—11.35 pm—VLA8	25.51: To Indo China in French.
11.35—12.00 pm—VLA8	25.51: To Siam in Siamese
	VLG9 25.21: To Siam in Siamese (VLG9 from 11.45 pm).
12.00—1.00 am—VLA8	25.51: To Pacific and India.
	VLB9 31.2: To Pacific and India from 12.45 am)
	VLC4 19.59: To Pacific and India. From 12.30 am).
	VLG9 25.21: To Pacific and India.
	VLG9 25.21: (from 12.00 am).
1.00—2.00 am—VLA8	25.51: To British Isles (VLA8 till 1.30 a.m.
	VLB9 31.2: To British Isles (VLA8 till 1.30 am)
	VLC4 19.59: To British Isles (VLA4 till 1.45 am)
	VLG9 25.21: To British Isles (VLG9 till 1.45 am).
2.00—3.00 am—VLA4	25.49: To Nth America (West)
	VLC6 31.2: To Nth America (West)
	VLG 31.32: To Nth America (West)

U.S. INTERNATIONAL BROADCASTING STATIONS

West Coast Transmitter Schedule

Station	Time	Mc	Metres	Beam
KCBS	7.00pm—2.00am	15.15	19.80	Ph'ppins/NEI
	2.00am—7.00am			—Off air.
	7.00am—1.00pm	15.24	19.69	Sth America
KCBF	1.00pm—7.00pm			—Off air.
	7.00pm—2.00am	15.15	19.80	Japan/China
	2.00am—7.00am			—Off air.
KCBR	7.00am—1.00pm	17.85	16.81	Sth America.
	1.00pm—7.00pm			—Off air.
	8.00pm—2.00am	9.70	30.93	Ph'ppins/NEI
KGEI	2.00am—8.30pm			—Off air.
	8.30am—11.15am	15.33	19.57	China/SE Asia
	11.30am—1.00pm	11.77	25.49	Sth America
KGEX	1.15pm—7.45pm	15.33	19.57	Japan/Alaska
	7.00pm—M/N	9.53	31.48	Philippines
	8.00am—10.45pm	15.13	19.83	Alaska
KNBA	1.00am—6.45pm	15.13	19.83	Sth W Pacific
	5.00pm—2.00am	11.73	25.58	NEI/Ph'ppines
	2.00am—8.00am			—Off air.
KNBI	8.00am—4.45pm	15.21	19.72	Philippines
	3.15pm—6.45pm	17.78	16.87	Alaska
	7.00pm—2.00am	9.49	31.61	Japan/China
KNBX	2.00am—7.00am			—Off air.
	7.00am—8.15am	21.61	13.88	Sth America
	8.30am—3.00pm	17.77	16.88	Japan/China
KWID	3.15pm—6.45pm	17.78	16.87	Alaska
	7.00pm—2.00am	9.49	31.61	Hawaii
	2.00am—7.00am			—Off air.
KWIX	7.00am—8.15am	21.61	13.88	Sth America
	8.30am—3.00pm	17.77	16.88	Hawaii
	7.00pm—7.30pm	11.79	25.45	New Zealand
KRHO Honolulu	7.45pm—2.00am	11.79	25.45	China/SE Asia
	2.00am—7.00am			—Off air.
	7.00am—1.00pm	15.34	19.56	Sth America
KCBS	1.15pm—6.15pm	15.25	19.67	Japan
	5.00pm—9.30pm	11.90	25.21	Sth Pacific
	10.00pm—2.00am	9.57	31.35	China/SE Asia
KWIX	2.00am—7.00am			—Off air.
	7.00am—10.15am	17.76	16.89	Sth America
	10.30am—1.00pm	9.57	31.35	China/SE Asia
KWIX	1.15pm—4.45 pm	15.29	19.62	Alaska
	5.00pm—M/N	11.89	25.23	Japan/China
	M/N—8.30am			—Off air.
KRHO Honolulu	8.30am—11.15am	15.29	19.62	Japan/China
	11.30am—4.45pm	17.76	16.89	Japan/China
	7.00pm—2.00am	9.65	31.09	Japan/China
KRHO Honolulu	2.00am—8.00am			—Off air.
	8.00am—11.15am	17.80	16.85	Ph'ppines/NEI
	11.30am—3.00pm	17.80	16.85	Japan/China
	3.15pm—5.00pm	9.65	31.09	

(Continued)

GST, London	21.55mc, 13.92m
1.30 am—2.30 am to Cent. America.	
GVT, London	21.75mc, 13.79m
1.30 am—2.30 am to South America.	
GSI, London	21.53mc, 13.93m
7.00 pm—3.00 am to India, etc.	
GSH, London	21.47mc, 13.97m
7.00 pm—3.15 am to East Africa, etc.	
GVS, London	21.71mc, 13.82m
9.15 pm—1.15 am to South America.	
KNBA, San Francisco	21.61mc, 13.88m
7.00—8.15 am to Sth America.	

KNBI, San Francisco	21.61mc, 13.88m
7.00—8.15 am to Sth America.	
WCRC, New York	21.57mc, 13.91m
10 pm—7.30 am to Europe.	
WLWL-1, C'natti	21.65mc, 13.86m
8.30 am—Noon to W. Sth. America.	
WLWS-1, C'natti	21.65mc, 13.86m
9.45—8.00 am to Europe.	
WLWS-2, C'natti	21.65mc, 13.86m
9.45 pm—7.30 am to Nth. America.	
VLC-10, Shepparton	21.68mc, 13.84m
7.15 am—9.30 am to Pacific.	
VLA-9, Shepparton	21.60mc, 13.89m
10.15 am—11.30 am to Nth America.	

VLB-5, Shepparton	21.54mc, 13.94m
Noon—2.00 pm to Asia (daily).	
1.15—5.29 pm Sporting (Sats.)	
VLB-8, Shepparton	21.60mc, 13.89m
2.25—3.45 pm to Nth America (ex. Sat.)	
6.30—11 pm to Asia.	
VLA-9, Shepparton	21.60mc, 13.89m
5—6.15 pm to British Isles.	

And now I have word from Ern. Suffolk that he has heard:

WOOW, New York, on 21.50mc, 13.95 m
 WNRI, New York, on 21.61mc, 13.88m,
 both around 11 p.m.

A.B.C. NATIONAL SHORTWAVE STATIONS

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

VLH CALL SIGNS—

	Metres	Mcs.
VLH4	25.25	11.88
VLH5	19.69	15.24
VLH4	25.25	11.88
VLH3	31.32	9.58

WEEKDAYS

Monday to Friday

VLH4	25.25	11.88
VLH5	19.69	15.24
VLH4	25.25	11.88
VLH3	31.32	9.58

SATURDAYS

VLH4	25.25	11.88
VLH5	19.69	15.24
VLH3	31.32	9.58

VLR CALL SIGNS

VLR2	48.78	6.15
VLR	31.45	9.54
VLR2	48.78	6.15

WEEKDAYS

Mondays to Fridays

VLH2	48.78	6.15
VLR	31.45	9.54
VLR2	48.78	6.15

SATURDAYS

VLH2	48.78	6.15
VLR	31.45	9.54
VLR2	48.78	6.15

VLG CALL SIGN

VLG7	19.79	15.16
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SUNDAYS

VLQ CALL SIGNS	6.45am—8.15	
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VLQ CALL SIGNS

VLQ	41.44	7.24
VLQ3	31.06	9.66
VLQ2	41.58	7.215

WEEKDAYS

VLQ	41.44	7.24
VLQ3	31.06	9.66

VLQ2	41.58	7.215
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VLW CALL SIGNS

VLW7	31.51	9.52
	31.51	9.52
VLW-3	25.36	11.83

WCRC

New York 10.00pm—7.30am 21.57 13.91—Europe

8.00am—3.00pm 9.65 31.09—W.S. Amer.

2.00pm—10.00pm —Off air.

WGEA 7.45pm—3.45am 15.33 19.57—N. Africa

Schenectady 4.00pm—7.30am 15.33 19.57—N. Africa

8.00am—Noon 11.81 25.40—Brazil

Noon—7.45pm —Off air

WGEO 7.45pm—3.45am 15.33 19.57—Europe

Schenectady 4.00pm—7.30am 15.33 19.57—Europe

8.00am—2.00pm 9.53 31.48—E.S. Amer.

2.00pm—7.45pm —Off air

WLWK 9.45pm—7.30am 17.80 16.85—Europe

C'nntati 8.00am—1.00pm 15.25 19.67—W.S. Amer.

1.00pm—9.45pm —Off air

WLWO 9.45pm—2.00am 11.71 25.62—Europe

C'nntati 2.15am—8.00am 15.35 19.54—Europe

8.30am—1.00pm 11.79 25.45—E.S. Amer.

1.00pm—9.45pm —Off air

WLWL-1, 9.45pm—8.00am 17.955 16.71—Europe

C'nntato 8.30am—Noon 21.65 13.86—W.S. Amer.

Noon—9.45pm —Off air

WLWL-2 9.45pm—8.00pm 17.955 16.71—Nth Africa

C'nntati 8.00am—9.45pm —Off air

WLWR-1 9.45pm—8.00am 15.25 19.67—Europe

C'nntati 8.30am—4.00pm 9.70 30.93—W.S. Amer.

—C. Amer.

—Off air

WLWS-1 4.00pm—9.45pm —Off air

C'nntati 9.45pm—7.30am 21.65 13.86—Europe

7.45am—4.00pm 15.20 19.74—W.S. Amer.

—C. Amer.

—Off air

WLWS2 4.00pm—9.45pm —Off air

C'nntati 9.45pm—7.30am 21.65 13.86—Nth Africa

7.45am—4.00pm 11.71 25.62—W.S. Amer.

—C. Amer.

—Off air

WNBI 4.00pm—9.45pm —Off air

New York 7.45pm—7.30am 17.78 16.87—Europe

7.45am—2.00pm 17.78 16.87—S.S. Amer.

2.00pm—7.45pm —Off air

WRCA Midnight—7.30am 15.15 19.80—Europe

New York 8.00am—9.45am 15.15 19.80—Brazil

(Monday to 10 am)

10.00am—Noon 9.67 31.02—Brazil

(Monday from 10.15am

Noon—M/N

WNRA 7.45pm—8.15am 18.16 16.52—Europe

New York 8.15am—7.45pm —Off air

WNRE 7.45pm—8.15am 15.28 19.63—Europe

New York 8.15am—7.45pm —Off air

WNRI 7.45pm—8.15am 13.05 22.98—Europe

New York 8.15am—7.45pm —Off air

WNRX 7.45pm—8.15am 14.56 20.60—Europe

New York 8.15am—7.45pm —Off air

WOOC 7.45pm—7.15am 15.20 19.74—Europe

New York 7.30am—8.15am 11.87 25.27—Europe

8.15am—7.45pm —Off air

WOOW 7.45pm—2.00am 11.81 25.41—Europe

New York 2.00am—4.00am —Off air

4.00am—6.45am 11.87 25.27—Europe

6.45am—7.45am —Off air

WRUA 8.00pm—6.30am 15.13 19.83—Nth Africa

Boston 7.00am—8.15am 11.79 25.45—Nth Africa

8.15am—9.30am —Off air

WRUS 9.30am—4.00pm 15.35 19.54—C. Amer.

Boston 4.00pm—8.00pm —Off air

8.00pm—6.30am 15.13 19.83—Europe

7.00am—8.15am 11.79 25.45—Europe

8.15am—9.30am —Off air

WRUL 9.30am—4.00pm 15.35 19.54—Mexico

Boston 4.00pm—8.00pm —Off air

8.00pm—8.00am 15.29 19.62—Nth Africa

8.15am—8.45am 11.73 15.58—Caribbean

9.00am—4.00pm 11.73 25.58—C. Amer.

4.00pm—8.00pm —Off air

U.S. INTERNATIONAL BROADCASTING STATIONS

East Coast Transmitter Schedule

Station	Time	Mcs.	Metres	Beam
WBOS Boston	7.45pm—3.45am	15.21	19.72—No.	Europe
	4.00am—6.45am	15.21	19.72—No.	Europe
	7.00am—8.15am	15.21	19.72—Europe	
	8.30am—1.00pm	15.27	19.65—E.S. Amer.	
WCBN New York	1.00pm—7.45pm			—Off air.
	8.00pm—8.00am	15.27	19.65—Europe	
	8.15am—8.45am	11.83	25.36—Caribbean	
	9.30am—4.00pm	11.83	25.36—Mexico	
WCBX New York	4.00pm—8.00pm			—Off air.
	7.45pm—7.30am	17.83	16.83—Europe	
	8.00am—Noon	17.83	16.83—Brazil	
	Noon—7.45pm			—Off air



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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.

Speedy Query Service

F.R.D. (Brisbane) enquires about an English short-wave magazine.

A.—You must be thinking of "The Short-wave Magazine," which is published from 49 Victoria Street, London, SW1. Editor is Austin Forsyth, O.B.E. (G6FO). Subscription rate is 22/- per annum, payable in English currency.

* * *

K.L. (North Sydney) deplores the absence of communications-type receivers.

A.—This week's mail seems to be full of complaints about this and that. There is no doubt that we have not yet recovered from the effects of the war, not by a long shot. Patience is needed. In due course surely some firm will find that they are not making all the profit they can think of, and start to turn out a really effective receiver at a reasonable price. As soon as we hear of any such thing you can bet that we won't hesitate to tell everybody about it.

* * *

P.L. (Geelong) wants a circuit for a portable receiver.

A.—Unfortunately the portable business has been completely upset by the delay in introducing the new "peanut" type valves. About the time the war ended it was expected that these valves would soon be in production, then their release was anticipated for May, 1946. At the moment it looks more likely that it will be May, 1947. But in the meantime it would be folly to spend time and money on the development of a portable to use the old style 1.4 valves, as it would become outdated the moment the "peanuts" eventuate.

* * *

S.L.B. (Minyip) and several others want circuits and sets of special kinds to use the valves they have obtained in ex-army transceivers.

A.—Afraid this is beyond us at the moment. We can only suggest that you study up on your fundamentals and then do your own design work. Knowing the characteristics of valves and their usual ways of application it is comparatively simple to work out suitable circuits. If you draw out your circuits and submit them for approval we will try to check them over, but we simply can't cope with special designs for individuals.

E.M. (Wagin, W.A.) wants to know if he can get a correspondence course for the examination for the amateur operator's certificate of proficiency.

A.—Yes, the Australian Radio College has just introduced a special course to cover this examination and we have no hesitation in recommending it. It is presumed that you already have a fair knowledge of radio theory and practice in general, but covers all the fundamentals. The average time taken to complete the course would be about eight months, as there is a lot of ground to be covered. Few realise just what a range of subjects has to be understood by anyone who wants to make a certainty of passing the A.O.C.P. Cost of the complete course is £7 cash, and it is also available on terms by either of two different instalment plans.

* * *

F.S. (Coburg) complains of lack of attention to a query submitted some weeks ago.

A.—Yes it is highly probable that the query is merely involved in the system somewhere. At the moment our organisation for handling queries is anything but 100 per cent perfect, and they keep on pouring in. In the course of a month or two we hope to complete arrangements for the proper handling of queries, so watch for an announcement in this regard.

Unfortunately you have not repeated your query and so we are unable to help you.

* * *

A.V. (Croydon) wants to know what use is a good amplifier when there is so little range in the music you can put into it from either radio or records.

A.—Yes, there are plenty of problems associated with the pursuit of perfection in reproduction, but the true position is not quite as black as you picture. Some of the local broadcasting stations are capable of giving quite good quality if carefully handled in the r.f. stages, detected without introducing too much distortion and then feeding into a really good amplifier. Records at present on sale are not claimed to have any great width of frequencies cut into them, but are still capable of giving pretty fair output quality if you go to enough

troupe with the pick-up and amplifier. Some will tell you that records don't handle anything above 5,000 cycles and therefore an amplifier's response beyond 5,000 is of no consequence. This is quite erroneous, as you can easily prove to yourself by ear when listening to an amplifier with a high response. Even the difference between a high limit of 10,000 and 15,000 cycles can be readily detected by ear when working from commercial recordings.

Incidentally, both pick ups and recordings are constantly being worked upon with a view to improvement and since a good amplifier is at least likely to last you for ten years you had better make it a good one to cover the possible improvements in technique over that period.

* * *

S.T.H. (Thornbury) writes about prices and costs.

A.—Yes, there is little doubt that the price of components is higher today than before the war, taken all round. Some items still sell at the same price, some have been influenced by sales tax, others have been pushed up. This is also reflected in the retail prices of commercial receivers, few dual-wavers, even of the mantel type, listing at less than £20, whereas there were several on the market before the war. We feel sure that if you compare prices on this basis you will find that the home-built set still has a considerable advantage in cost.

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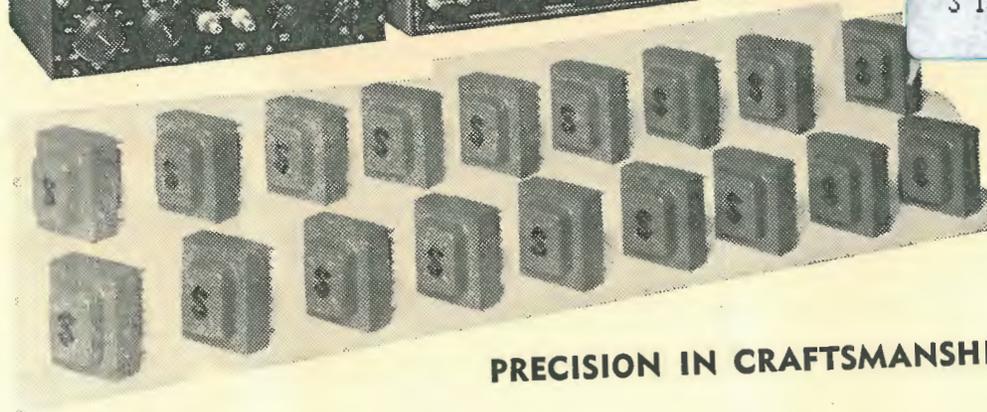
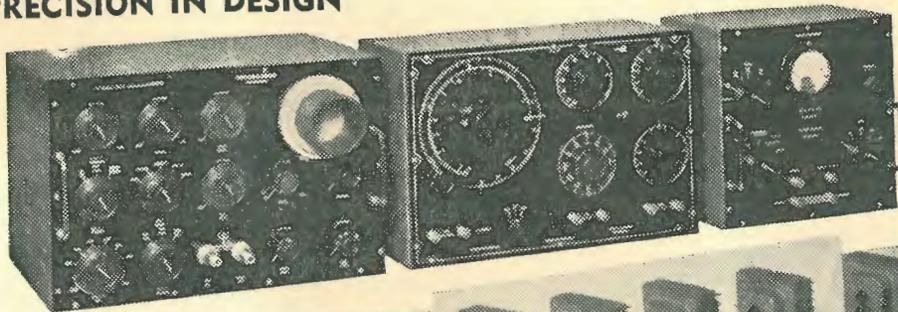
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AUSTRALIA WILL NEED THOUSANDS MORE COMPETENT RADIO SERVICEMEN!

With a prewar turnover of £8,000,000, the number of male personnel alone engaged in the Radio receiver field runs into thousands and the need for more grows each week.



Train quickly for a profitable career in RADIO . . . or a prosperous business of your own!

One of the most attractive features of Radio in Australia is the scope offered to start your own business. With a total of 1,481,919 licensed radio receivers (remember civilian production ceased during the war), some idea can be gained of the pressing need for more and more trained servicemen . . . Such servicemen make big money, too, in selling valves, components (of which over £1,000,000 annually were sold before the war) as well as associate electrical appliances.

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, will want trained men urgently to fill vital positions. If you want security, prosperity, and a recognised status in the community, start training NOW.

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£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.

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