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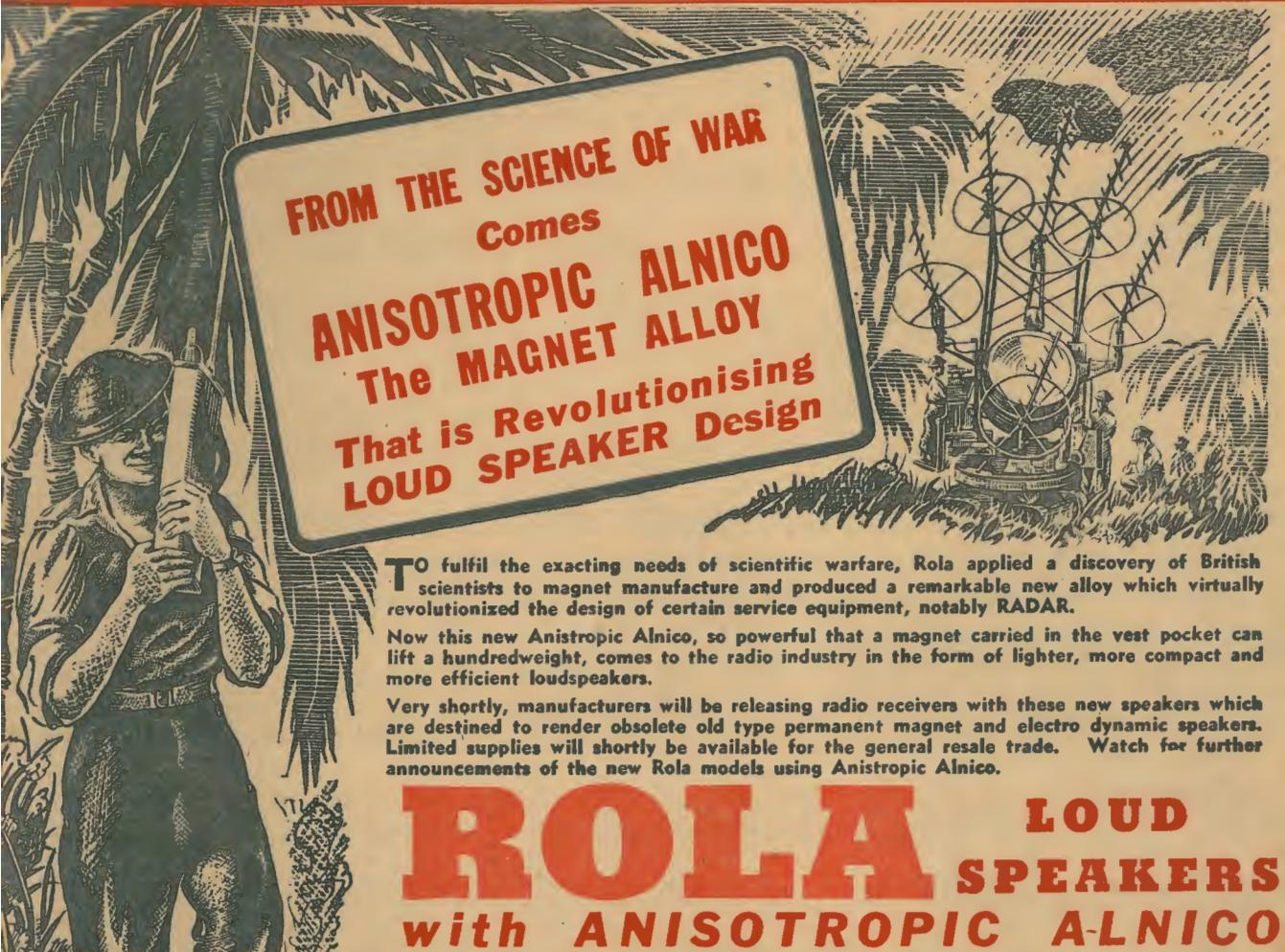
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# Radio World

1/-

VOL. 11 . . . . . NO. 1

JUNE 15, 1946



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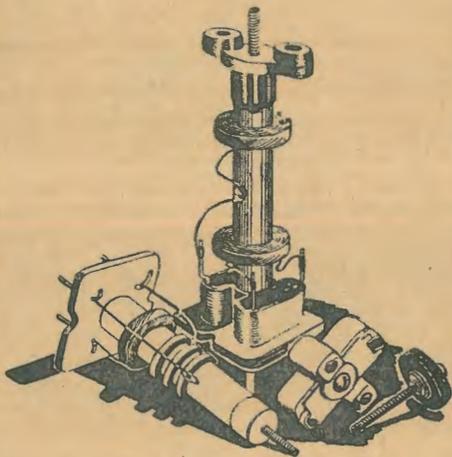
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## EDITORIAL

Congratulations on last month's birthday issue have poured in from all parts of the Commonwealth, but unfortunately these have been punctuated by the sad cries of those who missed the issue. Expecting it to be rushed, we arranged for the extra printing of a couple of thousand issues, but it was not nearly enough.

In the hope that it will save disappointment we would like it clearly understood that we do not have any spare copies available and it is useless to write direct for them or to request that new subscriptions be dated back to start with the May issue.

On the happier side, however, the response was equally terrific, and, as you will soon see as you glance through this issue, it has brought forth a fresh crop of interesting contributions from readers.

We know that no matter how many staff writers we employ we can never hope to cover the many angles and aspects of technical radio and its associated electronic applications, but if each and every reader will co-operate from time to time by sending along a short article about the subject with which he is most closely acquainted then we will, in the aggregate, have worthy editorial content in every issue.

This month's issue shows what co-operation can do and it only remains to again ask you all to write us a note every time you think of something likely to interest other radio enthusiasts like yourself.

A. G. HULL.

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# A POST-WAR AMERICAN RECEIVER

## No Startling Developments Revealed

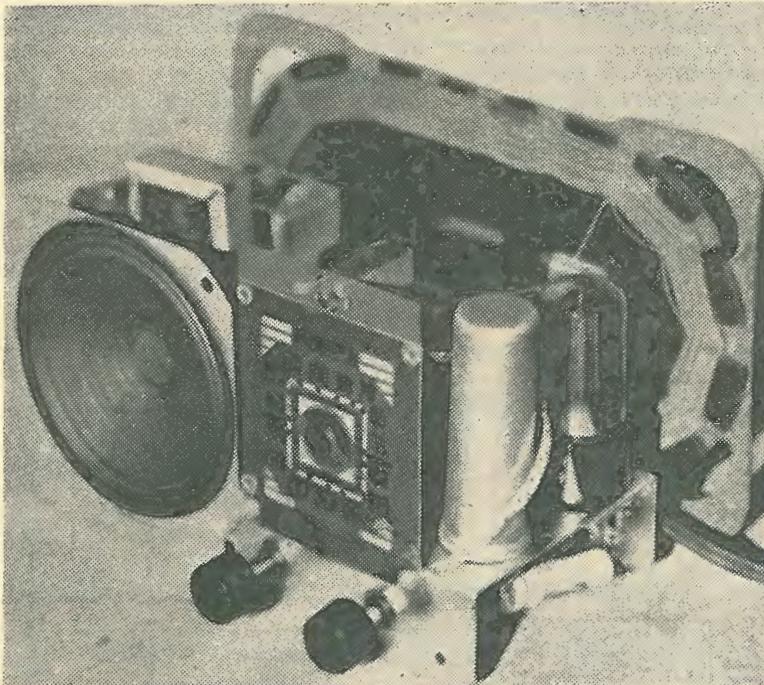
OUR recent editorial on the dearth of technical development brought forth criticism from one or two of our lesser-informed readers. One quoted an advertisement from an American paper in which claims were made for a set which was static-proof. This probably referred to a set for the reception of frequency-modulated transmission. The same technique cannot be applied to the sets for use with the ordinary broadcast transmissions as being used in Australia to-day. If, and when, we get frequency modulation transmissions there will be plenty of scope for local technicians to show their ingenuity.

We recently had a chance to inspect one of the latest American receivers, and so far as we could see there was nothing worth reporting in the way of new ideas. Its general design and construction is exactly the same as the usual pre-war Yankee set of similar style.

Small size and light weight is achieved by avoiding the use of a



This photo does not give a true impression of the size of the set, which is only about five inches high.



A general view of the chassis, showing the loop aerial mounted about an inch behind the metal.

power transformer and taking the high tension and filament supply direct from the mains, through suitable resistances.

Operation without an external aerial is obtained by using a loop wound on a cardboard former about an inch and a half behind the main chassis; this former also forming the back cover of the cabinet to keep out any little fingers that might otherwise come in contact with a "live" chassis.

Tracking of the oscillator tuning is accomplished by the use of a tuning gang with the oscillator plates of smaller size and different shape to the plates used in the aerial section. As will be seen from the photo of the underside of the chassis, we have little to learn from this set on the subject of neatness. Each item appears to have been fitted in the most suitable position without any regard to glamorous looks.

### NEW CLUB

A wide-awake radio club has been formed in Sydney. See page 33 for further details.

# IMPROVED SIGNAL TRACER FOR BATTERY OPERATION

"THE NAME TO  
KNOW IN  
RADIO"

*Radiokes*  
*Radiokes*  
*Radiokes*

**A**N article in a recent month's issue of "Radio World" depicting a Small Signal-Tracer using a ID8GT valve only, has prompted me to write and let others know of a similar but more powerful Signal-Tracer which has been in use here for several years, and which has been proved very successful.

By

E. C. JAMIESON

Forreston

S.A.

It has been built into a small masonite box approximately 7 ins. x 7 ins. x 6 ins. for portable use. This houses, besides the two valves and component parts, one PR45 portable type 45-volt battery, one 4½-volt C battery, and three 1½-volt torch cells wired in parallel for the filament supply.

### The Circuit.

Originally a single ID8GT was used with leaky grid detection, but it was found that its uses were very limited. For instance, it could not be used satisfactorily for tracing distortion in an audio amplifier, due to .00025 coupling condenser removing all bass notes and giving an incorrect and unbalanced output. Again, when testing output of microphones, due to low

gain of tracer, very great difficulty to hear the output. This same applies when using tracer in early stages of the RF end of a receiver.

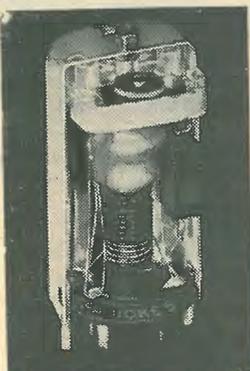
As a result, the present circuit was evolved. The IP5GT gives a very nice lift to all signals, especially useful around the RF stage of a receiver.

The first audio channel also uses the IP5GT and is used in early stages of audio amplifiers. When the signal has reached a sufficiently high level to cause audible distortion by reason of the leaky grid detector, the probe is placed in AF channel 2, which removes the IP5GT from the circuit. The two-way switch selects the necessary channel.

There appeared to be no necessity to remove the volume control to the grid of the triode section of the ID8GT, since the IP5GT is acting as a low gain pentode and RF signals do not reach the proportions that AF signals do. The .004 condenser across the phones helps to preserve the ears against sudden bursts of static and other interference.

No shielding was found necessary, but tracer is built on metal chassis, and thus probably helps to maintain stability.

This small unit is most useful for outside servicing jobs where a larger item of equipment is too bulky for ready transport; and is particularly useful for checking distortion and hum in audio amplifiers. It is cheap to build: whole unit costing less than £3, and easy to get working efficiently.



Radiokes' Broadcast Coils, both Air Core and Permeability types are now more freely obtainable. Features include rigid Trolitul construction. Ask for Type ACB, Aer, R.F. or Osc.

### RADIOKES D.W. UNITS

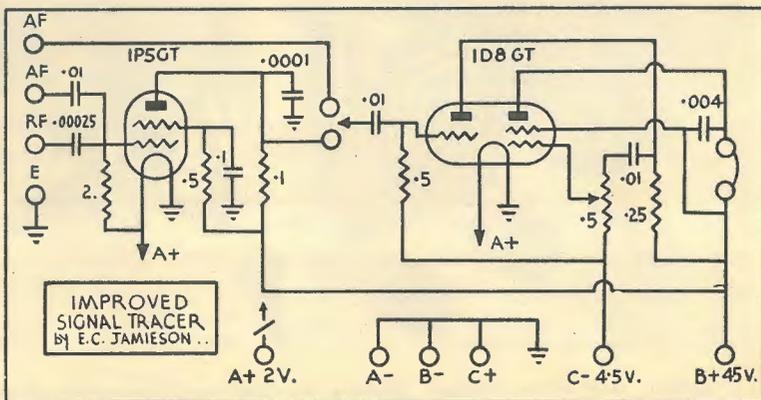
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# RECEIVING BEAM FOR "TEN"

## Rotating array gives improved results

**L**ISTENERS who enjoy tuning over the 28 mc band and logging stations in this band and others, have doubtlessly listened with interest to transmitting amateurs rotating their beams on to various points of the world.

It has perhaps become accepted thought by most listeners that the

By

H. K. LOVE

VK3KU

function of a beam is primarily for transmitting.

From long experience with all types of aerials, the writer has come to the conclusion that a great deal of benefit from a rotating beam

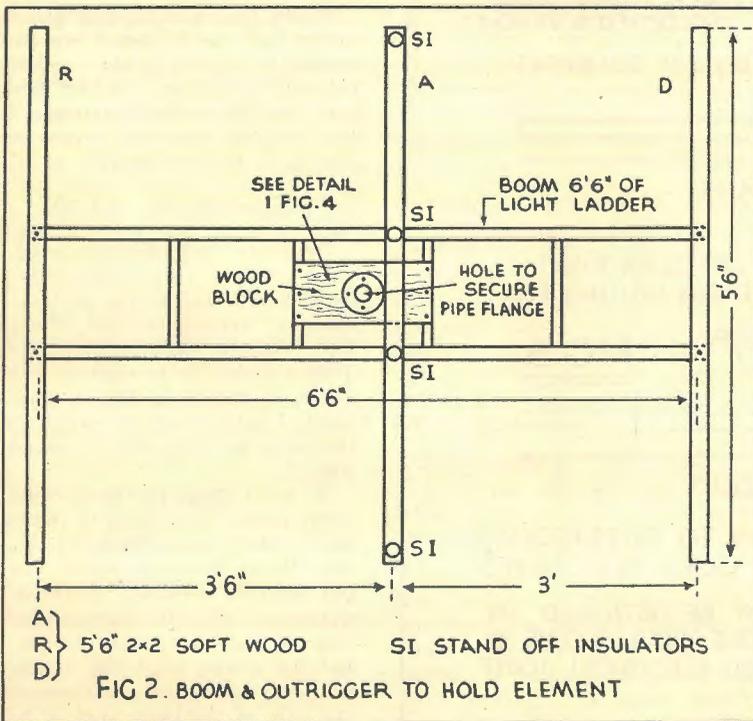
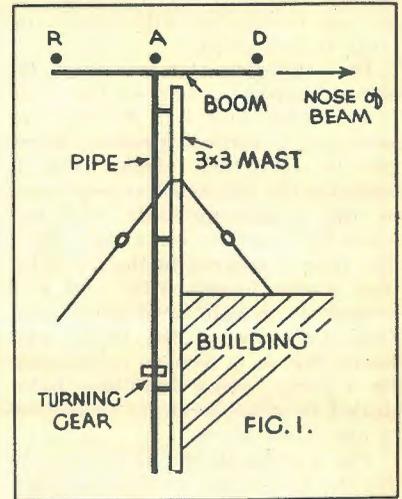
may be had by a listening station.

For example, some Saturday and Sunday mornings one may tune over the 28 mc band and find hundreds of W stations crowding the frequency range. By using a beam, the rotation of the head from NE to E or SE will cut out all the W stations and bring in Central or South American countries free of interference from the W stations.

Such an aerial adds to the selectivity of the receiver to an amazing degree and all serious listening stations would do well to consider the erection of such a unit.

On reception of local stations, a strong R8 to 9 signal can be reduced to R2-3, by turning the back of the beam to the transmitter.

For 28 mc the structure necessary to achieve results need be quite simple; it can be mounted either vertically or horizontally and will not take up a great deal of space. For receiving purposes pruning or adjustment is not an involved operation to secure a satisfactory



front to back ratio.

There is no occasion to construct a unit employing more than 3 elements and such an array does not take up very much space, is light and can be rotated simply, either direct or from a distance.

For a receiving station, there is no great worry about insulation, and the beam described here only provides insulation for the aerial; the reflector and director elements need not be insulated from the wooden structure at all.

### Construction

The first point which comes up for decision is the height of the array above ground and the factors to be considered here are the nature of the location. If the beam is to be operated in clear space with few obstructions, it can be 15 to 20 feet high and produce very satisfactory results. If a number of obstructions, such as buildings, trees or iron roofs are surrounding the location, it is advisable to elevate the beam above these if it is possible.

### Supporting Mast

A piece of 3 x 3 timber is quite sufficient to support the structure, and, if not too high, will need only

(Continued on next page)

# BEAM FOR "10"

(Continued)

one set of guy wires, which should be well broken up with insulators every 6 feet or so.

The supporting mast may be partly supported against the wall of an outbuilding or a dwelling, as when in a vertical position there will be very little strain. Fig. 1 indicates the suggested arrangement of the supporting mast with the boom in position on a  $\frac{3}{4}$  in. pipe. The pipe is secured to the 3 x 3 by pipe clamps loosely fitted and well greased to permit turning the pipe from the base of the mast. The boom, Fig. 2, is secured to the pipe by a flange which has three holes drilled to allow screwing or bolting to the wood block.

Fig. 2 gives all the measurements for the boom and outriggers, which

are made of 2 x 2 soft wood, screwed to the boom. The centre outrigger has 4 stand-off insulators screwed to it to support the aerial "A" (Fig. 3).

The elements "R" (reflector) and "D" (director) are fixed by pipe clamps to outriggers "R" and "D" without insulators.

A piece of ladder 6ft. 6ins. long makes a very convenient structure for the boom and saves a good deal of constructional work.

The centre block of wood is very easily fixed by bolts or screws to the rungs in the centre of the length of ladder and this forms a fixing point for the pipe flange to be screwed to. Detail 1 (Fig. 4). When pipe is turned from the bottom the whole boom, with outriggers and their elements, will revolve.

The director should, in every case, be pointed with its broadside

to the direction from which it is desired to receive.

## The Elements

The three elements are known as the Reflector (back of the beam), the Aerial (centre of the beam) and the Director (front of the beam). For easy reference these are referred to as R, A and D.

We begin with A—the aerial; this element, for the centre of the 28 mc band should be 16ft. 9ins. long, the one described is a folded doublet and is constructed as shown in Fig. 3A—a piece of conduit, 16ft. 9ins. has two heavy brass clips fixed on each end, as shown in the detail. To these brass clips are soldered two pieces of No. 14 gauge wire, which are drawn up tightly around a strain insulator in the exact centre of the conduit tubing.

The ends of the conduit should be thoroughly cleaned before the brass is clipped round it and it should be well soldered. The 14-gauge copper wire should also be well cleaned before soldering to the brass. The wires, when stretched tightly round the strain insulator should lay about  $1\frac{1}{2}$  ins. away from the centre of the length of conduit tubing. The twisted pair or coax cables should be well jointed and soldered to the wires at the points marked X, Fig. 3 "A."

When the conduit and wire elements are all soldered up, holes should be drilled in the conduit to coincide with the stand-off insulators on the centre outrigger and the element mounted on the brass screws of the insulators.

## Elements "R" and "D"

Reflector and director need no work on them other than cutting to exact length and laying on their respective outriggers and clamping into position with conduit clamps. They will now be in relation to each other, as shown in Fig. 4, and the whole head is ready to mount on to the pipe as indicated in detail of Fig. 4.

A good two or three coats of paint should be applied to the boom centre block and outriggers to protect them, then the whole can be put up into position. There are a number of ways the pipe at the bottom of the array may be turned, but the system used will depend on the local conditions. In cases where the base of the beam is close to the

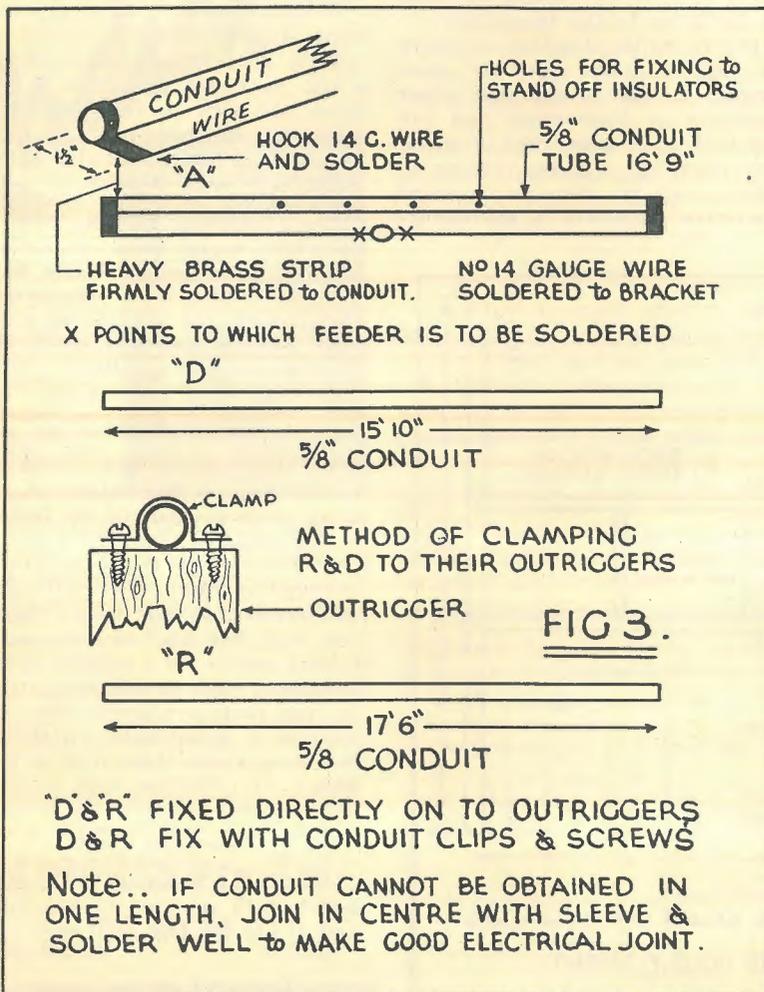


FIG 3.

receiver, the problem should be easy of solution; where the beam must be some distance away, steel cables and a counterweight will serve well. See detail 2, Fig. 4, for a suggestion.

#### Operation With the Receiver

The feeder cable should be connected to the terminals on the receiver and then listen to a station the location of which is known. Now point the beam directly at the station—this will produce maximum signal; now slowly rotate the beam away from the station. The signal will begin to drop and when the elements are end on to the transmitter a marked drop in strength will be noted. Continue the rotation until the back of the beam is broadside to the direction of the transmitter and a very weak signal will result.

Such a beam is well worth while and provides controlled selectivity for receiving, which experience will prove quite remarkable.

The dimensions given for this beam are all for 28 mc.

## A READER'S OPINIONS

SEVERAL of the articles in Radio World lately have aroused my interest, especially those by Mr. Stevens. I would like to say that I agree with most of his observations in regard to American and Continental valve types, with one exception, that of the EL3NG.

In my opinion, this valve is too large and heavy on filament consumption for a small set, and I

By

L. THOMAS

17 Harborne Street

Wembley, W.A.

challenge Mr. Stevens to take an EL3NG out of a set and replace it with a 6V6G/GT, and say that

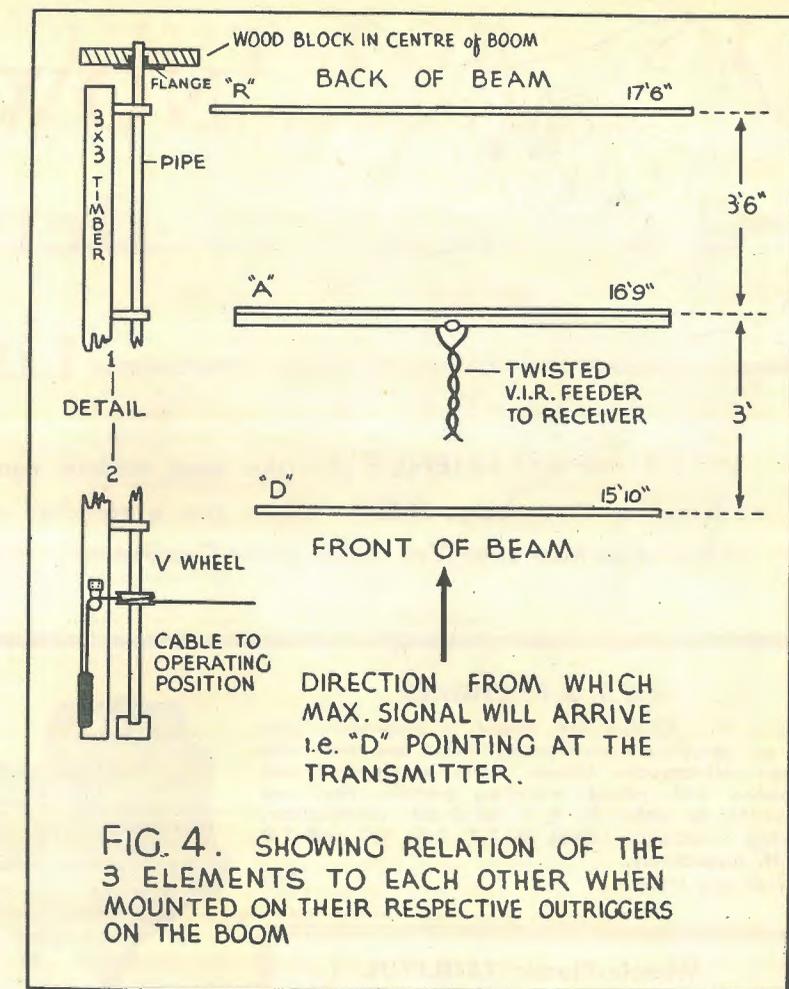


FIG. 4. SHOWING RELATION OF THE 3 ELEMENTS TO EACH OTHER WHEN MOUNTED ON THEIR RESPECTIVE OUTRIGGERS ON THE BOOM

there is any noticeable difference.

Theoretically, of course, the EL-3NG is the better valve, but the human ear obeys a logarithmic law as far as volume is concerned, and it would take a much greater difference in power sensitivity before the difference could be heard. For this reason I always use the 6V6G/GT in small sets.

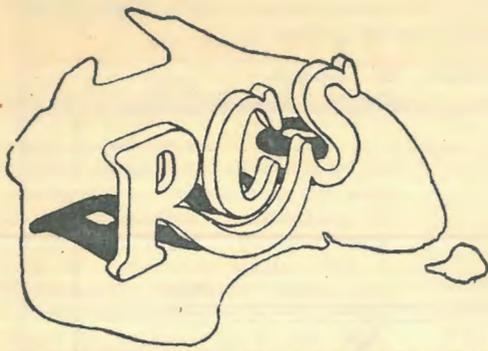
Your article on using single gangs in superhets also interested me, as I have done a lot of work in this direction.

One point not brought out in your article is the fact that a fourteen-plate midget will cover the whole of the broadcast band if the padder is omitted, and an iron-cored oscillator coil used. Also the R.F. choke in the aerial leads to

complications as it may resonate with the I.F. when certain lengths of aerial are used, leading to uncontrollable oscillation. I myself use a 20,000-ohm potentiometer here, the slider going to the aerial, one end to control grid of the converter, and the other end to earth. This makes an excellent type of volume control for a small set.

In order to make the best out of three valves and a rectifier, I use an EK2 converter, an EBF2 I.F. amplifier with diodes feeding straight into a 6V6G/GT. Selectivity and sensitivity are ample.

In conclusion, let me thank you for the high standard of your paper. The only complaint I have is that it is not published weekly instead of monthly.



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CV36	25	3.5	4	4 6
CV37	35	4	5	4 9
CV38	50	4	7	5 3
CV39	70	5	9	5 10
CV40	100	6	14	6 6
			M/C	
CV41	10	3	2	7 3
CV42	15	3	3	7 9
CV43	25	3.5	4	8 4
CV44	35	4	5	9 0
CV45	50	4	7	9 6
CV46	70	5	9	10 0
CV47	100	6	14	11 3

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## A sound design embodying crystal control

WHEN the recent world upheaval happened on the scene in 1939, the writer, in common with an increasing number of VK "Hams," was having a rare old time on the old 56-60 mC/s band. In and around Sydney there were lots of stations to talk to, and VK2NO's CW signal had been heard five times in N.Z., once in U.S.A., and, above

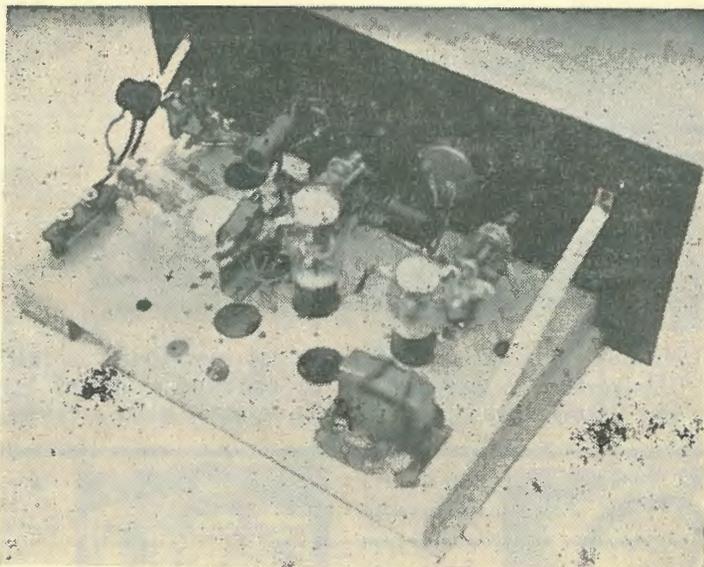
By

DON B. KNOCK  
VK2NO

all, were reported from a lonely mountain top location in North Wales. There was some argument about that report . . . many G's opined that the listener concerned had been "hearing things," but there was the inescapable fact of the report, which we still have, checking with the station log.

Then the U.S. "Bustands" informed "Bill" Conklin of "Radio" UHF fame that ionosphere conditions at that time were such as to do unusual things. All this was very interesting, and then came the "Big Close Down," and away we all went into training, teaching future A.I.F. lads the ins and outs of all kinds of Sigs. Communication.

Now, with the curtain again raised on the world of amateur radio, we are back at our doings, but not quite in the same stamping ground. However, there's nothing wrong about the new "Six metre" band, and, if anything, it has more in its favour than the old "Five." Somehow we can't help thinking that there may still be repercussions about harmonics on 56-60 mC/s from 28-29 mC/s . . . we are told that already some "Ten metre men" have been chided by authority for radiating harmonics on "Five." Reason isn't hard to seek . . . that region . . . now ex-"Ham" . . . becomes a Television allocation . . . and you can perhaps visualise what "Calling CQ DX" on



A general view of the exciter, from the rear, showing layout.

top of a picture of a glamour lady advertising French swimmers might look like! So, those who spend their time on "Six" are not for one thing radiating harmonics from "Ten," and there is lots to be done in populating the new band. Let's go to it.

In making a start on "Six," there is no question of interim gear . . . the idea that S.E. rigs and squeagers will do meanwhile is tabu . . . and that isn't private opinion . . . it's regulations. So that . . . crystal control . . . or something of equal stability is the order of the day. Thus, in planning a transmitter for "Six," we decided that it would have to be a very nifty kind of job that would shine any brighter than the one we had pre-war. To describe the resulting transmitter in toto would take more space than we have available at the moment, but here, to go on with, are essential details of the exciter portion of our rig, which can be heard on 50.4 mC/s quite regularly, with phone and/or CW.

In three valves it gets straight from a comparatively low frequency to the desired output with

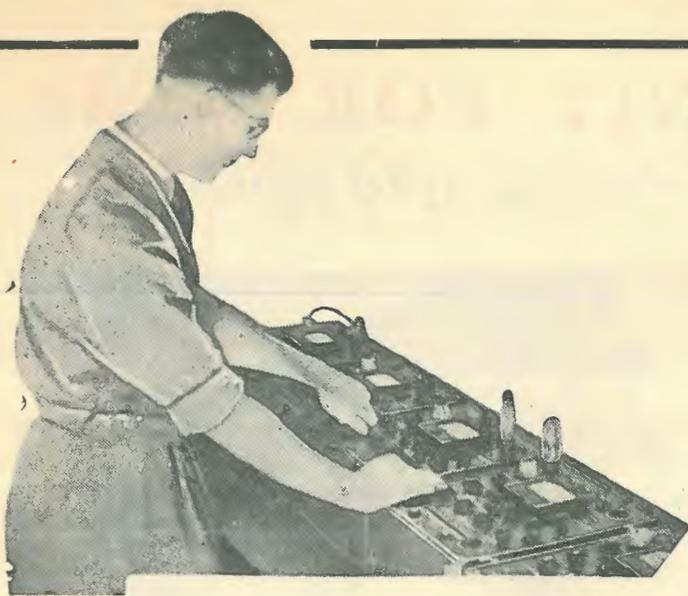
high efficiency, and does so by application of a simple regenerative principle introduced years ago by the famous W "Ham," John Reinartz (now Capt. U.S.N.). Thus, with a 7 mC/s crystal in the oscillator, matters were arranged to finish up with about 20 watts of RF from the output at 56 mC/s. Now, with a 6.3 mC/s crystal in the front end, we wind up at 50.4 mC/s, with plenty of soup available and with delightful simplicity.

### "Straight" Crystal Oscillator.

There are all kinds of trick ideas to get harmonic output from in-offensive crystals by introducing regeneration as an integral function of the controlled oscillator valve, and most of these stunts are workable. Some are not so amenable to reason, and may result in punctured crystals and a sadly contemplating "Ham" to boot. Safe enough is the time-tested Tritet, but even that, in the hands of the careless, can be tough on quartz.

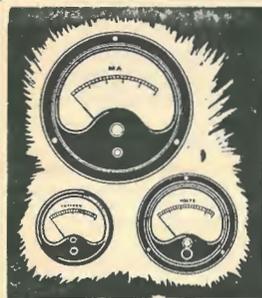
The arrangement diagrammed in

(Continued on page 13)



# Mr. White is a tough man

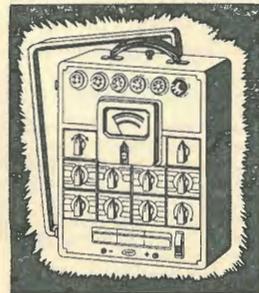
He has the final say. Here we see him giving a last grueling check to a batch of "University" Supertesters. The exacting series of bench tests is but another reason why "University" Indicating Equipment gives sterling service and lasting satisfaction.



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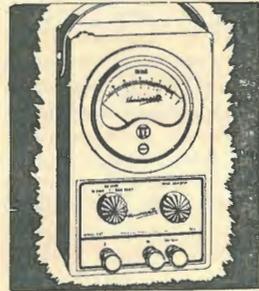
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## RADIO EQUIPMENT PTY. LTD.

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# EXCITER

(Continued)

the circuit of our exciter **re-inforces** the harmonic at the 4th (or what you plan) multiple, and it does it without the possibility of excessive crystal current. Briefly, the arrangement is this . . . straight grid-plate C.O. driving a quadrupler with regeneration introduced by mutually coupling the oscillator and quadrupler "tank" circuits together. Thence to a series-tuned doubler with plenty of "sock." Now, we realise that 6L6G valves won't be in everybody's possession these days, but remember that the 807 is simply an overgrown 6L6G . . . with anode connection on top. So you may use a type 807 as quadrupler. You can also use one as the C.O., and, if you don't mind a little sacrifice in R.F. output, you can use a 6V6GT for the C.O. and quadrupler stages. Finally, you don't **have** to use a beam tube at all as C.O. . . . if you have any kind of usable pentode lying idle, such as 6F6, 42, 2A5, etc. . . . it is quite applicable. But we suggest you stick to valves with beam characteristics for the rest of the picture, such valves being rich in harmonic behaviour.

## Quadrupler.

There is an important point regarding the circuit arrangement of the quadrupler stage, and that is inclusion of R.F. chokes in the anode feed line to this stage and

the oscillator. In this scheme of back coupling the two tank coils to introduce regeneration in the quadrupler stage and thus build up the desired harmonic, the arrangement just doesn't function if the chokes are omitted. They should be the multi-pie type of choke, such as the R.C.S. type 85.

With the exception of the coil details, all resistor and capacity values are shown in the circuit diagram, and it should be unnecessary to stress the point that only variable condensers, valve sockets, etc., of the highest grade of insulation should be used. Assuming that the 50 mC/s reader plans to use a crystal between 6.2 and 6.4 mC/s for operation between 50 and 50.4 mC/s coil details with the values given will be as follows:—

L1: Oscillator anode coil. 20 turns 14 enam: copper close wound, 1 inch internal diameter.

L2: Quadrupler anode coil. 6 turns 14 enam: copper, 1½ inches long, 1 inch internal diameter.

L3: Doubler anode coil (series tuned). 10 turns 12 enam: copper, close wound, ¾ inch internal diameter.

All coils are wound "on air" and are made rigid by cementing strips of Polystyrene, celluloid, or Perspex, across the turns after finalisation. For coupling the exciter to another stage, or to use it "as is" as a very effective transmitter, a two-turn link is wound over the "cold" end of L3. Note that the

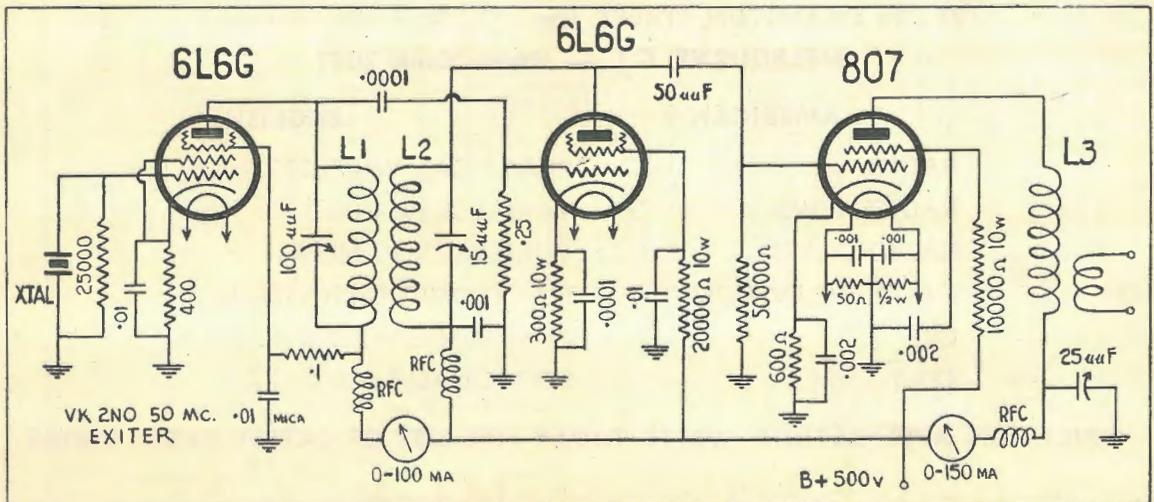
rotor of the doubler tuning condenser, a 25 pf type, is earthed.

## Application.

Needless to say, this exciter arrangement can be applied to various crystals and harmonics with no alteration other than inductance and capacity values. A case in point here is the ease with which it is possible to select the wrong harmonic in the quadrupler if means of checking is not handy. We found that at first the harmonic selected by L2 and its tuning capacity was the 5th, instead of the 4th. The cure was easy . . . just a matter of pinching together the turns of L2 to raise the value of L. We would **not** have discovered this quintupling until much later if we didn't have on hand an absorption "wavemeter" of the simple pea-lamp indicator variety to show at a glance just in what range that 6L6G was operating.

In passing, we mention that there is no more useful or important gadget around the shack than a wide-range calibrated absorption type wavemeter, especially one of the crystal-rectifier meter indicator type. If such a checker incorporates a micro-ammeter, it is useful as a fieldmeter for checking antenna radiation patterns, in addition to doing the usual duties. We intend to describe such a meter in a future article.

It will be obvious to the 28 mC/s addict that with a 7 mC/s crystal in the oscillator of this type of exciter, high efficiency performance can be obtained on that band by



## EXCITER

(Continued)

using the final 807 as a buffer. Another way would be to use the quadrupler stage in the same harmonic re-inforcing fashion as a doubler, taking the C.O. from "40" to "20", and then using the final 807 as series-tuned doubler to "Ten" with appropriate L/c values.

Anode meters are shown in the H.T. feed to oscillator and doubler stages, but these can be connected in the cathode circuits in the usual manner, if desired. Meters are less likely to be damaged that way.

With a power supply at 500 volts from a 5Z3 pack at 150 m/a, the oscillator runs perfectly cool at 35 m/a. Reason for that is the low screen voltage applied through the 100K resistor. For this reason alone, this form of exciter is desirable. Function of a crystal oscillator is, primarily, to provide a form of **control** . . . it should not be considered as a power stage, and something to be driven hard.

As for the final stage of a transmitter, that is a matter for the individual "Ham," with regard to his 50 or 100 watt licence rating. For the latter, this exciter will do a fine job with an 813, which needs just about a wink of an eyelid to be fully excited! An 809 following this set-up will take ample care of the other power rating. There are quite a few combinations of harmonic selection that can be applied to arrive with a crystal controlled signal in the "Six" metre band, and to mention some for the benefit of possessors of suitable crystals:—

A 7800 kc/s crystal can triple to 25400, thence double to 50800 kc/s.

An 8600 kc/s crystal can triple to 25800, thence double to 51600 kc/s.

An 8650 kc/s crystal can triple to 25950, thence double to 51900 kc/s.

We mention these figures because there appear to be for sale, ex-Service, quite a few quartz crystals

## VICTORIAN AMPLIFIER CHAMPIONSHIP

will be held towards the end of November. Rules and conditions will be given in full in next months issue.

in the 8 mC/s region. Some have been seen in shop windows in Sydney for a few shillings.

After this little story, which is complete enough for any experimenter to do and do likewise, we don't expect to hear any signals but T9 CC ones on 50-54 mC/s.

Now, brother, what's holding you up in getting on the air on "Six"?

—DON B. KNOCK.

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# REMARKABLE POSSIBILITIES IN 2 MC. I.F.

## Promising development from war-time practice

**D**URING the war the writer had occasion to see some English army signals equipment. Firstly, one was struck by the extraordinary tuning ranges covered in one single span.

On examining the equipment this became all the more mystifying when it was found that the tuning condensers used were quite small, in most cases about .0001 mf. Our standard 23-plate midget condenser would approximate the types used in the abovementioned receivers.

By

**C. MUTTON**  
1 Plow Street  
Thornbury, Vic.

However, on examining the equipment the mystery became solved when it was found that the I.F. frequency used was in the region of 3.5 megacycles. At this time not much thought was given to this fact, due to other much more pressing and important business.

A recent description in "Electronics" by an American designer of a receiver using a 2 mC intermediate frequency channel which

covered a tuning range of 100 kC to 1750 kC and which only tuned the local oscillator, reawakened the interest of the writer.

This interest was born of two factors, firstly, it was something really different and, secondly, at least it was one way in which the average enthusiast could dodge the vain search for a two-gang condenser, with the other alternative of paying somewhere in the region of thirty shillings for the above article.

The writer often wonders how long it will take the powers-that-be to wake up to these people who have the effrontery to trade under the title of legitimate wholesalers and blatantly advertise two-gang condensers at a price which is more than double their prewar value. Admitting there's been a war on, and prices have gone up, still, that doesn't excuse daylight robbery.

Having removed the chip off the shoulder, let us continue with the article and revert to a short discussion on superhet theory.

In the case of the usual 455 kC I.F. channel in a normal receiver, seeing that the oscillator section tunes higher in frequency than the incoming signal by an amount considering the broadcast band,

equal to the I.F. frequency, then which covers from 550 to 1,500 kC, which will at some time be extended to 1,650 kC. It can be seen that while the signal circuit goes from 550 kC to 1,500 kC, the oscillation covers from 1,005 K to 1,955 K, in which case, as is generally known, the oscillator coil requires less inductance than the aerial coil for obvious reasons.

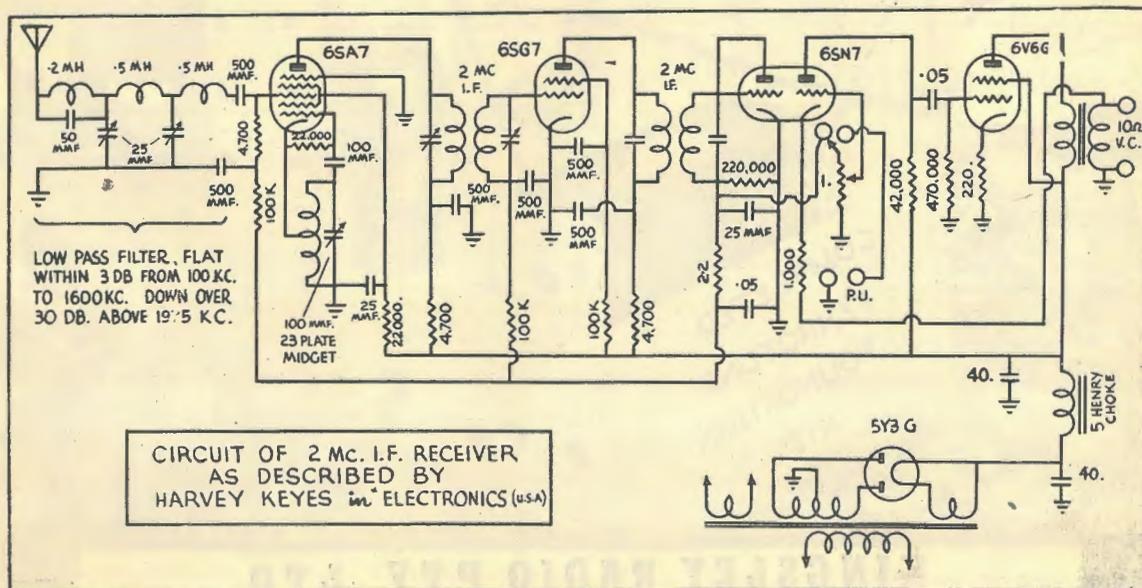
### A Typical Example

Now taking the case of the receiver with the two megacycle I.F., let us only consider the broadcast band. The original design catered for a coverage of 100 kC to 1,750 kC, whereas most of our readers will only be interested in a coverage of the standard B.C. band as there is not much interest in the lower wavelengths in Australia.

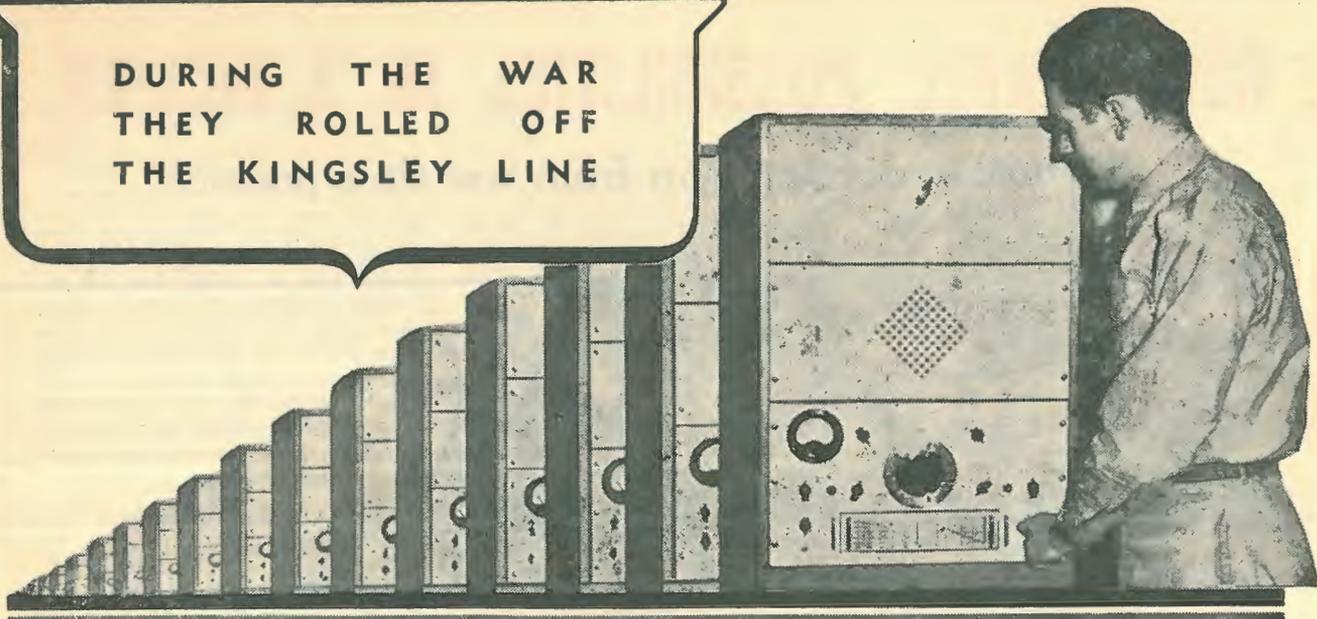
Seeing then that our I.F. channel is 2 mC or 2,000 kC, it will be realised that if the signal circuit covers from 550 kC to 1,800 kC, the oscillator in the new set-up will only have to cover from 2,550 kC to 3,500 kC, which converted to megacycles becomes 2.55 to 3.5 mC.

Now, as soon as we start to talk

(Continued on next page)



DURING THE WAR  
THEY ROLLED OFF  
THE KINGSLEY LINE



The Kingsley production line is now operating and gathering momentum for peacetime products.



**KINGSLEY RADIO PTY. LTD.**

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(Continued)

megacycles instead of kilocycles, we can reduce associated inductances and capacities, and it becomes quite a simple matter to cover from 2.55 to 3.5 megacycles with a tuning condenser of 100 uuf maximum capacity and an inductance of much smaller dimensions than the usual B.C. 455 kC oscillator coil.

By referring to the reproduced circuit it can be seen that the design consists of an aerial input circuit comprising a low-pass filter. The 2 mC I.F. channel makes it only necessary to tune only the local oscillator in the receiver, covering 2,100 kC to 3,500 kC, which is less than a 2 : 1 tuning ratio for a receiver range of 15 : 1 in the input circuit. Signals which cause image response in this receiver lie in the range of 4,100 kC to 5,500 kC but the low pass filter employed between the aerial and first detector is designed to eliminate these. No variable tuning condenser is required for the low-pass filter.

The writer has chosen several points brought up by the designer of the original circuit; to quote his own words, he says: "This set was designed for high-fidelity reception of local stations only, in the residential section of Boston. The receiver is almost too good as regards tone, network and recorded programmes are easily recognised as being inferior in tonal quality to local studio broadcasting when this receiver is used.

As might be expected, this receiver has its limitations. Since all signals in its tuning range appear on the control grid of the first detector, spurious responses result from beats between and harmonics of, strong signals. This means that weak signals cannot always be received in the presence of strong signals, which naturally restricts the maximum length of aerial that may be used, otherwise the strongest signal in the tuning range will overload the detector.

The 6SA7 was chosen as the most suitable tube for the first detector and oscillator because of its ability to handle a wide range of signal strengths without spurious response.

The I.F. amplifier has a centre frequency of 2,000 kC and is down 3db at about 10 kC off response. The I.F. transformers are modified 1,500 kC types with the coupling

## A PRACTICAL DEAF-AID AMPLIFIER

RECENTLY I had occasion to build a deaf-aid amplifier for a client, and the finished job proved so successful that I feel sure the circuit and details will be of great interest to many other readers of "Australasian Radio World."

The delivery to me of one of the first of the new five-inch permag

By

R. BROWN  
82 Victoria Street  
Taree, N.S.W.

speakers featuring the Alnico magnet material prompted the idea, as the sensitivity of these units has to be witnessed to be fully appreciated.

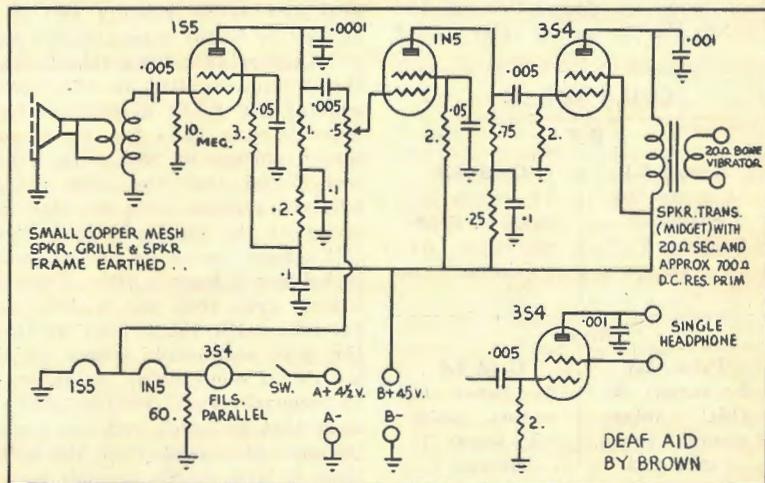
The whole outfit, including batteries, was housed in a former portable analyser cabinet, the size being about 9in. x 6in. x 6in. The battery drain is about 7 mA for the high tension and the filament drain is 100 milliamps. The batteries used were of the PR45 type, with a stan-

dard 4½-volt "C" battery. Doubtless an even lighter version could be made to use the newer minimax type batteries when they become readily available.

With the volume control at maximum, the slightest touch anywhere near the cabinet sounds like someone at work with a sledgehammer. The gain and volume output are both greater than any normal use of the instrument could require.

The filament hook-up could also be run with the two 50 mA. valves in parallel and the shunt between these valves and the 3S4, but actually I started off with 1½ volts bias on the 1N5 as it was an unknown quantity to me as an amplifier valve on 45 volts of high tension. Moreover, other readers may have other types of valves on hand. Bias can be tried by merely earthing the grid return of the volume control.

Other combinations of valves would, no doubt, work equally well, such as 1T4 in place of the 1N5, but it just happened that the valves used were the only suitable ones in our stock at the time. The chassis was a plate of 5in. x 3in. tinned steel and was mounted directly to the frame of the speaker.



increased and inductances reduced.

A 6SN7 double triode serves as a diode detector and first audio amplifier. The cathode of the audio driver section is grounded through the ten-ohm coil of the speaker. The frequency response of the audio

system is flat within 3db from 25 to 20,000 cycles.

It is interesting to note that the gain of the audio system is so low that the power output capabilities of the 6V6 cannot be exceeded. That is

(Continued on page 36)

# DO YOU WANT TO BE A HAM ?

A "HAM" is a radio enthusiast who owns and operates his own transmitter.

Being a ham is great fun, but to get to be a ham is not as easy as it might be, and there is nothing very sudden about it, either.

To become a ham you need to be

energetic and you also need to be able to maintain your enthusiasm for an extended period.

Before you can have your own transmitter you need to pass the necessary examinations to get yourself an Amateur Operator's Certificate of Proficiency. That is the first

step towards getting your experimental station licence.

Even to get yourself a Second-class Certificate you have to prove that you have the following qualifications: (1) a knowledge of wireless telegraphy and telephony and electrical principles; (2) ability to send and receive morse code at 14 words per minute and then lots of other knowledge about regulations, procedure and the adjustment, maintenance and operation of a transmitter.

---

## FURTHER NOTES ON "VK2NO-V6"

Owing to a typographical error in the preparation of the article on this receiver, the details of the coils for the "20 metre" (14—14.4 mc/s) band were omitted from coil winding data on page 9 of the March issue. Also, it should be obvious, upon referring to the circuit diagram in comparison with the coil data, that L1 is the aerial coil, and L2 the grid coil, and not vice versa.

Some readers have asked me for additional data on application of the EF50 valve, and in that connection I wish to point out that the very excellent article in the same issue (March, 1946) on "Using the 1852" by J. G. DuFaur can be taken as applying in general to the use of such valves as the EF50. As explained in my description of the VK2NO V6," a special valve socket

is needed for the EF50. It is known as a "T" socket and has nine connections. Looking at it from the bottom, in the usual manner, the pins are as follow:—

No. 1, Heater; No. 2, Screen Grid; No. 3, Anode; No. 4, Suppressor Grid; No. 5, Internal screen; No. 6, cathode; No. 7, control grid; No. 8, internal screen (common with pin 5); No. 9 Heater.

In applying the valve as R.F. amplifier it is customary, and often quite important, to fit a metallic screen in the form of a sheet of metal across the valve socket, and earthed directly to the internal screening pins 5 and 8. This is a precautionary measure against unwanted feedback between control grid and anode circuits and it is as well to fit the screen at the outset. Queries have been raised about the voltage applied to the screen grid of the EF50 in this receiver. Maker's data calls for anode and screen voltage of 250 volts, but it was found that the gain in the original receiver was so high because of the high-gain iron cored IFT's used, as to be advantageous in holding it back a little. Thus the screen grid feed is, in this case common with the screen grids of the R.F. and mixer stages. If the individual constructor, in resorting to "reconditioned" 1600 kc/s IFT's, finds that he needs and can use all the gain obtainable from the EF50, then it is a simple enough matter to raise the screening grid potential to maximum. Since the article was written, ample stocks of ECH35 are obtainable, so that there is no reason why the reader's version of the receiver should not equal the performance of the original.

### Learning the Code

To do a nice job of the test at 14 words per minute calls for a fair bit of practice at the morse code, and, as this will probably take you six to nine months to learn, it is probably the first thing to get started with. We take it for granted that if you are a reader of "Australasian Radio World" you won't have any difficulty about passing an examination on theory, fundamentals and so on, but you'll still need to study up the "Radio Amateur's Handbook" and also the "Handbook for the Guidance of Operators of Experimental Wireless Stations," which has been issued by the P.M.G.'s Department at 1/6, and is available from the Technical Book and Magazine Co., of 297 Swanston Street, Melbourne.

In fact, once you get this booklet you will find that it contains full details of just about all you need to know about going ahead and securing your operator's certificate and then your station licence.

However, there are some points about which you may want further information. For example, what sort of stuff do they send for the code examination?

### The Code Test

A typical example is the following text, which was used both for the sending and receiving tests at a recent examination. Here it is: "ON FEBRUARY 18th, 1900, A RADIO STATION OPENED ON THE GERMAN ISLAND OF BORKUM AND IN TEN DAYS IT COMMUNICATED WITH THE KAISER WILHELM OVER A DISTANCE OF SIXTY MILES. ON THE 11th IN 1901 THE RANGE OF COMMUNICATION WAS EXTENDED 196 MILES BE-

—"D.B.K."

---

### COILS FOR 20

#### R.F.

**Aerial L1**  
4 turns 16  
enam: at  
earth end of  
L2

**Grid L2**  
11 turns 16  
enam: spac-  
ed over 1½  
inches

---

#### Mixer

**Prim. L3**  
4 turns 30  
DSC inter-  
wound from  
earth end.

**Grid L4**  
11 turns 16  
enam: spac-  
ed over 1½  
inches.

---

#### Oscillator

**Grid L6**  
4 turns 30  
DSC close  
wound and  
spaced ¼-in.  
from earth  
end of L5.

**Grid L5**  
7 turns 16  
enam: spac-  
over 1 inch.

TWEEN NITON IN THE ISLE OF WIGHT AND THE NEW MARCONI STATION AT POLDHU."

You will notice that, although this text is straight-forward English, with a few figures thrown in, it is a rather tricky bit on account of the unusual words, such as "Niton" and "Poldhu." Just exactly how much of the code test you have to get, or just how many mistakes you can make and still pass appears to be a departmental secret, so to be on the safe side you should practice the code until you can be certain of getting it letter perfect.

### The Theory Exam.

The following is a typical question from the theory paper: "Explain fully which of the following can be determined if only the applied voltage and current flowing in the a.c. circuit are known: impedance, power factor, resistance and reactance. Indicate how you would compute the values concerned and state reasons for not being able to compute in the other cases."

Another question from the same paper: "What are the advantages to be gained in arranging antenna elements in broadcast and co-linear arrays? Give a brief description of each arrangement and discuss the possible db. gain which may be obtained with a variation in the number of elements used."

### Regulations

From the examination regarding knowledge of regulations, the following is a typical question: "You are a licensed experimenter operating under the call-sign VK4ZRB, and you are visiting another licensee whose call-sign is VK5MUG. You wish to communicate with VK4KIT from the station of VK5MUG. How would you conform to departmental requirements?"

### Application

If you feel you have the necessary knowledge and you want to get your certificate, the application should be lodged at least 21 days before the examination. Examinations are held on the second Tuesday in the months of January, April, July and October.

# About Disposal Bargains

(Continued from May issue)

The story goes that a Sydney Central cloakroom attendant got a surprise when a Ham handed over the counter half a dozen 10 feet lengths of "heavy looking 1 inch piping," but lack of weight reaction to braced muscles resulted in unnecessary lifting effort by the attendant. I expect to see certain of the keen DX men sprouting light, but effective 28 mc/s arrays in and around the Sydney area! One type of component that may be found in profusion in ex-Radar gear is the 500 cycle 180 volt primary breed of power transformer with secondaries of all kinds for L.T. and H.T. uses. There isn't much that the Ham can do with these things, but as they are available for a few pence, they are at least of use for stripping for the windings. There is very little iron in the cores, but one possible application would be for a low impedance speech line between mike pre-amplifier and modulator. It would be feasible to make use of two of the smaller transformers at each end, back to back. Ideas of using the large types for modulation transformers may be entertained, but may be forgotten . . . there isn't enough inductance to do the job in most cases. But for low impedance links, I consider that many of the 500 cycle transformers have a use around the shack. Motors are something the electrically (and mechanically) minded Ham has lots of use for around the station and workshop. Small motors come in handy for drill grinders, flexible shaft drives, "CQ machines," and geared drives for Sig squashers. Much of the ex-Radar gear I have seen for sale included small (and large) blower fans for cooling special valves, but many of the motors are of the 24 volt variety and designed for D.C. application. Others are laminated and perform well on A.C. supplies. In any case, the light loading D.C. ones can be put to use from Copper oxide or Selenium rectifiers of which quite a few have been seen around the "junk" market. Such rectifiers have a lot of use also for relays, operation of solenoid switches, etc., around the

station. I can think of lots of such uses for a D.C. power unit handing out up to 30 volts at 5 amps or so. A.C. relays, incidentally, have been conspicuous by their absence in this Disposals' picture. Did you, fellow Ham, run across any of those weird looking ex-Navy receiver assemblies with two rotary **Cylindrical** variable condensers, plus ribbed coil former and windings? And did you pass them by as of little or no use? In the IFT application for which they were designed they would not appeal to the Ham receiver constructor, but those unusual condensers were well worth a second look. They consist of an ingenious arrangement of outer and inner half-cylindrical plate connected in series-aiding and opposing manner. Capacity, as measured on my Philoscope type Bridge, is 25 Pf Minimum to 100 Pf Maximum. If one outer plate is removed, the capacity then runs from 15 to 50 Pf. Because of the design they provide a smoothly operating and silent variable with lots of obvious uses in receivers and gear of all kinds, to say nothing of small transmitters. And the insulation? Far from "moulded mud" . . . it is loaded ebonite.

Thus the story could go on, of bargains of all kinds to please the eye and pocket of the average experimenter. It is an era of surplus material that will, in years to come be but a memory, although I imagine that lots of things may keep in circulation indefinitely. In the meantime, there is a sad lack of generally wanted important components around the home constructor trade . . . H gangs . . . electrolytics, variables of the pre-war "Raymart" or "Eddystone" quality . . . these are in very short supply. And now, fellow Ham, please don't write to ask whether I know of any ex-American service communications receivers for Disposal, such as Hallicrafters SX28, Hammarlund Super-Pro, or National HRO. I don't. I am told that they are all at the bottom of the cold ocean, or else bulldozed into a tangled mass of scrap.

VK2NO.

# IS THAT YOUR BID ?

## A Tale of a Disposal Auction

**A**BOUT the time the war finished up there was about ten million pounds' worth of radio gear lying about, quite a lot of it brand new and some of it not even finished off.

The very thought of this stuff makes the radio enthusiast squirm with excitement. It is easy to understand why we have had so many letters from readers who want to know about the disposal sales. They have in mind that "they wouldn't mind going to a quid or even thirty bob for a good Yankee communication receiver."

Auction sales are conducted by the Disposals Commission every few weeks up at the old Melbourne Haymarket, so we went along to one to get the "dinkum oil" about these things. We feel sure that our tale is going to be of great interest to those who live in distant locations and can't go along to see things for themselves.

Notices of the sales are published in the daily papers and you can go along on the day before the sale and take a good look at the stuff. This is very fortunate, because otherwise you will have little idea of what you are bidding for when the sale starts, for there are quite a few other people to crowd around the stuff, so that you only get a glimpse of a sample in the distance. This is fair enough when you are bidding for a simple lot, such as "Lot H213, Approx. 850 Headphones (Reference 655, 1-7)" but it doesn't help you much when you come to "Lot H297, Approx. 65,000 washers, 20,000 rivets, 4,000 screws, 1,000 brackets, 940 chassis covers, 526 clips assembly, 4,400 nuts, 440 pins, 60 waterproof covers, etc. (Reference 762, 19, 53)."

### Prices

Incidentally, this lot, H213, brought £16/10/-. Would you say it was a bargain or not? I'll bet

you couldn't even guess, any more than I could, for I didn't get a chance to see what sort of washers they were. But there were a few things which I did see. In one or two cases I felt sure that if the Prices Commissioner knew about it he would soon have the auctioneer in gaol on a charge of black marketing! A typical case of this kind was in regard to loud-speakers. Several lots of these were put up, little midget speakers, about four-inch cones and without input transformers. They brought from 36/- to £2 each, which must have been way above their normal retail value. But you know how the speaker market is today!

Single-gang condensers brought prices which reflected the shortage of gangs in general. A lot of 121 single-gangs brought £50, which works out at about 9/- each by the time you pay the carrier to pick them up and deliver them to your home.

Doubtless there were many bargains secured, but these would be rather hard to define. Lot H166 consisted of "Approx. 317 Canvas Dust Covers, 700 mounting bases, 185 switch spindle assemblies, and 10 chassis assemblies." This lot brought £2/10/- and might be a great bargain to the right type of dealer. But it would seem a tough proposition to make a fortune out of aerial wire bought at a price of £9 for 3,000 yards.

And so it goes. To attend one of these sales is an interesting business, but it doesn't take long to knock out any ideas you may have about getting communications-type receivers for thirty bob.

Don't let it be said that I would discourage anyone from going along to these sales, but I feel sure that those who are interested in the game from a purely amateur point of view will be far better advised to wait until the dealers get the stuff sorted out. Then you can pick it over carefully and know exactly what you are getting for your money. Possibly the price will be a shade higher, but in the long run you should save money.

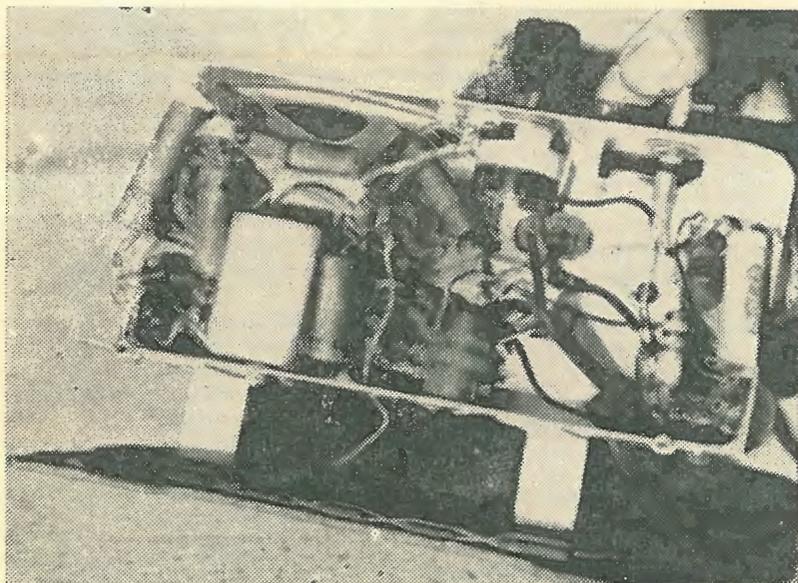
It would be so easy to get yourself loaded up with a few thousand brackets, bent at funny angles, with holes drilled in them and not the slightest hope of ever finding a useful purpose for them.

—A.G.H.

---

---

## Neither Neat Nor Tidy



Another view of the American set detailed on page 5. It will be noticed that no effort has been made to tidy up the layout or wiring.

# UNDERSTAND VALVE CURVES

HERE is nothing very difficult or mysterious about fundamental valve characteristics, their curves and interpretation.

The construction and operation of valves was considered in November, 1944, "R.W." and will not be repeated here.

## The Diode

The diode is the simplest of all valves having only one characteristic—the plate-voltage (Vp), plate-current (Ip) curve as depicted in Fig. 4. A circuit suitable for obtaining readings to draw this curve is shown in Fig. 1.

By

**CHARLES ASTON**

21 William Street, Double Bay

Of course, it is not necessary to take out curves for a valve as these are prepared by the manufacturer and published in their data books. However, understanding the curves is simplified if the construction is known.

The correct filament voltage is applied to the heater to bring the cathode to its correct emitting temperature. The high tension voltage is applied to the place of the diode through the variable resistance R, which is capable of varying the plate

READING	PLATE VOLTS	PLATE M.A.
1	10	.4
2	20	.8
3	30	2.2
4	40	3.6
5	50	4.8
6	60	5.0

FIG. 2.

voltage from maximum to zero. The voltmeter, V, is for reading the applied plate voltage and the current meter, Ma, is for measuring the current flowing through the valve.

The resistance is varied in any convenient steps, say, every 5 or 10 volts, and at each step the voltage and its respective current reading is noted. After a set of readings have been taken we should have a chart somewhat similar to Fig. 2. For convenience, a sheet of graph paper is used in the production of the curve, any reasonable scale being satisfactory—in our case half an inch for ten volts and half an inch for one milliamp, Fig. 3. The graph paper is marked to scale accordingly as shown. The first reading is then plotted; the position of 10 volts is noted on the voltage line (horizontal) and from this point a line is projected up vertically parallel to the current line. The corresponding reading on the chart for 10 volts is 0.4 ma. This is positioned on the current line and projected to the right parallel to the voltage line until it meets the line that was projected up. At the point of intersection (cutting) a dot is marked.

This process is carried out for the six readings, resulting in the plotting of six dots, Fig. 3. These dots are joined by a line forming the curve shown in Fig. 4. It should be obvious that the curve begins at 0 (zero) for when there is no plate voltage no plate current will flow.

The above may sound a tedious process, but with squared graph paper it is a fairly simple matter once the initial readings are available.

From the Vp, Ip curve it is just a matter of seconds to find what current will flow through the valve when a certain plate potential (voltage) is applied.

The flattening of the curve at the top is due to the plate attracting all the electrons as they are emitted by the cathode, so an increase in plate voltage, after this condition exists, will produce only a small increase in plate current. This is called "plate current saturation" and simply means that the plate current will not increase until more electrons are emitted by increasing the current through the heater circuit, if it will stand it, thereby increasing the temperature of the emitter with the result of a greater electron emission. Fig. 5 illustrates the saturation effect of operating the cathode at four different temperatures. Curve A is the lowest temperature, increasing to B and C, then to D, the correct operating temperature. At temperature D saturation point has not been reached, as modern valves produce ample quantities of electrons and saturation point is not approached when working within maximum ratings.

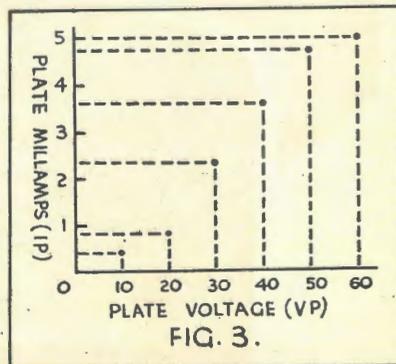


FIG. 3.

It will be noticed from the graph that an increase in plate voltage beyond saturation point produces a small increase in plate current. This is due to the positive potential on the plate dragging electrons from the emitting surface which adversely affect the emitting substance.

At first thought it would seem the cathode is emitting unnecessarily large quantities of electrons when operating below saturation point, which is the usual practice. This is not so; the first electrons emitted that do not flow to the plate form

(Continued on page 24)

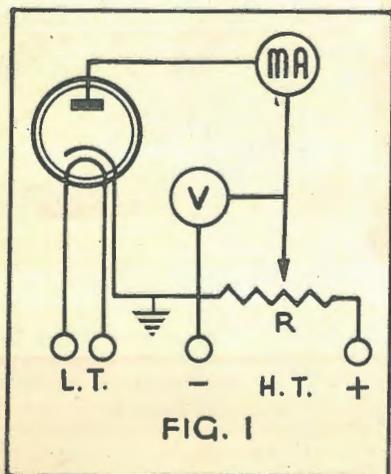


FIG. 1

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## VALVE CURVES

(Continued)

a cloud around the emitter and is known as the "space charge." When the space charge becomes more negative than the cathode, electrons flow back to the cathode; so they are more or less in a state of potential equilibrium. The plate, when at operating potential, causes electrons to flow from the space charge, reducing its potential with respect to the cathode, thus permitting extra electrons to be emitted into the space charge to make up for those lost to the plate. The space charge acts as a reservoir supplying electrons to the plate and replacing them with electrons from the cathode.

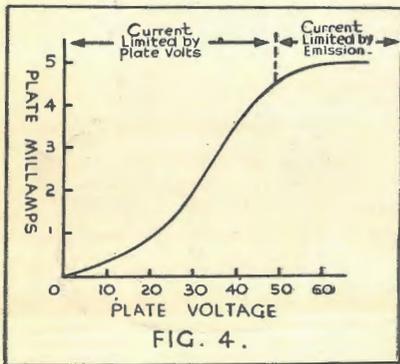


FIG. 4.

### Plate Resistance

The plate resistance of a valve is the only characteristic that may be obtained from the  $V_p, I_p$  curve, so is applicable to the diode.

Plate resistance is the ratio of the small change in plate voltage to the small change in plate current, the potential of the other electrons (if any) being kept constant.

Ohms law states that resistance is equal to the applied voltage divided by the current flow, which implies a straight characteristic. It is obvious from the examination of any valve characteristic it is curved and a "non-ohmic" conductor.

The linear (straight) portion of a valve's characteristic provides a constant ratio between  $V_p$  and  $I_p$ , which is taken advantage of in calculating the valve's plate resistance and is the only portion of the curve that can be used for such calculations.

From the given definition the formula for calculating plate resistance is:

$$R_p = \frac{V_p - V_p}{I_p - I_p}$$

where  $R_p$  is the plate resistance,  $V_p$  is the first voltage,  $V_p$  is the second voltage,  $I_p$  is the first current,  $I_p$  is the second current. This may be written as:

$$R_p = \frac{dV_p}{dI_p}$$

where  $dV_p$  is a small change of plate voltage and  $dI_p$  is the equivalent small change of plate current. We will now take two sets of readings from the linear portion of Fig. 4 and calculate the plate resistance for both cases.

The voltage increase from 20 to 30 gives a  $dV_p$  of 10 volts, which increases the current from 0.8 ma. to 2.2 ma., a  $dI_p$  of 1.4 ma.; substituting in the above formula:

$$R_p = \frac{10 \times 1,000}{1.4} \text{ ohms} \\ = 7,143 \text{ ohms}$$

A voltage increase from 35 to 40 gives a  $dV_p$  of 5 volts, which increases the current from 2.9 to 3.6 ma., a  $dI_p$  of 0.7 ma.

$$R_p = \frac{5 \times 1,000}{0.7} \text{ ohms} \\ = 7,143 \text{ ohms}$$

The reason for multiplying by 1,000 is to change the current from milliamps to amps.

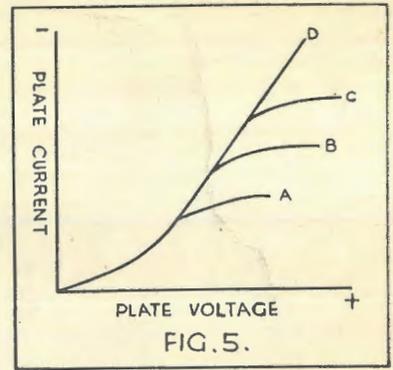


FIG. 5.

It is left to the reader to make a calculation on the non-linear portion to show a correct reading is not obtained.

### The Triode

The introducing of the grid into the valve causes several effects, but we are only concerned in its ability to control the plate current.

The control grid usually takes the form of a helix of wire concentric to the emitter and as close to it as possible, giving a greater control over the electron stream (plate current).

A relatively small negative potential, with respect to the cathode, on the grid will completely "cut-off" plate current flow. The amount of negative voltage applied to bring about this state of affairs is known as the "cut-off bias" or the valve is said to be "biased to cut-off." This grid action is purely due to an electrostatic repulsion between the

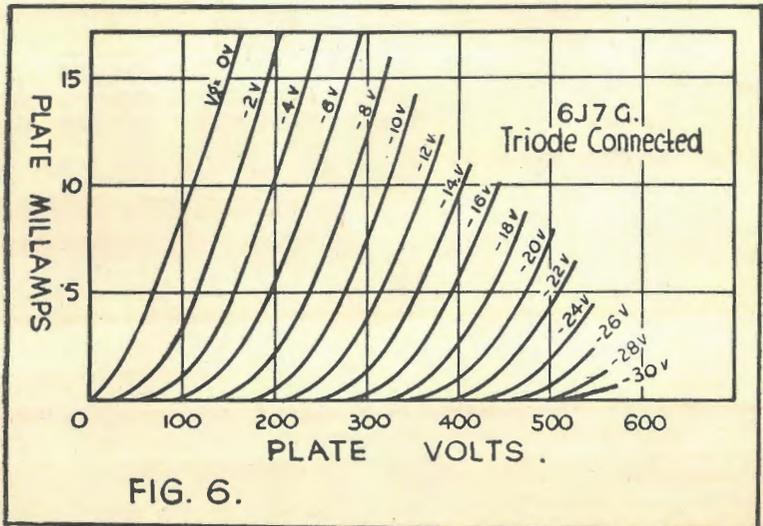


FIG. 6.

negative grid and the emitted electrons (which, as we know, are negative particles of electricity), requiring no expenditure of power by the grid circuit.

The triode or three element valve consists of an emitter and plate as the diode but with the addition of a grid between them. The effect of the grid on the characteristics of the valve are very considerable, indeed producing three in all, which are no harder to understand than the  $V_p, I_p$  characteristic of the diode.

These characteristics are referred to the static or average characteristics as either the plate voltage, plate current or grid voltage is held constant in the production of the characteristic curve.

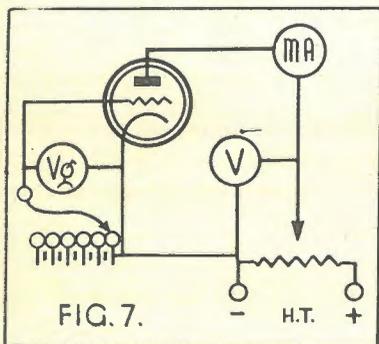


FIG. 7. Plate Resistance

Fig. 6 shows a series or family of curves for a 6J7G connected as a triode. As can be seen they are  $V_p, I_p$  curves for a different fixed value of grid voltage, starting at 0 grid volts and decreased in steps of two volts to minus 30 volts. Fig. 7 shows a suitable circuit for obtaining plotting points for the curves.

Meters are used to measure the applied voltage and current flow of the plate circuit, as with the diode. Now we have the grid to consider where a battery is connected, so that the negative terminal is connected to the grid and the positive to the cathode, so it is impossible for the grid to become positive with respect to the cathode which is invariably true for valves operating in receivers. To obtain suitable grid potentials, a thirty-volt battery is required tapped, at every two volts in this case. The meter,  $V_g$ , is to check the negative voltage applied to the grid.

As said before, there will be no grid current; the reason for this is simple—another electrode in the

valve has to be positive to the cathode before there can be a current flow, but, as we know, the control grid is always kept negative and its control is purely electrostatic.

For the first reading the grid was connected directly to the cathode; naturally it will be at the same potential to the cathode, which is another way of saying, zero grid bias. The grid is held at this zero potential and the plate voltage is increased in steps, note being taken of the plate voltage and current each time, and when sufficient readings have been taken they are plotted on the graph paper and a curve similar to the one marked " $V_g = 0v$ " resulted. This method is exactly the same as with the simple diode.

#### Second Curve

To obtain the next curve the grid is connected to the first tapping on the battery, which then makes the grid minus 2 volts with respect to the cathode. This negative voltage exerts a sufficient repelling action on the emitted electrons that a higher plate voltage has to be applied to obtain the same current reading as with 0 grid volts. By examining the two curves it can be seen that at 0  $V_g$ , 70 volts applied to the plate will produce a plate current flow of 5 ma. and yet, when the grid has 2 volts negative bias, 115 volts has to be applied to the plate to obtain a plate current flow of 5 ma.

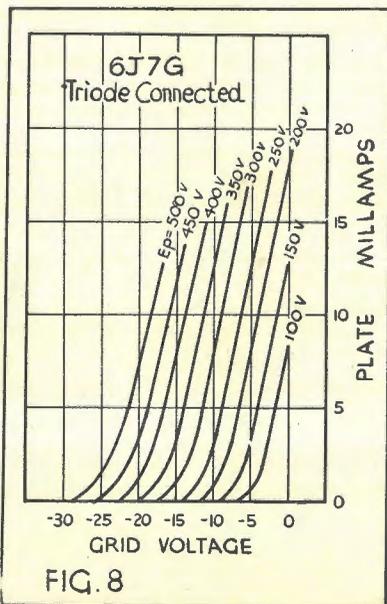


FIG. 8

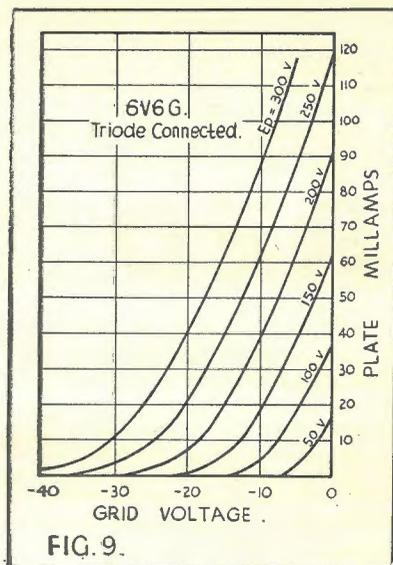


FIG. 9.

When the grid is biased to minus 12 volts, a plate voltage of 190 is required before the valve will begin to pass current. While, for a grid bias of minus 30 volts, a plate voltage of about 490 volts has to be applied before the valve is conductive. It can now be seen that a relatively small negative grid voltage is sufficient to cause the valve to become non-conductive when high positive plate potentials are applied without any expenditure of energy in the grid circuit, which is one of the most useful properties of the radio valve.

All the curves shown in Fig. 6 are obtained in the same manner—the grid voltage is set and held at the same potential and the plate potential varied in steps, this potential (voltage) being noted with the current flow through the valve caused by it for each individual curve.

The method of calculating the plate resistance of a triode is exactly the same as with a diode, but in Fig. 6 we have several curves to choose from; only one is used at a time for the calculation, but the same formula and method as the diode is used.

#### Mutual Conductance, gm

The second characteristic of the triode valve that we will consider is "mutual conductance," called "gm." This may be defined as the ratio of a small change in plate cur-

(Continued on page 27)

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## VALVE CURVES

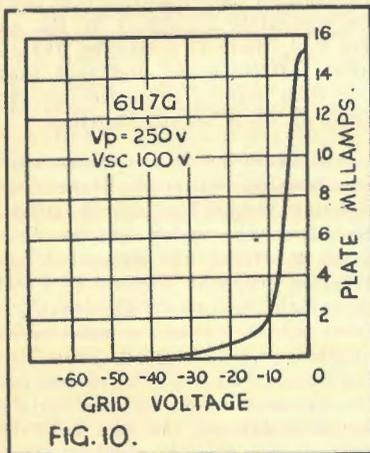
(Continued)

rent to the small change in grid voltage causing it, the plate voltage being kept constant. This simply shows the degree of control of the grid voltage over the plate current, while the plate voltage is kept constant and is expressed by the formula:

$$gm = \frac{dI_p}{dV_g}$$

$V_p$  is held constant, where  $dI_p$  is the small change in plate current and  $dV_g$  is the small change in grid voltage causing it, the plate voltage  $V_p$  held constant.

Mutual conductance may be expressed in milliamps per volt, meaning milliamps change in plate current to the grid volts change causing it. The mho is the unit of conductance and is the reciprocal of the ohm and is one amp per volt, which is much too large for our purpose, but the micromho, a microamp—



(millionth of an amp)—per volt, is very suitable; there are 1,000 micromhos in 1 ma. per-volt, and 1,000 ma.-per-volt in an 1 amp per volt, so it is an easy matter to convert one to the other.

Mutual conductance can be calculated from the family of curves shown in Fig. 6, as will now be explained, but to calculate it from the  $V_p$ ,  $I_p$  curves it is necessary that at least two suitable curves are shown.

The two curves marked  $-2v$  and  $-4v$  will be used, which gives us a grid voltage change of 2 volts. At 175 plate volts there is a current flow of 7 ma. when the grid voltage is  $-4$  and at  $-2$  volts on the grid the

plate current is 12 ma. Thus when the plate voltage is held at 175 a grid voltage alteration of 2 volts will cause a change in plate current of 5 ma. (12 ma. - 7 ma. = 5 ma.), substituting in the formula:

$$gm = \frac{5}{2} = 2.5 \text{ milliamps per volt}$$

The mutual conductance is 2.5 milliamps per volt, which may be expressed as 2,500 micromhos (multiply by 1,000) or 0.0025 mhos (divide by 1,000).

### Mutual Curves

A more satisfactory way to calculate mutual conductance, or transconductance, as it is sometimes called, is from the  $V_g$ ,  $I_p$  curves shown in Fig. 8. The curves may be obtained with the aid of the circuit shown in Fig. 7, but this time the plate voltage is set and held constant for each curve, 100, 150, 200 volts, etc., and the grid voltage is varied in steps and note is taken of the plate current flow and the grid voltage causing it. These readings are plotted against their respective scales and curves accordingly produced. The mutual conductance curves for a triode connected Radiotron 6J7G are shown in Fig. 8; the same formula applies but with these curves only one is required to calculate the mutual conductance.

An examination of the curve marked 200v (plate voltage) shows that at  $-2$  grid volts the plate current flow is 15 ma.; at  $-4$  volts, still on the same curve the plate current is 10 ma. Once again we have a grid change of 2 volts, producing a plate current change of 5 ma, so the mutual conductance will be 2,500 micromhos per volt as before.

A little thought will show that the steeper the slope of the curve the larger will be the mutual conductance, so it is often referred to as "the slope of the valve." By comparing Figs. 8 and 9 it can be seen that the slope (mutual conductance) of the 6J7G, triode connected, is greater than the 6V6G triode connected, while the 6U7G, pentode connected, for the greater portion of its curve has a greater slope, Fig. 10, than either of the other two.

In Fig. 10 the 6U7G is operated with a plate voltage of 250 and the screen grid at 100 volts. It can be seen that the control-grid voltage has to be reduced to about  $-55$

volts before cut-off plate current; yet in Fig. 8 for the same plate voltage a grid bias of  $-15$  volts produces cut-off. The 6U7G is known as a "remote cut-off" valve and the 6J7G as sharp cut-off.

### Amplification Factor, $\mu$

The third and last characteristic of a triode to concern us is Amplification Factor, sometimes called  $\mu$ . This may be defined as the ratio of a small change in plate voltage to the small change in grid voltage required to produce similar changes in plate current and is expressed by the formula:

$$\mu = \frac{dV_p}{dV_g} \text{ for a given } dI_a$$

It is more usual to assume that the anode current,  $I_p$ , is held constant and the ratio of plate voltage changes to grid voltage change while the anode current is held constant for the amplification and is expressed as:

$$\mu = \frac{dV_p}{dV_g}, I_p \text{ constant.}$$

Actually both formulae are the same, but the latter more correctly states the ratio.

The ratio really shows how much more effective a variation in grid voltage is over the plate current than a variation in plate voltage.

Applying the second formula to Fig 8, at a constant plate current of 10 ma. a variation in grid voltage from  $-4$  to  $-6.5$  volts (a change of 2.5 volts) requires an equivalent change of from 200 to 250 volts of plate potential (a change of 50 volts), substituting in the formula:

$$\mu = \frac{50}{2.5} = 20, I_p \text{ held at } 10 \text{ ma.}$$

It is just as convenient to calculate amplification factor from Fig. 6. Once again the plate current of 10 ma. is used and a change of  $-4$  to  $-6$  grid volts is used (change of 2 volts), requiring an equivalent plate voltage change from 200 to 240 (change of 40 volts), substituting in the formula:

$$\mu = \frac{40}{2} = 20, I_p \text{ held at } 10 \text{ ma.}$$

It can be seen that a similar answer is obtained. As the answer is a factor it is expressed as a pure number.



# EXPERIENCES WITH NOISE SUPPRESSION

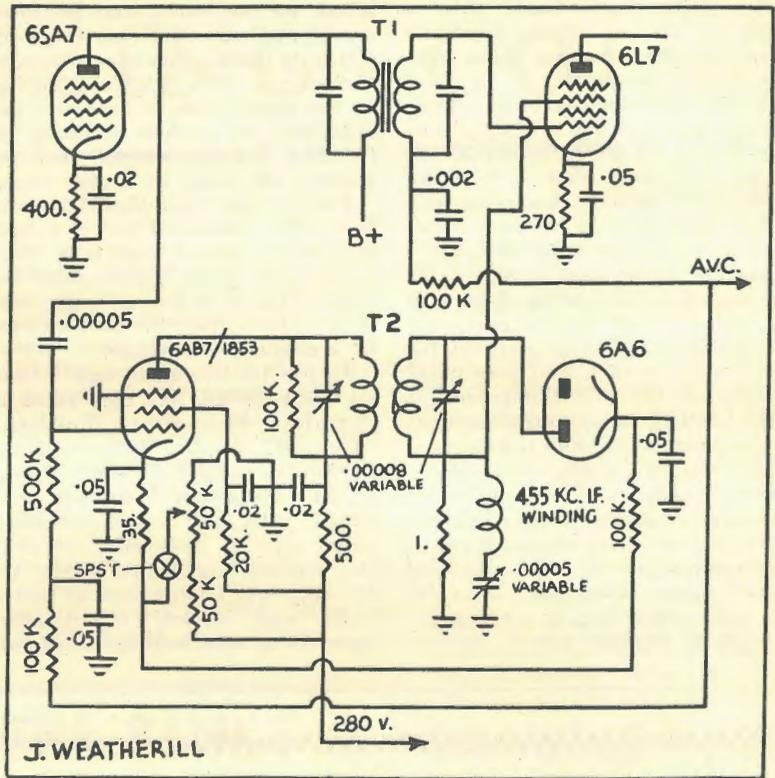
READ with interest Mr. Dufaur's article in the December issue of "Radio World" on the theory and construction of the "Lamb" Noise Suppressor. I was struck with the similarity of the

By  
**J. WEATHERILL**  
 141 George Street  
 Launceston  
 Tasmania

circuit to one used in a high-class American communications receiver which I annexed (the portion of the circuit, I mean—not the set) for future reference.

It has the advantage for the home builder that no centre-tapped I.F. transformer or high inductance RF choke is needed. As I have not got the complete details of the receiver, I cannot quote figures, etc., with regard to performance, but as I remember, it was claimed to be pretty good. Australian equivalents could quite easily be substituted for the American-type valves.

The action of the suppressor is somewhat similar to that described by Mr. Dufaur. The signal is picked off the mixer plate circuit and fed to a 6AB7/1853 noise amplifier. The amplified signal is then fed to the 6H6 noise rectifier via a broadly tuned, closely coupled I.F. transformer. An old compression trimmer tuned I.F. would probably work quite well. The series resonant filter in the detector circuit consists of one winding of an old I.F. transformer with a mica trimmer in series. This serves to filter out the 455 K.C. I.F. and, at the



same, pass on the "noise sidebands" to the 6L7 grid. An ON-OFF switch and bias control give manual control of operation.

To line up the suppressor:—

(1) Switch on AVC, connect output meter across diode load and a 50K resistor across the primary of T2. Set signal generator to 455KC and feed into 6AB7/1853. Set suppressor gain control to maximum and adjust T2 for maximum output.

(2) Remove 50K resistor and grid connection to 6L7. Set suppressor gain control to maximum and adjust series resonant filter trimmer for minimum reading. Connect 6L7 grid, and circuit should now work.

This circuit may be of interest to "Hams" or DX listening enthusiasts, provided you think it can be printed without incurring the wrath of the manufacturers (I think it was a Hammerlund).

## ORGAN

(Continued)

do. The special reverberation chamber spoken of does not make organ tone, it merely produces the illusion of the reverberation effect of a large building.

The "Everett Orgatron," another electronic organ, though perhaps not so well known as the Hammond, is the one which deserves a great deal more credit and publicity claimed by Mr. Mutton on

behalf of the Hammond, if only because it is played and sounds infinitely more like a real pipe organ than the latter instrument, particularly does this apply to its actual tones as imitative of organ tones, and the organ-like attack and decay of the notes produced. Moreover it has the pipe organ's advantage of being able to add stop after stop, which are then played simultaneously up to "full organ," thus giving real tonal build up, and chor-

us effect, and on top of this it still has the Hammond's dynamic amplification range.

An old saying states that the proof of the pudding is the eating; well I have made a practice of visiting six churches in surrounding suburbs regularly during the last couple of years. Two of these have pipe organs, two have Everett Orgatron installations, and two have Hammond installations, one of these

(Continued on next page)

## ORGAN

(Continued)

latter being camouflaged with a grille of dummy pipes, which no more resemble the real thing than the sounds produced.

Taking the pipe organs as a basis for comparison, the two Orgatrons are played so as to resemble the pipes so closely that I have no doubt even the most discerning pipe organ enthusiast, if he were blind-folded, would not know the difference; the little peculiarities which are sometimes noticed in pipes, such as hesitation of speech even, are noticeable on the orgatron. On the other hand, even a deaf man could distinguish the two Hammonds, if only by their shrill and discordant upper partials, and dull thuddy (one might almost say explosive) base.

Incidentally, a friend of mine recently returned from overseas, tells me that of the several types of electronic organ in use in England the "Compton Electrone" is by far the most organ-like in every way.

I am no organist myself, but can

play one well enough for my own amusement, yet, notwithstanding a complete knowledge of the Hammond, its theoretical and practical considerations, and the methods by which its tones are synthesised, even throwing a little wishful thinking in for good value, I have not yet been able to produce anything on it which I could honestly say resembled the music of a pipe organ.

I would say that the Hammond is a truly wonderful and beautiful musical instrument, especially when played with small instrumental ensemble, but it is not an organ and is unsuitable for the performance of straight organ music.

Lest it be considered that I have an axe to grind, like the "guild of American Pipe Organ Builders," whose attitude, Mr. Mutton tells us, borders on lunacy, I want to make it quite clear that I am not associated with any organ interests, either pipe or electronic, not even the organisation named above. On the contrary, I have been an active radio and electric experimenter since 1912, and held radio experi-

## 8-VALVE CIRCUIT

It is regretted that the 8-valve circuit scheduled for this issue has been held over until next issue.

mental licence 2VI in the early twenties, and of recent years have devoted the whole of my spare time to the question of electronic music development.

Like Mr. Mutton, I am most enthusiastic about the future of this class of organ as a general type, but I feel that to make extravagant claims for one type (Hammond) and shut the eyes to its disadvantages will react to the detriment of the electronic organs generally, which all the wishful thinking and enthusiasm will find hard to overcome.

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## CALLING CQ!

By Don Knock, VK2NO

### THE "RENEGADES."

Shortly after hostilities ended in the Pacific, amateur observers of our pre-war DX bands were quick to note activity by service-equipped stations, operating in the "20" metre band. "A.R.W." observer Finlay A. Buchester, of Brisbane, Queensland, comments: "I have been interested in the 'Hams' and have been hearing the 'Renegades' on 20 metres since before Xmas, when W.T.A. told them to 'pull their heads in.' However, they are still there (9/3/46)."

List of "Ham" stations heard,

as submitted by our observer, includes a number of Chilians, Costa Ricans, Argentinians, etc., and, although the "Fixed Portable W's" in contact with these South Americans were operating "piratically," it must be emphasised that the Argentinians, etc., were using the band with official sanction. Most of the South American countries have restored pre-war facilities to their amateurs, so that operation in the "80," "40," "20" and "10" metre bands is in order. A sequel to the "renegade" activity on "20" is shown in a statement by "Radio News" (U.S.A.), which claims that F.C.C. logged every station in the

Pacific and European areas using W amateur calls, and that action is being taken against them. A battle royal may result from this, as it is known that individual officers commanding Signals Units in many locations permitted amateur G.I. personnel to operate thus in order to counteract restiveness and boredom. After all, reasons given for retention of amateur bands the world over are "military necessity." If, then, those who "own" the bands—the military authorities concerned—chose to permit "Ham" operation therein, it appears to be no business of F.C.C.'s or any other civil authority. What the "Ham" does in those bands when they are again controlled by the normal regulating authorities is a different matter. Reference to WTA, the station in Manila, P.I., which repeatedly warned off the "synthetic W's" on "20," reminds us—unless we possess a poor memory—the station gave up the unequal battle and finally joined in the amateur picture with the "rest of the gang." We are definitely on the side of law and order, but our reaction to this position is that we support the Sig. officers concerned—those who permitted the "illegal" operation by their "Ham" personnel. As officers—they will accept the responsibility—and as "Hams" themselves, they will no doubt have good reasons to air. There couldn't have been overwhelming "military necessity" or the renegade operation wouldn't have occurred. Where Australian Service needs were concerned, our own observations months ago confirmed that stations in the 7 and 14 mC/s ranges were virtually "marking time" (and space). It is high time the pre-war amateur bands were restored everywhere—now that freedom (?) has been attained.

### SWELLING THE RANKS

"Demobbed R.A.F. Technical Signals officer, now licensed in — district, wishes to meet keen practical amateur willing to assist him in his amateur radio hobby." So runs an advertisement in the "R.S.G.B. Bulletin," England. Motive behind that form of appeal may well apply everywhere, with amateur radio in a transition period—that of completion of re-issuing licences to pre-war holders, and the formidable business of attending to the newcomers. There are hundreds of thousands of men (and women) who served in the Signals Branches of the Services to whom the practical nature of radio as typified in the amateur sphere is an unknown quantity. These people were introduced to radio in its administrative and purely signals communications forms and in such category became highly proficient as operators, most of them lacking nothing in handling a key (or mike). They would, however, in many cases be out of depth in facing up to an A.O.C.P. exam. because of insufficient practical—and possibly, theoretical, knowledge.

Many a potential amateur is lost

to the fraternity from the start, because so many with the urge to break into amateur radio find difficulty in making direct contact with kindred souls. Attendance at a meeting of amateurs may prove disappointing—where a hundred or so are present—the new face may go unheralded, especially if most of the evening is absorbed by business discussion and a lecture. A kindly word of welcome from the old hands does much to instal enthusiasm, but too often the fledgling gets a cold shoulder, unintentional though it may be. There is usually more of the personal touch in evidence at the suburban radio club. The atmosphere of most clubs is one of predominance for the practicalities of amateur radio, with politics in the background. The new amateur is likely to find in such an atmosphere some practical soul willing to assist him in his hobby, rather than an "ear-bashing" exhibition of political intrigues. The helping hand is the best way to swell amateur ranks in this or any other country.

—D.B.K.

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# Experimental Radio Association of N.S.W.

## "UP AND COMING" CLUB LAUNCHED

### HAM NOTES

(Continued)

Whichever way you care to look at it, there was a definite measure of aloofness between Signals and Radar men in all fighting Services. I heard tangible proof of this when listening recently to a phone QSO on "Ten" between two Sydney men. They were both ex-R.A.A.F., and were comparing notes. One was one branch of that Service and one t'other. Said one to t'other, "Radar, huh?—Oh well, of course, that wasn't really radio—not Signals!" At the risk of starting something, I leave the subject with an open mind.

As I write this, word comes from Elgar Treharne, VK3AFQ, of a test on "Six" between VK3 and New Zealand, scheduled for the week ending May 4-5. If any DX breaks it will be one way, because the ZL's don't "own" our 50-54 mC/s band—they can only listen and reply on "Ten" (or the old 56 mC/s band). Ionosphere predictions are such that unusual things may happen at V-H-F's, any tick of the clock.

Says Arthur Milne (G2MI) in R.S.A.B. Bulletin: "People who live in glass houses—Do you grouse

**M**OST old hands in the world of amateur radio will recall that, particularly in N.S.W., Radio Clubs flourished with much enthusiasm in metropolitan suburban areas, in the years prior to September, 1939. Those clubs were the places where amateurs met together in more of a spirit of intimacy than might have been the case otherwise. One recalls pleasant "annual reunions" at the old "Waverley," "Leichhardt," and "Lakemba" Clubs, and faces—and call signs arise and fade into the mists of memory. Memories and activities are in the process of an intense revival in the case of the lastnamed club.

With the coming of war in 1939, the "Lakemba Radio Club, N.S.W.," closed its doors along with the rest, and went into recess until the Big Argument be settled. The successor to "Lakemba" has now appeared and already surpasses its predecessor in membership and enthusiasm. Now known as the "Experimental Radio Association of N.S.W."—a title in keeping with progress, meetings are held on alternate Thursdays at 8 p.m. at Melody Hall, George Street, Burwood, an easy train jaunt from Sydney city. Visitors and intending members are welcomed and may be assured of a spontaneously warm reception in an atmosphere where the true spirit of Amateur radio reigns to the exclusion of politics—and mutual "back-slapping." Secretary is T. R. (Reg) Anthony (VK2AEC), and President J. C. Warren (VK2QX).

"A.R.W." congratulates the prime-movers in the formation and activity of this association, progress of which will be watched with interest. If laudatory remarks heard on the air from "Hams" who have attended meetings are a sample, the "Experimental Radio Association of N.S.W." is destined for widespread and deserving popularity.

about car QRM? Have you got a car yourself? Is it 'suppressed'?"  
I thought so.

A veteran "Ham" comes to light in a letter to hand from Dick Rees—ex-A2RE of 1927 vintage. Dick,

in pre-war days a theatre sound technician, is also a "Ham" at heart, and a first-rate key-puncher. The war took him to sea, and the Nazis took him from there to "Marlag und Milag Nord," where Dick waited five weary years for the final showdown. The "Ham" spirit came up in the P.O.W. surroundings, for the "K.G.F. Radio Club" was formed therein, with ex-A2RE as secretary. Discussions and lectures on amateur radio matters helped to keep impatience and boredom in check. Back in Australia, radio claimed his continued interest, and he now functions as technician on the staff of 2AY, Albury. Yes—he has a VK "Ham" call, an appropriate one, VK2APW ("a prisoner of war"), and will be heard on what we have to offer in the way of bands, when sufficient gear can be assembled to launch a Class A signal on the air.

## ANOTHER NOISE SUPPRESSOR

Perhaps the worst obstacle to quiet and satisfying reception at frequencies above the 12 MC/s region is that of electrical QRM from car ignition and similar systems. Many a DX QSO has been wrecked as a taxi cruises up a roadway and halts nearby with motor idling. Or if the luckless Ham lives on a main highway where vehicles "step on the gas," his XYL is likely to start proceedings for separation if he persists in trying to receive through the infernal din. There is nothing new about noise silencers and limiters—they have been in vogue since Jim Lamb of "QST" introduced his silencer "way back." Most of them involve receiver alterations—some quite comprehensive in nature, but

others are simple additions involving audio peak suppression and can be applied externally. The latter types, unfortunately, invariably cut down audio gain, and may introduce some speech distortion. Others accentuate the lower audio frequencies and make C.W. reception a difficult matter.

Something of a different nature has been evolved by one enthusiastic 28 mC/s man in Sydney and passed on to others for application likewise. Results are claimed to be ideal and addition to a receiver is reasonably simple. Only a 6H6 double diode, plus a 500 K Pot. and a few resistors are needed. We intend to try it in the "VK2NO V6" receiver, and if satisfactory, give full details to readers of "A.R.W."

As this is written (6/5/46), no report is to hand as a result of the 50 mC/s test of 4-5 May between VK and ZL. In Sydney, active stations were VK's 2WJ, 2NO,

(Continued on next page)

## HAM NOTES

(Continued)

2AZ, 2NP, with 2LZ in the mountains region. More tests will be forthcoming, and it is now planned to keep VK2NO on the air each week-end between 1100 and 1500 hours E.A.T. with automatic C.W. There will be listening intervals, and it is hoped that with optimum frequencies soaring according to ionosphere predictions, signals should be recorded at unusual distances—if there are stations listening!

On the morning of 4/5/46, the Perth (W.A.) aircraft beacon around 34 mC/s was equal in received strength to the Sydney (local) airport beacon. Such conditions are a guidepost to what might happen up to 54 mC/s.

\* \* \*

A peculiar form of interference appeared on "Ten" during the mornings of May 4th and 5th, between 28.1 and 28.2 mC/s. Source of interference was evidently an aircraft beacon signing "IH," but no definable carrier could be made out. A mushy ICW tone around 1000 cycles spread over the dial, and with receiver BFO in use, a hissing form of radiation reminiscent of spark was all that could be heard. QRM was widespread as W's could be heard in complaint thereof.

\* \* \*

A colleague of mine, an experienced amateur, whilst shopping for parts at a Sydney wholesaler's, noticed a schoolboy enquiring for a virtually unobtainable 12-volt valve of American type. Interested in

## "PITCHFORK" ARRAY IS EFFECTIVE

Listening to the ten-metre gang around Sydney reveals that most experimentation (remember that we are "experimenters" and not merely "amateurs") is in the inevitable direction of getting the most from antennae systems. Everything comes in for an airing, from humble dipoles to long wires, thence to rotary beam arrays, pretentious and otherwise. A nice example of what can be done with the latter category is afforded by Alf Barnes, of VK2CE, who, in his location, is, as so many of us are, limited by space considerations. Alf decided that (even if he **did** work an FA8 in Algiers on it) his horizontal "two half waves in phase" was a poor show so far as preferred directions were concerned, and the direction whereby lies most DX is, unfortunately for 2CE, smack behind the immediate bulk of a headland towering above his station. Something with a "beam" about it was indicated, and all that could be used as accessories to the fact were small garden space, plus a neat 40

foot "stick." The latter sports a yard-arm, and thence came the idea. The simplest of W8JK's arrays in the form of the one section close-spaced arrangement was made up as a vertical "pitchfork," hanging from a bridle on the arm. This simple array is fed at the bottom by tuned feeders and can be easily swung to the wanted direction. Being bi-directional, it has merits that are obvious, although the "radiator-reflector" boys won't agree. Sufficient to say that 2CE's "pitchfork" pops signals into places and keeps 'em from where not wanted. Directivity is very marked, signal at VK2NO varying from R9 to R5 as the arrangement is rotated. For those who are interested, the "pitchfork" is simply two vertical half-wave elements spaced an eighth wave apart, and bent inward at the bottom to form either a stub or the usual tuned line. There is no reason why co-ax or twisted pair cannot be applied at the end of a quarter-wave stub as usual.

why the youngster wanted such an unusual type, conversation revealed that the lad, with no previous experience of fundamentals or construction, was trying to get the parts together to build up a set described in a many-years-old American magazine. The thing (the proposed set) was an AC/DC mon-

strosity with obvious lethal possibilities. Explanation of things persuaded the lad that his quest was better forgotten—and he went happily on his way with an April copy of "A.R.W.," wherein is more appropriate practical reading material for young and old. There is hidden menace in copies of some of those old overseas magazines, especially where alleged transmitters of bread-board type were eulogised.

\* \* \*

## PIRACY IN EUROPEAN MEDLEY

March issue of "RSGB Bulletin" lets off steam in G2MP's columns about rampant piracy on 7 mC/s. The situation appears to be out of hand, with the band a mass of telephony stations jostling each other, particularly on Sundays. Many are obviously Continentals, but English voices of the others indicate that origin is in the British Isles. As it is possible to buy some types of ex-R.A.F. telephony transmitters complete for £10, it is perhaps not surprising that this form of illicit operation has arisen. The position

is aggravated by the inexplicable withholding of "40" (and other bands) from amateurs by the Service rajahs. The pirate transmissions are causing severe interference to the S.W. broadcasters, a state of affairs in which the R.S.G.B. can truthfully say: "Told you so." Remedy is easy—move the B.C. people off the amateur channels—and restore those channels to rightful ownership. It's no small claim to say that amateurs virtually fought for those bands—among other things.

Heard two of the "Beam Boys" discussing the acquisition of Dural tubing in an industrial suburb of Sydney. Number One had located the supply, and the price (with no previous demand) was ridiculously low. He had let a friend or two in on the know, with result that certain Hams had swooped on the tubing and departed in great glee with maturing plans for rotaries on "Ten." Poor Number Two—he got there late—found the eyes picked out of things—and what indifferent scraps of tubing remained were

## SHODDY RADIO COMPONENTS

priced about six times higher per foot. Moral: when you hear of such bargains, act quickly.

An interesting article on "Six-Metre DX" in a current American magazine states that the M.U.F. (Maximum usable frequency) seems likely to reach 53 mC/s for communication between America and Australia this year. Such occasions will be infrequent and the answer to such QSO's in the 50-54 mC/s region is **population of the band**. That will be no problem for U.S.A., but here in VK the stalwarts are few but enthusiastic.

What is the matter with Sydney power transformer (constructor type) manufacturers these days? I know the materials position is acute but that doesn't excuse shoddy design. The well-made pre-war horizontal or vertical mounting type with tabbed terminal strip just doesn't exist, or if it does it is kept in the background. Only transformers one can buy around Sydney just now are indifferently-made vertical types with trailing rubber leads and a limited wattage rating. The picture is quite different in Melbourne, I know, where long-established power and audio trans-

former manufacturers seem justifiably jealous of their good name. Their goods are good. Sydney will have to get out of the post-war stagnation rut. Too many people are sacrificing high-quality practice of wartime tropicalisation demands to the god of price. Pre-war it was the fashion to condemn some Japanese goods as shoddy, but in radio I have seen Nip components that put items at present offered by some of our "inflated back-yarders" to shame. Even the Nips would have hesitated to use some of the rubbish one encounters.

—D.B.K.

### "SIX METRE DOINGS"

News of activity on 50-54 mC/s is confined so far to Melbourne and Sydney, but, no doubt, Queensland, S.A., W.A. and Tasmania are not completely dormant. If there is no news from those locations, there is nothing for comment, so that it's up to the prime movers in V.H.F.

there to let your scribe know what is doing.

From Elgar Treharne (VK3AFQ) comes word of activity on "Six" in and around Melbourne. Those using the band are VK's 3MJ, 3JD, 3GG, 3NB, 3NW and 3AFQ. All these stations are crystal-controlled.

Three stations (unquoted) were due to make a start in Geelong at Easter and VK3NW took a receiver to Mt. Dandenong and had no difficulty in hearing strong signals from the city stations.

In Sydney activity is on the increase and a group of stations now holds nightly conference and discourses at length upon technicalities. Included in this group is Con Bischoff (VK2LZ), who, although 60 miles distant at Wentworth Falls, has such a strong signal as to be "local." The active stations are VK's 2WJ, 2NP, 2ABZ, 2LS, 2AZ, 2NO, 2LZ, 2AFO, 2CP and others have been heard making preliminary tests. Also, there are a few non-transmitting listeners interested in what goes on below "Ten." Observations from these people have been of value. As usual in the process of "digging in," main experimental trend is in the direction of radiating systems.

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#### FLASH!

**British Amateurs on 160 Metres**

March issue of "R.S.G.B. Bulletin," official journal of the Radio Society of Great Britain, contains good news for G's. Not only do G's now have restored to them the whole of the ten-metre band, i.e., 28,000 to 30,000 kC/s, but they are also permitted to use 1800-2000 kC/s. Input power is limited to 10 watts on the latter band.

British licences are now defined as **Amateur**, not experimental licences, and the G's use the universal "CQ" call instead of the pre-war "T-E-S-T."

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## 2 MC. I.F.

(Continued)

the R.F. stages of the receiver overload before the audio system distorts.

The usefulness of the receiver is limited by the strongest signal in the received band. That is, there appears to be a critical maximum amount of signal voltage that may be applied to the control grid of the 6SA7; when this happens a heterodyning squeal appears in the background on all signals. This disappears when the input signal is reduced below the critical value. Increasing the I.F. or audio gain makes possible a wider range of signal strengths, but this does not appear to be justified since the receiver is only designed for local station reception. So much for the designer's comments.

The writer's own comments merely point out a few unusual points in the circuit. Firstly, the decoupling of the I.F. channel plate circuits and the small value of decoupling condensers employed, i.e., 500 mmf; secondly, the low value of

diode load condenser, namely, 25 mmf; and, finally, a point which often crops up in American receiver circuits and that is the use of odd values of resistors such as 47,000, 470,000 and 220,000. Personally, the writer can see no logical reason for such odd values.

### Actual Results

The writer's own experience with this receiver proved that it has very definite possibilities. At present the receiver consists of a 6J8G, 6U7, 6B6, 6V6 combination, the special oscillator coil consists of a 455 iron-core oscillator pulled down so that it covers a range of 2.55 to 3.5 mC, it is tuned by a small A.W.A. 100 mmf variable condenser scarcely more than one inch long and three-quarters of an inch wide. This covers the broadcast band quite easily.

With a view to featuring a receiver of this type as a constructional article, and altered somewhat to make it easy for the home constructor and using Australian-made and easily obtainable tubes, design work is in progress at the

moment. The receiver is working reasonably well but still has a couple of bugs in the I.F. transformer design; therefore, the writer is hesitant to present it as a final design for the home constructor until these troubles are overcome. Getting I.F. gain at 2 mC is a totally different proposition to obtaining gain at 455 kC.

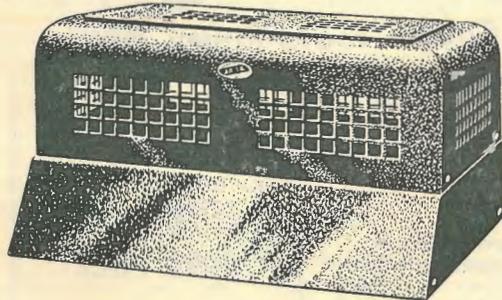
Another point comes up also: a two megacycle I.F. channel may be all right in U.S.A., but it presents problems out here. Enquiries through the P.M.G. Department reveal that the only channel free, near 2 mC, is actually 1,900 kC. So it would appear desirable to use 1,900 kC I.F. transformers in order to avoid signals coming through at the I.F. channel.

Instead of the low-pass filter which would prove to be expensive and hard to get made, a standard B.C. iron-cored aerial coil secondary has been utilised, connected straight into the 6J8 grid. The aerial is capacity-coupled through a standard mica trimmer condenser into the signal grid.

(Continued on page 42)

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## HAM NOTES

(Continued)

Just now the present "top" band sounds like "40" around Sydney in pre-September '39 days. QRM is on the increase as new (and old) call-signs appear on the scene but what of that? QRM from the other fellow is all part of amateur radio, and your own Sig. is likely to smear somebody else's QSO some time or other. Apart from the locals now inhabiting "Ten," most mornings between 0800 and 1200 hrs. the band is a mass of W's (in U.S.A. and elsewhere) clamouring for DX and traffic. Add to that the newly-arrived-on-the-28 mC/s-ZL's, and we have a busy picture of Ham activity. DX is the lure on "Ten" for as yet it's the **only** band with DX characteristics (as this is written, 16/4/46) and DX will **always** be a

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### AUTOMOBILE RADIO-TELEPHONE

A new type of car radio was recently tested in America. This equipment utilises a selector dial mechanism fitted to the dashboard, by means of which it is possible to call up anyone in the town or district who is on the system. In the experiments the driver of a saloon held a conversation with the driver of a goods waggon, and both drivers were able to chat with each other and with a central station whilst cruising through the streets of Manhattan. The chief engineer of the Corporation demonstrating the device stated that it will be several years before such 'phones are generally available.

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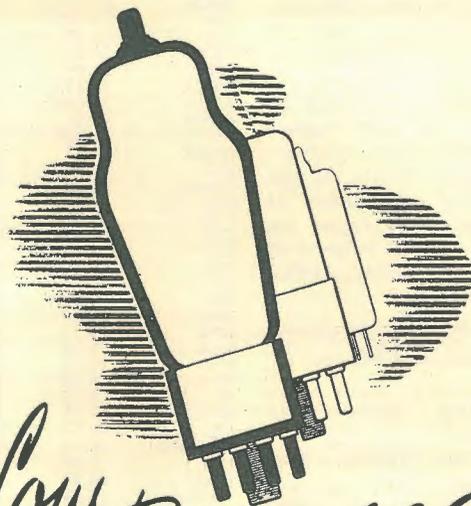
magnetic attraction for Hams. That goes for SWL's also. In comparison with "Ten" around Sydney, "Six," except for a few stalwarts, is comparatively unoccupied. That is a picture which we predict will be a different one inside twelve months if the trans-Pacific ionosphere predictions run to form; but more about that anon!

"Ten" is revealing some unusual DX at odd times, and, although we haven't shared in the feast, we've been interested to hear references to this DX, especially from the "Beam Boys." VK2AKR, Jack Lindsay (Lidcombe, N.S.W.) is a shining light in European QSO's. That two-element rotary of his reaches out and grabs QSO's in Britain, France,

Sweden, Luxembourg, Germany, Greece and Egypt and his Sig. strength reports are well up the scale. Only snag so far, as with so many "DX Hounds," is South America.

Reverting to the QRM question: The old bone of contention, phone and C.W., is in the air again and there are those who agitate and fume because phone stations are active between 28 and 28.1 MC/s. The powers that be say—"28 to 29 MC/s—open to phone and C.W." It all arises from a bad habit born in U.S.A. on 14 MC/s in the 1930's when C.W. stations literally usurped the L.F. end of the band. F.C.C. later on partitioned it off. At pres-

ent, both types of transmission are entitled to be spread over the whole range (in Australia) and why not? If you are a C.W. man, you'll get QRM from other C.W. men if you have an exclusive channel for that purpose, and we fail to see how one brand of QRM is any less potent than the other. Nevertheless—channels for each purpose **would** be a nice Utopian state of affairs. We sympathise with exponents of both C.W. and phone because we use both, and appreciate them equally well. But we are too old in the Ham game to get all steamed up if some other lad QRM's our DX. There **will** be other occasions perhaps with a clear run. Live and let live!



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# Shortwave Review

CONDUCTED BY

L. J. KEAST

## NOTES FROM MY DIARY

### Calls, Megs. and Mins.

For the benefit of the ever-increasing number of recruits to the thrills of DX-ing, I am assigning most of the space allotted me in this issue to a fairly comprehensive list of world stations in the 11, 13, 16 and 19 metre bands. Call-signs and frequency are shown and, where possible, times on the air. It will not only give newcomers an opportunity to commence a station list but afford a good chance for the regular DX-er to check his lists. I would mention for the benefit of those unfamiliar with shortwave tuning that this is the "silly season" for night reception, so do not be discouraged; the daylight signals will fully compensate for any poorness of strength or clarity in the evenings. If trying for London at night, it will be probably found the 13 and 16 metre bands offer best results, whilst occasionally GWG, 19.85 metres, behaves.

### Crosley's Seasonal Changes

#### To Europe:

WLWK, 11.71mc, 25.62m: 9.45 p.m.-7.30 a.m.  
 WLWO, 17.80mc, 16.85m: 9.45 p.m.-6.15 a.m.  
 WLWO, 9.59mc, 31.30m: 6.30 a.m.-7.30 a.m.  
 WLWS, 15.13mc, 19.83m: 9.45 p.m.-4 a.m.; 4.15 a.m.-7.30 a.m.  
 WLWL, 17.955mc, 16.70m: 9.45 p.m.-3.30 a.m.  
 WLWL, 9.70mc, 30.93m: 4 a.m.-8 a.m.

#### To North Africa:

WLWR, 15.25mc, 19.67m: 9.45 p.m.-7 a.m.  
 WLWS, 21.65mc, 13.85m: 9.45 p.m.-4 a.m.  
 WLWL, 15.23mc, 19.70m: 9.45 p.m.-3.30 a.m.; 4 a.m.-8 a.m.

Latin-America schedule is unaltered.

### NEW ADDRESS

Will reporters please note my address is now:

L. J. KEAST  
 3 Fitzgerald Road  
 Ermington, N.S.W.

## SHORTWAVE STATIONS OF THE WORLD

Compiled by L. J. Keast

JUNE, 1946

All Times East. Aust. Stand.

This has been compiled with the idea of giving listeners a comprehensive list of stations, most of which should be audible at different seasons of the year.

Schedules are believed to be correct at time of going to press, but S/W stations embrace the prerogative of changing schedules or frequencies with little or no notice; therefore any information that listeners will send to me to bring the list up to date will be appreciated.

Call-sign	Mega-cycles	Metres	Location	On the Air.
GSK	26.10	11.49	London	9.15-11.30 p.m.
GSQ	25.75	11.65	London	
HER-9	25.64	11.70	Berne	
GVT	21.75	13.79	London	1.30-2 a.m.; 2-7.30 a.m.
GVS	21.71	13.82	London	9 p.m.-1.15 a.m.
CHLA	21.71	13.82	Sackville	Not yet in use.
GVR	21.675	13.84	London	9-10 p.m.; 10.15-10.45 p.m.
VLC-10	21.67	13.84	Shepparton	
WLWS	21.65	13.856	Cincinnati	9.45 p.m.-4 a.m.
GRZ	21.64	13.86	London	11.15 p.m.-1.15 a.m.
WRCA	21.635	13.87	New York	
WNBI	21.635	13.87	New York	
KNBX	21.61	13.88	San Francisco	
HEI-9	21.605	13.88	Berne	
WCBX	21.57	13.91	New York	
GST	21.55	13.92	London	1.30-2 a.m.; 2-2.30 a.m.
VLR-5	21.54	13.93	Melbourne	
GSJ	21.53	13.93	London	7 p.m.-1.15 a.m.
HER-8	21.52	13.94	Berne	
GSH	21.47	13.97	London	7 p.m.-1.15 a.m.
OTC	21.40	14.01	Leopoldville	Weak at 10.45 p.m.
VLN	21.10	14.21	Sydney	
VLN-2	20.50	14.63	Sydney	
OPL	20.04	14.97	Leopoldville	
ZRO-17	19.59	15.31	Rome	
IRW	19.52	15.37	Rome	
VLN-3	19.26	15.54	Sydney	
KNY	19.10	15.70	Dixon	
WVLC	18.60	16.14	Luzon	
PY-10	18.56	16.18	Manila	
WVLC-3	18.53	16.18	Tokyo	
FZI	18.52	16.20	Brazzaville	
HER/HBH	18.58	16.23	Berne	Wed., Fri. and Sun. 1-2.30 a.m.
HBF	18.45	16.26	Geneva	
KROJ	18.39	16.31	San Francisco	C.W. only.
WLWS	18.39	16.31	Cincinnati	C.W. only.
PCQ	18.22	16.46	Kootwijk	Netherlands (Home Service) 9.50 p.m.-5 a.m.
WLWS	18.18	16.50	Cincinnati	
WNRA	18.16	16.52	New York	9 p.m.-4.30 a.m.
PMA	18.16	16.52	Bandoeng	
JBC	18.135	16.54	Djakakarta	
GVO	18.08	16.59	London	M/N-12.15 a.m.; 2.15-3 a.m.
PCV	18.065	16.61	Amsterdam	
GRQ	18.025	16.64	London	6 p.m.-M/N; 2.15-3 a.m.
KQJ	18.020	16.64	Kahuku (Hawaii)	Irreg.; 11-11.45 a.m.
LRS-3	18.010	16.67	Buenos Aires	
WVLC	18.010	16.67	Luzon	
KHE	17.98	16.69	Kahuku (Hawaii)	Irreg.; 9-11 p.m.
WLWL-1	17.955	16.70	Cincinnati	9.45 p.m.-3.30 a.m.
VWY	17.94	16.72	Kirkee (India)	
XBC	17.91	16.75	Dutch N.G.	
WGEX	17.88	16.77	Schenectady	
GRP	17.87	16.79	London	1.30-3.45 a.m.; 4-6.45 a.m.; 8 p.m.-11.15 p.m. (Think now off the air.)
PRL-9	17.85	16.81	Rio de Janiero	
KCBF	17.85	16.81	San Francisco	
	17.85	16.81	Paris	
JLS-2	17.845	16.81	Tokyo	Often at 7.30 a.m.; closes at 8.30
RNB	17.845	16.81	Brussels	9-10.30 p.m.
Radio Eirann	17.84	16.82	Dublin	3-40-4 a.m.; News 3.45.
HVJ	17.84	16.82	Vatican City	Irreg.; 3-3.45 a.m.
VLC-9	17.84	16.82	Shepparton	9.40-11.50 a.m.
JVW-5	17.835	16.82	Tokyo	Contacts U.S.A. in mornings.
KU5Q	17.83	16.83	Guam	Irregular, now.
ZIJ	17.83	16.83	Okinawa	
WCBN	17.83	16.83	New York	Good around breakfast time.
WCDA	17.83	16.83	New York	
WCRC	17.83	16.83	New York	
VUD-10	17.83	16.83	Delhi	1.15-5.30 p.m.; 7-7.30 p.m.; 7.45-10 p.m.

Call-sign	Mega-cycles	Metres	Location	On the Air.	SUN-SPOTS AND RADIO
2RO-8 CKNC	17.82 17.82	16.84 16.84	Rome Sackville	9 p.m.-10.45 p.m.; News at 9.45; 2-8 a.m.; News 2.45 and 7.15 p.m.	<p>A recent investigation into the causes and effects of sun-spots has, according to some scientists, "opened up new fields of research." It has been discovered that the spots emit "radio noises" 100,000 times stronger than normal emissions from the sun, as a result of which forewarning of magnetic phenomena will be possible. The effects of the sun-spots are felt mainly on the ultra-short waves.</p>
GSV	17.81	16.84	London	3-6 p.m.; 7 p.m.-3 a.m.; 4-5.30 a.m.	
OIX-5	17.801	16.84	Lahti	4.30-5 p.m.; 8-8.40 p.m.; 11 p.m.-3.30 a.m.	
KRHO	17.80	16.85	Honolulu	9 a.m.-3 p.m.	
WLWO	17.80	16.85	Cincinnati	8-8.45 a.m.; 9.45 p.m.-6.15 a.m.	
WLWL	17.80	16.85	Cincinnati		
VLA-7	17.80	16.85	Shepparton		
TGWA	17.80	16.85	Guatemala		
HEI-8	17.795	16.85	Berne		
GSG	17.79	16.86	London	3-7.15 a.m.; 9-10 p.m.; 10.15-10.45 p.m.	
JLU-4	17.79	16.86	Tokyo		
JZJ	17.785	16.86	Tokyo		
HER-7	17.784	16.86	Berne		
WNBI	17.78	16.87	New York	10.30 p.m.-4 a.m.; 8-9.15 a.m.	
WRCA	17.78	16.87	New York		
KROU	17.78	16.87	San Francisco		
KNBA	17.78	16.87	San Francisco	5-7.45 a.m.	
KNBC	17.78	16.87	San Francisco		
KGEI	17.78	16.87	San Francisco	11 a.m.-3 p.m.	
RNB	17.775	16.88	Leopoldville		
OTC-5	17.770	16.88	Leopoldville	9 p.m.-12.30 a.m.; 2.30-3.15 a.m.	
2RO-7	17.77	16.88	Rome		
KROJ	17.77	16.88	San Francisco		
KCBB	17.77	16.88	San Francisco	1-4 p.m.	
Radio Paris	17.765	16.88	Paris	To Indo-China 10 p.m.-M/N.	
PCJ	17.765	16.88	Hilversum	Tuesdays 6-7.30 p.m.	
KWIX	17.76	16.89	San Francisco		
KWID	17.76	16.89	San Francisco		
SEAC	17.76	16.89	Malacca (S.S.)	Heard after PCJ signs at M/N.	
KROJ	17.76	16.89	San Francisco		
VUD-3	17.76	16.89	Delhi	3-4 p.m.; 4.25-4.30 p.m.; 5-9 p.m.	
WKRD	17.76	16.89	New York		
Paris	17.76	16.89	Paris	Opens at 10 p.m.	
WRUW	17.75	16.90	Boston	10.30 p.m.-12.15 a.m.	
WRUL	17.75	16.90	Boston		
2RO-20	17.75	16.90	Rome		
RCB	17.735	16.92	Leopoldville		
GVQ	17.73	16.92	London	5-7 p.m.; 9-11.15 p.m.; 1.15 a.m.-2.15 a.m.; 3.15-7 a.m.	
LRA-5	17.72	16.93	Buenos Aires	Try around 10.30 p.m.	
GRA	17.715	16.94	London	6-7 p.m.	
GVP	17.70	16.95	London	4-7 p.m.; 8-M/N; 12.30-3.15 a.m.	
KUIM	17.70	16.96	S.W. Pacific		
Radio Club	17.527	17.12	Brazzaville	3-4.30 p.m.; 7.45-10.45 p.m.; 2-8 a.m.	
HVJ	17.445	17.20	Vatican City	Occasionally around M/N.	
NPM	17.445	17.20	Pearl Harbour		
AFH	17.275	17.37	Italy		
CNR	16.666	18.00	Rabat (Morocco)	8.30-10.45 p.m.	
XMEW	16.54	18.14	Kumming	From about 9 p.m.	
PJY	16.350	18.34	Willemstad		
VLN-5	16.330	18.37	Sydney		
IRY	16.112	18.62	Rome		
AFH	16.025	18.73	Algiers	Irreg.; 3.40-7 a.m.	
WXFD	16.025	18.73	Alaska		
MCDE	15.95	18.83	Paris	Irreg.; 10 p.m.-5.15 a.m.	
FZT-2	15.95	18.83	Tonanarive		
Radio Djak	15.95	18.80	Djakjakarta		
KU5Q	15.94	18.82	Guam		

## NEW STATIONS

**CKLX, Sackville, 15.09mc, 19.89mc:** Leo Edl reports this new Canadian as announcing at 9.45 p.m.: "This is the Canadian Broadcasting Corporation. This is Station CKLX, 19.88 metres, and CKNC, 16.84 metres." Mr. Edl goes on to say that strength of CKLX was quite O.K. but CKNC was inaudible. Rex Gillett and Ern Suffolk, of Adelaide, also report "our cousin," and Arthur Cushen, of Invercargill, sends the following schedule: Week-days—9.05 p.m.-11 p.m.; 2 a.m.-8.15 a.m.; Sundays—9.05 p.m. right through till 8.05 a.m.

**LLJ, Oslo, 6.195mc, 48.39m:** Here is a new outlet for Norway as far as Australia is concerned and is reported by Mr. Ern Suffolk, of Lobethal. Is in parallel with LKJ, 9.54mc, 31.45m, but being free from interference puts in a much better signal than its sister on the 31-metre band. Best around 5.30 a.m.

**HED-4, Berne, 10.405 mc, 28.83m:** Broadcasting from 3.20 till 3.50 a.m. and opening with news for U.S.A., the Swiss Broadcasting Corporation is heard at fairly good strength.

**PCJ, Hilversum, 6.025mc, 49.79m:** Rex Gillett writes: "PCJ on this new frequency is fair strength in relay with 11.735 and 9.59mc in the 5-6 a.m. 'sked'."



Sole Australian Concessionaires:

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

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

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

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

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

# GENERAL SOUND AND FILM SERVICES

## LOOKING BACKWARD!

We realise that the steady growth of General Sound and Film Services has been due to a policy which at first we never thought of putting into words. It is simply this:

"In design, Material, and Workmanship we have built into every product we manufacture the utmost in precision and sturdiness that ensures long trouble-free life of Service."

We have found that this principle of manufacture costs little more than any other and has constantly brought us new customers without expensive promotion and advertising.

## LOOKING FORWARD!

We know that it cannot be improved upon.

The little group that started our operation had a background of knowledge gained from many years of pioneering and development in the industries which we sought to serve and the high standards they set have been required of each added employee.

Our products are widely used by the Radio Broadcasting and Sound Recording and Motion Picture Studios, whose requirements are extremely rigid.

Specially-designed equipment is frequently required and new problems often arise.

Our facilities are not limited to production of listed items in any catalogue.

Consult us with your problems.

Cordially yours,

**GENERAL SOUND  
AND  
FILM SERVICES**

BOX 5146 AA, G.P.O.,  
MELBOURNE

Call-sign	Mega-cycles	Metres	Location	On the Air.
NPM-8	15.92	18.84	Pearl Harbour	
WVLC	15.92	18.84	Luzon	
HEK-5	15.875	18.89	Berne	5.20-5.50 a.m.
CEP	15.865	18.90	Santiago	
WCW	15.85	18.93	Hicksville	
9AD	15.83	18.95	Morotai	
Dakar	15.83	18.95	Dakar	
<b>19-Metre Band</b>				
—	15.75	19.05	Moscow	Heard in afternoons around 3.45, also from 10.45-11.15 p.m.
VRR6	15.62	19.20	Stony Hill (Jamaica)	
KU5Q	15.60	19.23	Guam	
FZI	15.595	19.25	Brazzaville	Around 10 p.m.
KGIF	15.53	19.31	Okinawa	
—	15.53	19.31	Moscow	
ZIJ	15.52	19.32	Okinawa	
OPL	15.52	19.33	Leopoldville	
HDR	15.51	19.33	Quito	Irreg.; noon-3.30 p.m.
ZLM-5	15.50	19.35	Wellington	
KEM	15.49	19.36	Bolinas	
—	15.49	19.36	Moscow	
—	15.48	19.37	India	
2RO-24	15.48	19.37	Rome	
KKL	15.475	19.38	Bolinas	
KKR	15.46	19.40	San Francisco	
GRD	15.45	19.42	London	
—	15.45	19.42	Singapore	
—	15.44	19.43	Moscow	
GWE	15.435	19.44	London	7-8.45 a.m.; 11.40 p.m.-1 a.m.
PJY	15.43	19.45	Willemstad (Curacao)	
ZOY	15.43	19.45	Accra (Gold Coast)	1-1.45 a.m.
GWD	15.42	19.46	London	
Radio Bucharesti		19.46	Bucharest	
—	15.408	19.47	Moscow	
PZX5	15.405	19.48	Paramaribo (Suriname)	If noise permits, can be heard around 9 p.m.
—	15.385	19.50	Moscow	
CR7BG	15.38	19.50	Lourenco Marques	3-4 p.m.
FGA	15.38	19.50	Dakar	
VLK-6	15.38	19.50	Sydney	
GRE	15.375	19.51	London	
—	15.37	19.51	Moscow	
Radio France		19.51	Paris	
ZYC-9	15.37	19.51	Rio de Janiero	9-10 a.m.
RVW15	15.36	19.53	Moscow	
SEAC	15.36	19.53	Singapore	Good most nights.
KWU	15.355	19.53	San Francisco	Not on the air at present.
—	15.35	19.54	Moscow	
VUD-8	15.35	19.54	Delhi	1.15 p.m.-5.30 p.m.
WRUL	15.35	19.54	Boston	11.30 p.m.-12.15 a.m.
WRUW	15.35	19.54	Boston	
WRUA	15.35	19.54	Boston	
WLWR	15.35	19.54	Cincinnati	Has been testing at 7.15 p.m.
FZI	15.35	19.54	Brazzaville	Heard at 1.15 a.m.; closes at 1.30.
Paris	15.35	19.54	Paris	To Indo-China 10 p.m.-M/N.
FGA	15.345	19.55	Dakar	
—	15.34	19.56	Moscow	8.30 p.m.-12.30 a.m.
KNBI	15.34	19.56	San Francisco	4.15-6.45 p.m.
KNBX	15.34	19.56	San Francisco	1-2.45 p.m.
KGEX	15.33	19.57	San Francisco	
KCBR	15.33	19.57	San Francisco	
MTCY	15.33	19.57	Hsinking	Not heard lately.
WGEO	15.33	19.57	Schenectady	9 p.m.-7.30 a.m.
WGEA	15.33	19.57	Schenectady	
JLP-2	15.325	19.58	Tokyo	? off the air.
OZH	15.32	19.58	Denmark	
—	15.32	19.58	Moscow	8 p.m.-2.30 a.m.
VLC-4	15.315	19.59	Shepparton	Noon-2 p.m.; 3-3.45; 4-4.40 p.m.
GSP	15.31	19.60	London	7.15-9 a.m.; 3-7 p.m.; 9-11 p.m.; 7-7.15 a.m.
HER-6	15.305	19.60	Berne	
GWR	15.30	19.61	London	3.30-4.45 p.m.; 2-2.30 a.m.
—	15.30	19.61	Paris	
2RO-6	15.30	19.61	Rome	
KGEI	15.29	19.62	San Francisco	
KGEX	15.29	19.62	San Francisco	
WRUL	15.29	19.62	Boston	M/N-8 a.m.; 8.15-8.45 a.m.
WRUW	15.29	19.62	Boston	
WKLJ	15.29	19.62	New York	
KWID	15.29	19.62	San Francisco	
KWIX	15.29	19.62	San Francisco	
VUD-11	15.29	19.62	Delhi	1.45-3.30 p.m.; 4.20-4.45 p.m.; 5-7 p.m.; 7.45-11.15 p.m.
—	15.28	19.63	Moscow	Irreg.
WNRE	15.28	19.63	New York	Fair at 9.45 p.m.
WNRI	15.28	19.63	New York	
ZL-4	15.28	19.63	Wellington	Not yet in use.

## "BAND PASSING"

News from England about extension of "Ten" to 30 mC/s and use of "160 metres," comes, as this is written (29/4/46), in contrast to the VK frequency position:

At a W.I.A. meeting in Sydney on 26/4/46, it was announced, apparently with finality, that "VK's won't get bands other than 'Ten' for a long time yet," and that bands, when released, will be returned in the order "80-40- and 20." This news, if correct, is a cold shower on the immediate hopes of Australian radio experimenters and DX men. Despite questions in Federal Parliament and representations through various channels, sum total appears to be nil. If the Australian radio amateur is destined to confine his activities to V.H.F.'s alone, we predict a vast thinning of ranks soon after the DX demise on "Ten" two or three years hence.

That would be a natural reaction because, whichever way the idea is camouflaged, Hams the world over are lovers of DX primarily. By "DX" we mean the liking for communication with one's fellow man,

### RADIO TIME SIGNALS

Post office engineers at the Dollis Hill Laboratory in England have made some quartz crystal clocks which will keep time to a thousandth part of a second. The clocks are to be used to control radio time signals.—Practical Wireless.

not only overseas, but inside our own continent. There's a kick in discussing amateur radio affairs with kindred souls in other cities, country towns—or back of Bourke! This form of communication is denied the VK until he has restored to him the appropriate frequencies that he unselfishly gave up—with his qualifications—when he marched off to fight for the freedom he is at present denied. V.H.F.'s have their attraction, but it's no use gilding the lily—they are purely local channels of communication. Their DX propensities are infrequent and erratic.

It is definitely in the interests of the future of the Amateur Radio Movement and the future of this nation that the pre-war communication frequencies be restored. This is not asking for the moon, but a reasonable request for return of a former possession. —D.B.K.

Call-sign	Mega-cycles	Metres	Location	On the Air.
WCBX	15.27	19.64	New York	Good in early mornings.
KCBA	15.27	19.64	San Francisco	
KCBR	15.27	19.64	San Francisco	
KCBF	15.27	19.64	San Francisco	4-7.45 a.m.
SEAC	15.27	19.64	Moscow	
GSI	15.26	19.66	Colombo	1.30-5 a.m.; 9-11 p.m.
XBC	15.26	19.66	London	
WLWK	15.25	19.67	Dutch N.G.	8-10.45 a.m.
WLWR	15.25	19.67	Cincinnati	9.45 p.m.-7 a.m.
WLWL	15.25	19.67	Cincinnati	
WLWO	15.25	19.67	Cincinnati	Not in use now.
KRHO	15.25	19.67	Honolulu	
CR7BD	15.243	19.68	Lourenco Marques	
Paris	15.24	19.69	Paris	To New Caledonia, 2-2.45 p.m.; to Indo-China, 10 p.m.-M/N.
VLH-5	15.24	19.69	Lyndhurst	10 a.m.-4 p.m. (Suns. 9 a.m.-3 p.m.); Sats. to 5.30 p.m.
KNBI	15.24	19.69	San Francisco	
KNBC	15.24	19.69	San Francisco	
JVW-4	15.235	19.69	Tokyo	Irreg.; 9 a.m.-4 p.m.
VLG-6	15.23	19.69	Melbourne	Noon-2 p.m.; 3-3.45 p.m.
WLWL2	15.23	19.69	Cincinnati	10.30 p.m.-3.45 a.m.; 4-9 a.m.
2RO-14	15.23	19.7	Moscow	6-6.40 a.m.; 8.40-9.47 a.m.
OLR-5A	15.23	19.7	Rome	
JLT-3	15.225	19.71	Prague	Irreg.; 8 a.m.-1 p.m.
PCJ	15.22	19.71	Tokyo	Daily 11 p.m.-12.30 a.m.; Tuesdays 6-7.30 p.m.
CHTA	15.22	19.71	Hilversum	
XGOY	15.22	19.71	Sackville	
KGEX	15.21	19.72	Chungking	
WBOS	15.21	19.72	San Francisco	9 a.m.-1.15 p.m.; 2-4.45 p.m.
VUD-3	15.21	19.72	Boston	9 p.m.-3.45 a.m.
WLWS	15.20	19.73	Delhi	10.30-10.45 p.m.
WLWL	15.20	19.75	Cincinnati	7.45-10.45 a.m.
WOOC	15.20	19.75	Cincinnati	9.45 p.m.-3.30 a.m.; 4-8 a.m.
VLA-6	15.20	19.74	New York	7.15-9 a.m.; 9-9.30 a.m.; noon-2 p.m. (Sats. 1.15-5.25 p.m.)
VUD	15.195	19.73	Shepparton	Sports; 5.30-6.14 p.m.; 6.35 p.m.-12.15 a.m.
TAQ	15.195	19.74	Delhi	1.30 p.m.-3.40 a.m.
VUD-5	15.19	19.75	Ankara	
WKRX	15.19	19.75	Delhi	1.15-4.45 p.m.; 7.30-11.30 p.m.
WKRD	15.19	19.75	New York	
XGOX	15.19	19.75	New York	
CKCX	15.19	19.75	Chungking	
WOOC	15.19	19.75	Sackville	News at 8.15 a.m.; 10-11.45 p.m. (news 10.45).
KROJ	15.19	19.75	New York	Now idle.
OIX-4	15.19	19.75	San Francisco	Heard around 12.30 a.m.; also 5-6 p.m.
GSO	15.18	19.76	La'ti	2-7 p.m.; 8 p.m.-M/N; 12.30-8.45 a.m.
TGWA	15.17	19.76	London	1-9.30 a.m.
AFHQ	15.17	19.76	Guatemala	
OTC	15.165	19.78	Algiers	
PRE-9	15.165	19.78	Rome	
VLG-7	15.16	19.79	Leopoldville	9.30 a.m.-noon.
VUD-7	15.16	19.79	Fortaleza	
XEWW	15.16	19.79	Moscow	6-8 a.m. (Sun. 6.45-8.15 a.m.).
SBT	15.155	19.80	Melbourne	1.15-5.30 p.m.; 6.15-6.45 p.m.; 7-7.30 p.m.; 7.45-10 p.m.; 10.30 p.m.-12.30 a.m.
RNB	15.155	19.80	Delhi	11 p.m.-10.15 a.m.
WNB1	15.15	19.81	Suva	9-9.50 p.m.; 1 a.m.-4.15 a.m. (irreg.).
WRCA	15.15	19.81	Mexico	
KNBA	15.15	19.81	Mexico	
KNBC	15.15	19.81	Stockholm	
SEAC	15.15	19.81	Leopoldville	
GSF	15.14	19.82	New York	
KGEI	15.13	19.83	San Francisco	2-6 p.m.; 1.30-3 a.m.; 4-8.45 a.m.
KGEX	15.13	19.83	San Francisco	4-7.45 a.m.
KNBA	15.13	19.83	San Francisco	
KNBC	15.13	19.83	San Francisco	
WRUW	15.13	19.83	San Francisco	
WRUL	15.13	19.83	Boston	
WRUS	15.13	19.83	Boston	
WLWS	15.13	19.83	Cincinnati	9.45 p.m.-4 a.m.; 4.15-7.30 a.m.
Paris	15.13	19.83	Paris	
SEAC	15.12	19.84	Colombo	10.30 p.m.-3 a.m.
KRCA	15.12	19.84	San Francisco	
HVJ	15.12	19.84	Vatican City	
EPB	15.12	19.84	Teheran	5.45-7 p.m.
HCJB	15.115	19.85	Quito	Weak around 7.45 p.m.
GWG	15.11	19.85	Moscow	
DHTC	15.105	19.86	London	6-7 a.m.; 7.45-9.45 a.m.; 4 p.m.-1.15 a.m.
DTSP	15.105	19.86	Munich	Generally around 11 p.m.

(To be continued next month)

# Speedy Query Service

Conducted under the personal supervision of A. G. Hull

**T.G. (Bega) is unable to get a suitable steel chassis and asks if he can use "breadboard" style for a 10-metre converter.**

A.—Yes, it is always possible to use a wooden base, even for a dual-wave superhet, provided that you take adequate steps to arrange suitable shielding and efficient earth returns. Nothing must be overlooked. For example, if using condensers in metal cans, the cans must be earthed, also valve cans, tuning condenser frames and even the metal parts of dials and so on.

**R.B.B. (Bairnsdale) is confused over condenser circuit symbols.**

A.—There is a move in America to standardise on one straight line and one curved line for the condenser symbol, whereas we still continue with our old-fashioned symbol of two straight lines. There is no particular reason for this and maybe we'll get around to the new idea if we think of it. It seems to be a very minor

## 2 MC. I.F.

(Continued)

A thought which has occurred to the writer is the possibility of discarding the capacity tuning of the oscillator and winding the oscillator coil into a solenoid coil of small dimensions and attaching a slug or iron core to a system of cord drive. In view of the small frequency ratio required for the oscillator tuning, it is quite possible that the type of slug used in 455 kC I.F. transformers would do the job. However, that is a thought for the future.

It will be appreciated by readers that due to the fact that the tuning condenser is so small the actual size of the receiver can be reduced down to a size as yet unattained in all previous mantel receivers.

point and really shouldn't be troublesome.

**C.S.B. (Springwood) is having trouble with instability.**

A.—There can be many causes, such as layout, incorrect spacing of wiring, improper shielding and earthing and so on. If there is any chance of feedback taking place then you can run into oscillation trouble. We recently handled a set where the most effective cure was to fit a .01 mfd. mica condenser from screen to cathode of the i.f. amplifier valve, this being in addition to the usual .1 mfd. tubular by-pass condenser which was located at the voltage divider clip several inches away from the valve socket.

**J.M. (Chatswood) is having trouble with an amplifier using 807 type valves.**

A.—The most important point to watch with these valves is in regard to suppressors for the screens. The idea is to fit a 50-ohm resistor right at the socket in series with each screen. Similar suppressors are desirable in the grid and plate circuits, too, but the screen is the most important.

**D.T. (Ryde) asks about the new Rola speakers.**

A.—The baby permagnetic is the type 3C, with a three-inch cone and the 5C is the larger model, with five-inch cone. Both have voice coil impedance rating of 3.7 ohms. With regard to power handling ability, the 3C will handle only half a watt, so it should not be fitted in a circuit where it will get the full power output of a 6V6G or other fairly high power valve. The 5C has a power rating of 3 watts, so it can be used with a 6V6G, but for preference the

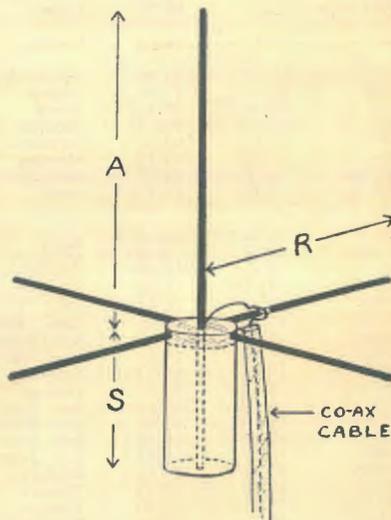
maximum high tension on the plate should be kept down to about 200 volts to be on the safe side.

**C.A.W. (Mornington) wants morse code practice.**

A.—There is plenty of code on the air at an evening between 35 and 40 metres, but you need a set fitted with a B.F.O. Much of the transmission is press news and sent at about 18 to 20 words a minute, so is good practice.

**A.A. (Rutherglen) enquires about disposals bargains.**

A.—Much of the gear being disposed of in Sydney has been used; in fact, comes from dumps where it was discarded by the Services as unfit for further use. At some of the Melbourne sales, however, brand-new and even uncompleted gear has been sold. When making enquiries it is highly advisable to ask whether the gear is new or secondhand and whether serviceable or "dud."



GROUND-PLANE ANTENNA

Here is the diagram of the ground-plane antenna which was described in the April issue. Due to an error this diagram did not appear with the original article.

# NEW EIMAC EXTERNAL ANODE TRIODE 3X2500A3

## Rugged mechanical construction Outstanding electrical efficiency

In the new 3X2500A3, Eimac engineers have developed a highly efficient external anode triode which, in Class C service, delivers up to 5 KW output at a plate voltage of only 3,500 volts. The mechanical design is radically simple, incorporating a "clean construction" which gives short, low inductance heavy current connections that become an integral part of the external circuits at the higher frequencies.

The external anode, conservatively rated at 2500 watts dissipation, has enclosed fins so as to facilitate the required forced air cooling.

Non-emitting vertical bar grid does not cause anode shadows ordinarily created by heavy supports in the grid structure.

Thoriated tungsten filament. Note unusually large filament area, and close spacing.

Filament alignment is maintained throughout life of the valve by special Eimac tensioning method.

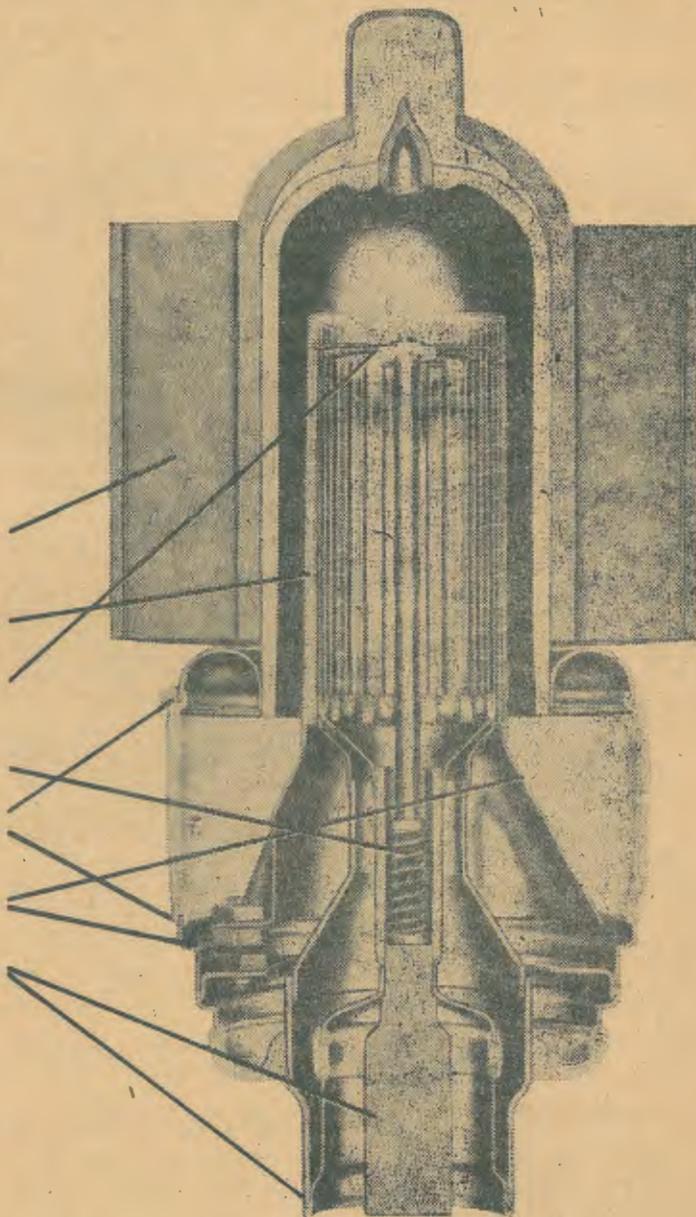
New glass-to-metal seals do not have the RF resistance common to iron alloy seals, nor the mechanical weaknesses of the feather-edged types.

Grid ring terminal mounts a cone grid support which acts as a shield between plate and filament.

A coaxial filament stem structure forms the base of the valve. This makes possible proper connections to the filament lines.

Grid and filament terminal arrangements make it possible to install or remove the 3X2500A3 without the aid of tools.

The new mechanical and electrical features of the Eimac 3X2500A3 external anode triode make it valuable for use on the VHF as well as low frequencies. More complete data and information yours for the asking.



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REG. U. S. PAT. OFF.  
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Plants located at: San Bruno, Calif.



and Salt Lake City, Utah

Export Agents: Frazer and Hansen, 301 Clay St., San Francisco 11, Calif., U.S.A.

### TYPE 3X2500A3 - MEDIUM MU TRIODE ELECTRICAL CHARACTERISTICS

Filament: Thoriated Tungsten	
Voltage . . . . .	7.5 volts
Current . . . . .	48 amperes
Amplification Factor (Average) 20	
Direct Interelectrode Capacitances (Average)	
Grid Plate . . . . .	20 pfd.
Grid Filament . . . . .	48 pfd.
Plate Filament . . . . .	1.2 pfd.
Transconductance ( $E_B = 830$ ma., $E_P = 3000$ v.) 20,000 amhos	

AUSTRALIA SPENDS MORE THAN

£ 8,000,000

ANNUALLY ON RADIO RECEIVERS AND PARTS

This is the last pre-war estimate and it's not hard to realize how even this colossal figure must jump in the post-war period. Incidentally, in the figure quoted, over £1,000,000 is made up of valves, service and parts replacement!



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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.

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