WIRELESS WEEKLY

THE HUNDRED PER CENT AUSTRALIAN RADIO JOURNAL

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August
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FOR TRANSMISSION BY POST AS A NEWSPAPER

SPECIAL FEATURE THIS WEEK:

Regulations Explained

By J. MALONE, Chief Manager Telegraphs and Wireless

Here at Last!

The New Regulations and A Perfect Loud Speaker

Manufactured by the MURDOCH TELEPHONE COMPANY who have been making phones for 20 years

Adjustable Diaphram

To make the adjustment simply screw the cap slightly backward or forward. No screws, no nuts, no fussing, no extra price

Special Price 42/6
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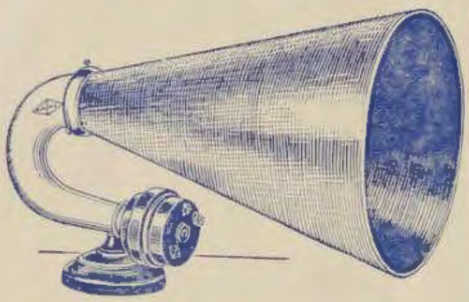

MAIN FEATURE

Radio and Acoustic Engineers claim that Murdoch Loud Speaker give a perfect reproduction, due to the Fibre Horn, and which does away with tinniness

THORDARSON'S NEW TRANSFORMER RED LABEL 6 to 1 RATIO 45/-

The Ideal Transformer for Crystal and the first stage of Amplification

Of Special Interest to North Sydney Wireless Amateurs

Call and inspect the latest in Wireless. Complete Sets & full stocks of Radio parts to build your own

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NEAR QUAY

where a fully qualified Radio Engineer will be pleased to assist the Amateur with his Radio problems. Nothing a trouble

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"Where your Money goes the furthest"

BRANCH No. 2: 40 PITT STREET *OPEN FRIDAY NIGHTS*

OFFICIAL ORGAN OF THE AUSTRALASIAN RADIO RELAY LEAGUE.

Vol. 2. August 10, 1923. No. 32

BROADCASTING LICENSE.

A very erroneous opinion is held by a number of people that they will be unable to obtain a Broadcast (Transmitting) License without first applying to Messrs. Amalgamated Wireless (Aust.) Ltd. Possibly this is on account of the Government holding £501,000 of shares in this company. In fact, so strongly has this opinion been impressed in some quarters that it will take some time for the following statement to be accepted.

We are pleased to inform our readers that Broadcasting (Transmitting) Licenses are obtainable only from the Postmaster-General's Department, Melbourne, provided the necessary guarantees, etc., are given, as laid down in Statutory Rules 97, 1923. Extracts of the Rules appear in this issue on page 3.

BROADCAST COMPANIES.

Broadcast Companies have been formed in several of the States, and from reports received the public will not have long to wait for daily wireless entertainment.

There is no doubt that when things are in full swing some interesting patent questions will arise, just as they did in United States of America.

Wireless, since it was discovered has caused more patent litigation than any other scientific discovery of recent years.

Roster for Week ending 15th August, 1923

	7.30 to 8.0	8.0 to 8.30	8.30 to 9.0	9.0 to 9.30	9.30 to 10
Thursday, 9..		2 GR	2 JM	2 GR	2 ER
Friday, 10.....	2 ER	2 WV	2 DK		2 DS
Saturday, 11..	2 GR	2 JM	2 DS	2 FA	2 GR
Sunday, 12...	6.45 to 7.45 2 GR		7.45 to 9.15 2 CM		9.15 to 10.0 2 JM
Monday, 13...	2 ER	2 WV	2 GR	2 GR	2 FA
Tuesday, 14 ..	2 ER	2 GR	2 FA	2 JM	2 GR
Wednes., 15...	2 ER	2 WV	2 GR	2 GR	2 FA

Vacant times may be booked by Transmitters by ringing Red. 732 between 9 a.m. and 5.30 p.m. daily.

Broadcasting Regulations.

BROADCASTING STATIONS.

APPLICATION FOR LICENSE.

An application for a Broadcasting Station License will be in writing as follows:— Name and address, technical qualifications, registered title of the company, location, type of transmitter and modulation, power, type of aerial, wave length required, service to be given and hours, diagrams of transmitter and receiver.

TERM OF LICENSE AND FEES.

A broadcasting license shall be for five years, and the fee for such license shall be fifteen pounds, payable in advance.

A license will only be granted to persons who satisfy the authorities of their financial and technical qualifications to carry on a reliable service.

A guarantee of £1,000 will be required during the five years the license is in operation.

POWER TO BE USED.

The power that must be used for broadcasting shall be between 500 and 5000 watts.

TRANSMITTING APPARATUS.

The transmitting apparatus shall have a tuned circuit coupled to the aerial, and shall not have more than one per cent. variation above or below the licensed wave length.

WAVE LENGTHS.

Each license will be issued for use on a particular wavelength between 250 and 3500 metres.

Only a certain number of wave lengths shall be allowed in each centre.

HOURS OF BROADCASTING.

The Minister holds the right to curtail the hours of broadcasting if necessary.

Certain items of general interest must be broadcasted and at such times as instructed by the Minister.

All matter broadcasted shall be subject to censorship.

CERTIFIED OPERATOR.

The broadcasting station shall be operated by a certificated operator.

RE-BROADCASTING.

Re-broadcasting shall be permitted under certain conditions.

TELEPHONE.

Every broadcasting station shall be connected by public telephone.

BROADCASTING (RECEIVING) STATIONS.

BROADCASTING LICENSE.

A broadcasting receiving license may be issued to anyone on payment of 10s. per annum together with the annual subscription payable to the broadcasting station.

The license shall not be transferable.

RECEIVING SETS.

Only apparatus that will not cause the aerial to oscillate may be used.

Sets shall be sealed.

Broadcast receiving sets shall be so made as to respond to a certain wave length, and a ten per cent. variation only will be allowed.

Sets shall be stamped indicating the type, number and wave length.

Only those sets or units of approved pattern shall be used.

AERIALS.

No standard aerial is laid down, but tests to comply with the foregoing shall be made on an elevated aerial one hundred feet long.

ASSEMBLING OWN SETS.

Those persons who assemble their own receivers shall arrange them as stated under "receiving sets."

The tuning elements shall be enclosed suitably for effective sealing and shall be submitted to an authorised officer who will test them to see that they conform to the regulations.

A charge of 2/6 will be made for this test, and if in compliance with the regulations the set will be sealed and shall not be broken except by the authorised officer.

MORE THAN ONE BROADCASTING STATION.

Sets may be made to receive more than one broadcasting station, and may be used if the subscriptions be paid to each broadcasting station that the set will receive together with the Government license fee of one pound.

REMOVAL OF LICENSES.

When the holder of a broadcast receiving license wishes to move his set to a new address not more than 20 miles from his original address permission shall be obtained from the broadcasting station to use the set at the new address.

INSPECTION.

All licensees shall allow authorised officers or approved employees of a broadcasting station to whose service they subscribe to inspect at any reasonable time in the day time their installation.

No broadcast receiving license can operate his set for profit without permission of the broadcast station.

SALE OF BROADCASTING (RECEIVING) APPARATUS.

DEALERS' LICENSES.

A dealer's license will be one pound and shall not be transferable.

TO WHOM SETS MAY BE SOLD.

No set may be sold or hired nor certain apparatus sold unless the seller is satisfied that the purchaser holds a broadcasting receiving license or an experimental license.

Any licensed dealer shall allow his record of sales of the above apparatus to be inspected by the broadcasting station licensee.

PENALTY.

The penalty for offences against the foregoing regulations shall be £50.

The foregoing regulations have been selected from the Broadcasting Regulations as those most likely to be of interest to our readers.

Complete copies of the Regulations may be had from the Sub-Treasury, Commonwealth Bank Buildings, Martin Place, for the sum of 1/-.

Wireless Regulations Explained.

Mr. J. Malone, Chief Manager Telegraphs and Wireless, has in the interest of all written the following article explaining the Regulations.

In reading his article all interested in Wireless, the general public, the Experimenter and the Broadcaster, will see clearly how to obtain a license, how to hold it, and how all can work harmoniously together for the development of Wireless in Australia.

The Regulations comprising Statutory Rules No. 97 of 1923, govern the licensing of all classes of Wireless Stations under the authority of the Wireless Telegraphy Act. This means, of course, that they govern all wireless activities in Australia and Territories, as no station can be legally erected or operated unless it is licensed as set out in these Regulations.

2. The Regulations are divided into Part 1 to 8; Parts 1, 2 and 8 contain clauses of a general nature referring to all classes of licenses, while Part 4 deals with broadcasting only. Persons concerned with broadcasting, therefore, should not refer only to Part 4, as there are some important clauses in the other Parts which being of general application will refer to broadcasting as well.

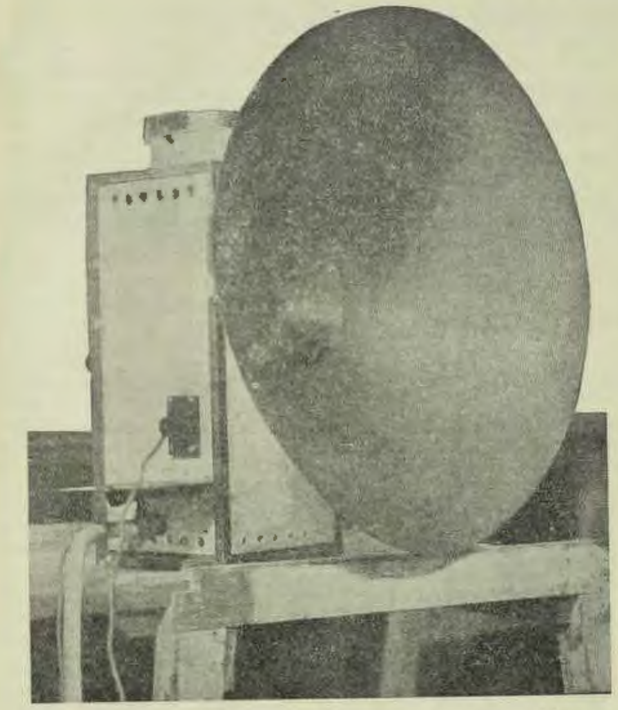
3. The classes of licenses of more particular interest to the general public are experimental licenses and broadcasting licenses. The conditions with regard to experimental licenses have not been altered to any great extent. Regulation 9 deals with them; sub-Regulation 9 (5) being of particular importance:

9 (5). "Conditions with regard to wave lengths, power, location of station, and other technical features as are necessary for the protection and safe-working of other stations shall be determined by an authorised officer, and shall not be inconsistent with these Regulations."

The object of delegating this power to the Chief Manager is to provide for flexibility of administration; any amendment not inconsistent with the Regulations can be made quickly. The "authorised officer" referred to therein is the Chief Manager of Telegraphs and Wireless who has set out the conditions in instructions regarding applications for experimental licenses which are obtainable from the Chief Manager's Office, 146 Flinder's Lane, Melbourne, or the Radio Inspectors, Sydney and Fremantle, and the G.P.O., Brisbane, Adelaide, Perth and Hobart. A reference to these instructions will show that the wave length of transmitting stations is 100 to 250 metres with no spark transmission over 200 metres. It will also be seen that in special cases a longer wave length may be granted. This longer wave length of course, will depend on the requirements of the broadcasting and other commercial and defence stations. Regenerative circuits capable of causing the aerial to oscillate are not normally allowed; but regeneration is permitted where it is safely controlled; in such cases the licensee must be capable of receiving morse signals by sound at the rate of 12 words per minute. Applicants for transmitting licenses shall possess operating qualifications and comply with certain conditions as set out in the instructions which should be studied carefully before forwarding applications or fees.

4. Applicants for experimental licenses will be required to satisfy the Chief Manager of their qualifications to conduct experiments scientifically and to indicate the nature and object of the experiments which they desire to conduct. In short, the Chief Manager will be required to determine whether the applicant is or is not an experimenter: if not an experimenter, the applicant cannot be given an experimental license, but will, of course, have the opportunity of listening-in to any broadcasting station for whose programme he may desire to subscribe by obtaining a broadcasting (receiving) license from the broadcasting licensee or licensed dealers, who will be authorised to issue licenses on behalf of the Postmaster-General.

5. Radio Clubs, Wireless Institutes, and such organised bodies of experimenters working under a constitution or rules which meet with the approval of the Chief Manager will be recognised and encouraged by the authorities. It is realised that such internal control and discipline are necessary in the interests of all concerned, and consequently it will be the desire of the authorities to see such Institutes



Front View of the Flame Microphone. Note the large Horn; This concentrates the Sound on the Flame.

flourish. It will, of course, be necessary to look for certain conditions before recognising officially such clubs so that the broadcasting business may not be jeopardised; membership of clubs should be confined to people genuinely interested in the science of radio.

6. At present a number of amateur broadcasting demonstrations are given in various States and these demonstrations apparently are much appreciated by other experimenters and amateurs. It is the intention of the authorities to permit such amateur broadcasting to continue unless and until it can be shown that interference is being caused with other stations or business.

7. With regard to broadcasting as set out in Part 4 of the Regulations, it is explained that these Regulations are based on the proposals of the Conference held in Melbourne on 24/5/23 at the invitation of the P.M.G., comprising all interests concerned in broadcasting. The conference selected a committee which drafted proposals for Regulations and this committee subsequently discussed in detail draft Regulations prepared by the authorities. The final amended draft has been put into legal phraseology by the Crown Law authorities. It will se seen, therefore, that the conference is mainly responsible for the Regulations and will it is hoped, take its share of responsibility in endeavouring to obtain harmonious and efficient working conditions which will make for the development of successful broadcasting.

8. It will be seen that it is not an easy matter to obtain a broadcasting license. Applicants must satisfy the Postmaster-General of their technical and financial ability to provide an efficient service and to maintain it for a period of 5 years. A financial guarantee of £1000 will be required to support their bona fides. This guarantee is demanded in order to protect the public, so that it will not be possible unless at considerable financial loss for any broadcaster to obtain a license and get in the first or second year's revenue and then desert his clients. Every broadcasting station will have an exclusive wave length and the power of the transmitter (measured in the High Frequency Charter Circuit) will be between 500 and 5000 watts: coupled circuits will be demanded and radiation must be maintained reasonably constant with a permissible variation of the authorised wave lengths of 1 per cent. above or below. No restriction will be placed on the class of programme broadcasted, or the times of broadcasting. Therefore, it will be possible for a licensee to broadcast advertisements. It will be necessary, however, for him to broadcast such items of public interest which the Minister may determine, comprising weather reports, market reports, etc., such special items shall not exceed the maximum of 20 minutes during each 12 hours.

9. The Regulation dealing with sealed receivers is one which has already called for considerable comment and criticism. This condition of sealing the receiver so that it will respond to the wave length of the station to which the licensee is subscribing is probably the most important Regulation of all as the basis of the Regulations is provision for a competitive entertainment business. Therefore each broadcaster will obtain as many clients as he can and in order to hold these clients it will be necessary for him to provide a good programme and ultimately only the broadcasters who provide first-class programme will remain in the field. It will be possible for any holder of a broadcasting (receiving) license to so arrange that his receiver will pick up more stations than one; in this case he will be required to pay an additional license fee of 10/-, also the additional subscriptions to the broadcasters whose programmes he picks up.

10. It will be possible for any person to make or assemble his own receiver, the only condition imposed by the Regulations being that the receiver when assembled in a box

shall be capable of being sealed so that it will respond only to the selected wave length and the reaction will be so fixed as not to be capable of causing the aerial to oscillate. The maker of such a receiver is required to take the box containing the tuning elements to a Radio Inspector who will test it to ascertain its conformity with the Regulation dealing with reaction and wave length; if satisfactory he will issue a certificate accordingly, and a fee of 2/6 will be charged for each such test.

11. Special Regulations concern- radio dealers who will all be required to be licensed and to display a sign, "Licensed Radio Dealer." These dealers will not be able to sell or hire any apparatus to any person unless the latter is in possession of either an experimental license or a broadcasting (receiving) license. In the latter case the various broadcasting stations will arrange so that the dealers will have available approved receivers capable of picking up their respective stations. Also for the dealer to collect the broadcasting subscription fee and the Government License fee—the latter being handed over to the Post Office authorities together with a duplicate copy of the form which will comprise both the license and a receipt for the license fee and the subscription fee; thus the public will not be required, as in England, to go to the Post Office for a license and then to the dealer or broadcaster to make arrangements for his subscription—he will be enabled to make arrangements and pay both fees to the dealer.

12. Manufacturers of receivers must arrange with the Radio Inspectors for a specimen type of their receivers to be tested for approval. If it complies with the conditions relative to reaction and variation of wave length it will be given a type number and a stamped impression containing particulars of such type number and the wave length to which it will respond. This stamped impression must be placed on all similar receivers made to that type. All such receivers must bear the approved Government seal. No conditions are laid down as to the method of sealing: this set must be capable of having the tuning elements sealed—the method of so doing being a matter for adjustment between the manufacturers and authorities.

13. The Department is anxious, as it has always been, to encourage the development of wireless in every legitimate way and hopes for the co-operation of all enthusiasts to maintain harmony in their various spheres. The new Regulations dealing with broadcasting are a distinct departure from practice in other parts of the world and it behoves all concerned to give the Regulations a fair trial before indulging in criticism. While it is recognised that the various interests have ideals almost irreconcilable, a constant co-operation and co-ordination of activities is not only advisable, but necessary if we are to find wireless developing happily and efficiently. The experimenter must be encouraged; he is mainly responsible for the introduction of broadcasting and he will still be able, in his proper place, to do useful work for Australian radio. The dealer, who will have to listen to public criticism, has a special duty to himself and the public in educating the prospective "listeners-in"; the broadcaster will naturally see to it that he "delivers the goods," and does not interfere with other people's goods or the satisfaction of his own and other broadcasters' clients. While the manufacturer will be in a happy position of security he has a big responsibility in recommending designing and manufacturing such equipment as will lead to efficient service to all. With these various interests working harmoniously and unselfishly for the common end flourishing and efficient wireless services — the authorities whose only interest is the care for all—will have peaceful nights even if they live laborious days.

SOUTH AMERICANS LISTEN IN ON A NEW YORK FIGHT.

New York was joined to Argentina by radio for the first time in history when round by round ringside reports of the Firpo-Brennan prize fight were transmitted from the high power radio station at Rocky Point, L. I., and were picked up in Argentina. The reports were sent out on a long wave length; for the benefit of local fans, after they were received they were immediately sent out again on a short wave length by an Argentine broadcasting station.

A sharp wave means that the transmitting station radiates a large proportion of energy in the form of Hertzian waves of uniform length, and only a small proportion of energy in the form of wave lengths which vary from this.

MAKE YOUR OWN

A Measurement Chart for Determining the Capacity of of your Antenna.

One of the most important, but extremely uncertain, of calculations in radio engineering and design is the determination of the constants of the antenna system.

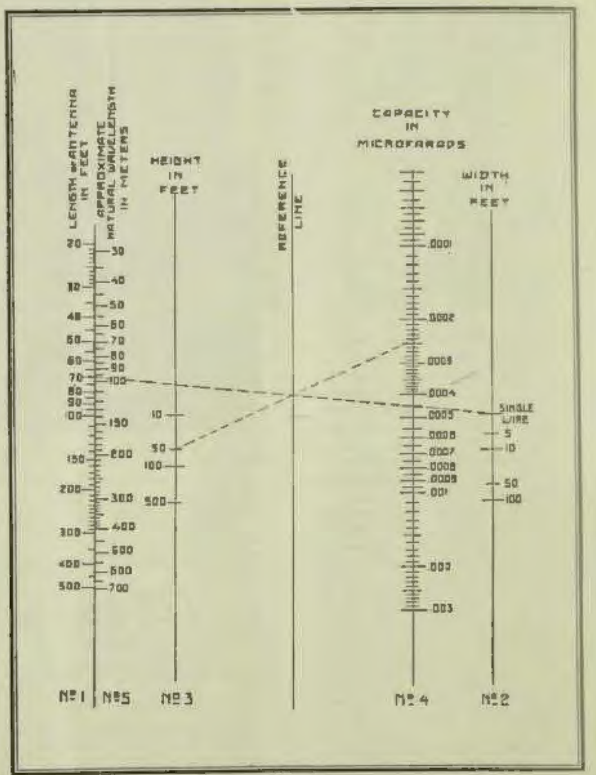
Under the term "antenna system" we understand the total construction outside of the set, connected to it in order to transmit to or receive signals or from a distant radio station. These include the antenna proper, grounds, fire-escapes, bedsprings, or any other aerial system attached to radiate or collect energy.

In the first article of this series we showed that for a certain wave length we require a certain amount of capacity and a certain amount of inductance. To use the charts in the first article, however, we were required to know the amount of capacity incorporated in the design of our antenna, in order to calculate the correct coil to use with our antenna for a given wave length.

In this article, then, we are introducing a chart that gives us the capacity of our antenna, with the requisite amount of accuracy to calculate the proper inductance for the coil to use with it.

To take advantage of simplicity, without deviating from accuracy—and the practical radio engineer always welcomes simplicity—we will neglect the inductance of the antenna, as it is small in comparison with the inductance of the coil to be used with it. This will not materially affect our calculations.

The chart (shown with this article) for calculating the capacity and fundamental wave length of our antenna system is derived from data obtained from many experimental tests and laboratory experiments on vertical and horizontal antennas.



We will readily see by trying a few calculations on imaginary antennas (with the aid of the chart) that the longer and wider (or the more wires used) our antenna is constructed, the more capacity it will have and the higher up it is suspended the less capacity it will have.

The chart has five scales.

Scale No. 1 indicates the effective length of the antenna (figuring the full length of the horizontal part and half the length of the vertical part).

Scale No. 2 contains the width of the antenna; (it also indicates the imaginary width to use for the single wire antenna). When more than one wire is used, the width will be the distance between the outer wires. The wires should be spaced not closer than two feet and not further apart than four feet in order to be effective.

Scale No. 3 indicates the value of the effective height from the ground.

Scale No. 4 gives the resultant capacity in microfarads.

Scale No. 5 gives the approximate natural fundamental wave length of the antenna, which corresponds to the values on the Scale No. 1, and in accordance with the standard formula:—

$$\lambda = 1.38\ l$$

wherein λ = the natural wave-length of the antenna in meters, and l = the length of the antenna in feet.

Let us work out the following example in order to understand clearly how to use the chart:—

We have an antenna with a 45 foot horizontal, single-wire stretch, a 40 foot vertical lead-in, and a 10 foot ground connection.

Taking the full amount for the horizontal wire (45 feet) and half the amount for the vertical part

$$(45 + 25) = 70 \text{ feet},$$

we will have an effective length of

$$\frac{(40 + 10}{2} = 25 \text{ ft.}$$

Connecting 70 on scale No. 1 with the mark "single wire" on Scale No. 2, and then connecting the profit of intersection (of this line we have drawn with the reference line) with the effective height of the antenna (40 plus 10) equals 50 feet, on Scale No. 3, we may read the resulting capacity of the antenna on Scale No. 4.

The approximate natural wavelength of this antenna would be about 97 metres.

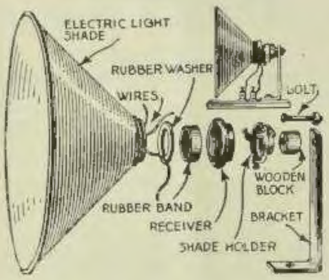
HOW TO USE THE CHART FOR DETERMINING THE CAPACITY OF YOUR ANTENNA.

With a ruler, connect the effective length of your antenna (scale No. 1) with the width of the antenna (scale No. 2). Then connect the effective height of the antenna (scale No. 3) with the intersection of the first line and the reference line. Carry the line out over scale No. 4—which will indicate the capacity of the antenna.

ELECTRIC LIGHT SHADE SERVES AS HORN FOR LOUDSPEAKER.

All that is necessary to make a very cheap yet neat looking loudspeaker is a 1500-ohm telephone receiver, a common tin electric light shade, a brass shade holder, and a few odds and ends to be found in almost any home workshop.

On a wooden base 7-8 by 4 by 8in., screw a support made from a brass strip 1-8 by ½ by 7in., drilled with a 3-16in. hole ½in. from each end, and bend as shown, 1in. from one end. Prepare a cylindrical block 1in. in diameter and 1in. long with a 3-16 in. hole through the centre and clamp it to the adjustable ring of the shade holder.



The parts of the lampshade loudspeaker in the order in which they are put together, with wooden bracket.

Fasten the block and shade holder to the top of the standard with a 1¼in. bolt. It will be found that the set screw end of the shade holder will fit over the top of the telephone the set screws holding it fast.

Place a rubber washer between the face of the telephone cap and the small end of the shade, slip a wide rubber band over the joint, and fasten the shade firmly by wiring it to the setscrews in the shade holder. Flexible leads from the telephone are brought down to binding posts on the base.—George Frederick, Washington, D.C.

R.F. Amplification Without Distortion or Reradiation.

Many beginners have been intrigued by the claims made for various involved circuits. For the novice, radio frequency is complicated, and its use does not always result in greater range with a home-made outfit.

You will do well to attempt R. F. amplification only after you have mastered a regenerative receiver and A. F. amplifier. This is especially true since the change in the broadcasting wave lengths has been in effect, because few transformers will cover satisfactorily a range from 220 to 550 metres.

To-day the question of radio-frequency amplification is uppermost in the minds of both the amateur and the broadcast listener.

Volumes have been written on radoi-frequency amplification, in which proponents of particular methods have been eager to convince readers of the merits of their choice circuits. Yet, many of those who have attempted to construct their own radio-frequency amplifiers for short wave-length work have been disappointed in the results. This is due to an inadequate knowledge of the functioning of the units employed, and the natural tendency to judge as "best" the circuits bearing high-sounding names and blessed with good press agents.

Many so-called radio-frequency amplifying transformers, or amplifying devices, which have been advertised for the shorter wave lengths, have proved to be poor. In fact, the writer has found that in some case so-called short wave length radio-frequency amplifying devices have done more harm than good. It seems only fitting that since radio broadcasting has reached a point where many wave-lengths must be used in order to relieve congestion, and since these wave lengths must be "short," the broadcast public should have a general idea, at least, as to why there is likely to be difficulty in applying only general ideas of radio-frequency amplification to circuits which they have already constructed or which they propose to construct, in order that these difficulties may be avoided.

Technical analysis has shown that R.F. amplification is more effective than A.F. in bringing in distant signals. Of course, if a signal is too weak, no matter how good the receiving set may be, the signal will not come in. In other words, there must be a slight disturbance, at least, in the neighbourhood of the antenna or loop, in order that the receiving apparatus may be affected. The antenna is capable of grasping more of the energy sent out in the form of waves than is the loop. As a consequence, much more amplification is necessary where a loop is used. In either case, where a single tube is used, and where signals are not coming in strong, or where distant signals cannot be heard, one is confronted with the problem of introducing some sort of amplification. One can use audio-frequency—a common practice—or radio-frequency. Audio-frequency has, of course, become very popular, and many receiving sets are now equipped with a stage or two of such amplification. Two stages of audio-frequency amplification, a regenerative tuner, and a detector tube, make the most popular combination. If a loud speaker is used, the amount of energy delivered by the two stages of amplification is not always sufficient to operate, especially in large, open places, so that in some cases an additional amplifier, usually of three tubes, is used to furnish sufficient energy to operate the loud speaker diaphragm.

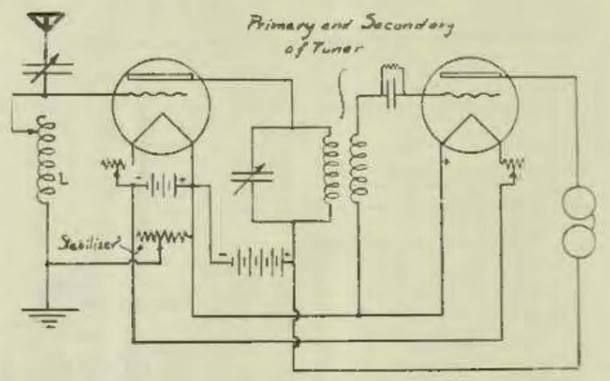


FIG. 1.
R.F. amplifier, showing a tuned primary transformer.

It has been shown by actual analysis that the detector tube is comparatively more sensitive when it is affected by a strong signal than when it is affected by a weak one. In fact, the effect which signals can produce on a detector is probably roughly proportional to their square. That is, if the intensity of the impressed signal is doubled, its effect

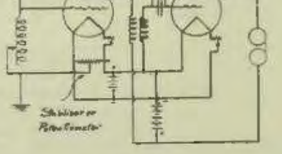


FIG. 2.
An air-cored transformer-coupled amplifier with a potentiometer to control the R.F. tube.

will be quadrupled. It is evident, then, that any amplification of the incoming signal which can be made before it reaches the detector tube

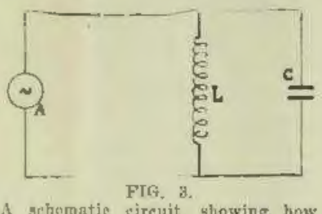


FIG. 3.
A schematic circuit, showing how a condenser and an inductance in parallel may divide the current.

will have an effect far greater than the same amount of amplification of the signal after it has affected the detector tube. Roughly, a radio-frequency (voltage) amplification of 10 has the same effect as an audio-frequency (voltage) amplification of 100. It is for this reason that so much effort has been made to devise apparatus which would properly amplify signals at radio frequency.

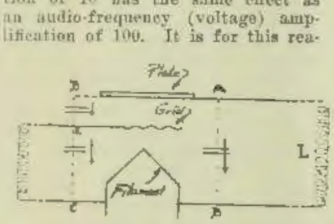


FIG. 4.
A schematic diagram showing the little fixed condensers which are present in every vacuum tube.

The design of radio-frequency amplifying circuits for the longer wave lengths is a comparatively simple matter. The long wave lengths correspond to the lower frequencies, and it is much easier to build circuits to behave properly at low frequencies than it is to build them to behave properly at high frequencies.

Various radio-frequency amplifiers were discussed in two articles by Mr. Arthur H. Lynch, in the March and April issues of "Radio Broadcaster."

Ordinarily, tremendous amplification is obtained by regeneration; and even greater amplification can be obtained by super-regeneration; but, at the same time, regeneration introduces distortion, and produces reradiation. Improperly adjusted regenerative sets may make a particular locality untenable for others who are attempting to receive, for the latter, in making their own adjustments, will be greeted with a series of variable howls and squeals which are anything but enjoyable. Regeneration can be used in conjunction with radio-frequency amplification, however, so as to prevent reradiation.

The greatest difficulty in radio-frequency amplification is to obtain this amplification without regeneration. Many of the coupled radio-frequency amplifiers for short wave-lengths operate as regenerative circuits, so that after all, the amplification in this case is determined by regeneration and not by what we would ordinarily term direct tube amplification—due to the amplification factor of the tube itself. An example of a tuned radio-frequency amplifier, as produced by a commercial company at the present time, is shown in Fig. 1. This amplifier is constructed with a set of four output coils, so that it operates at from 150 to 3000 metres. The radio-frequency amplifier is coupled to the detector tube. The grid bias voltage is obtained by means of the stabiliser shown in the figure. This stabiliser makes it possible to

(Continued on Page 13)

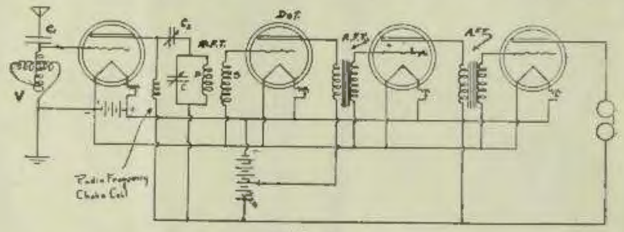


FIG. 6.
Wiring diagram of the set shown in Fig. 5. The oscillation condenser is shown as C2. Note that the B battery feeds the plate of the R.F. tube through a choke-coil.

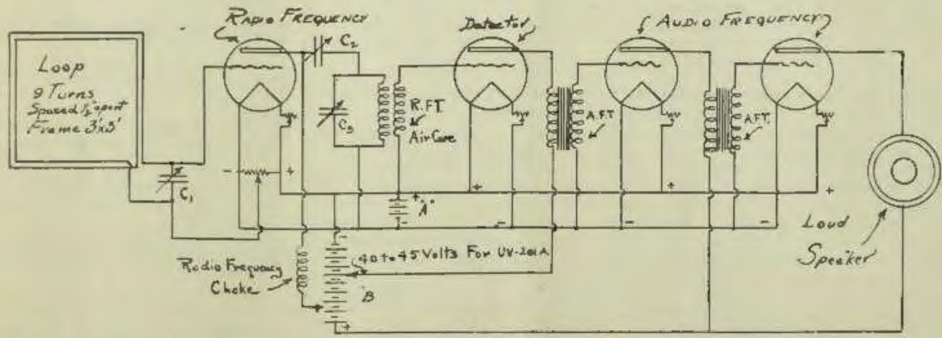
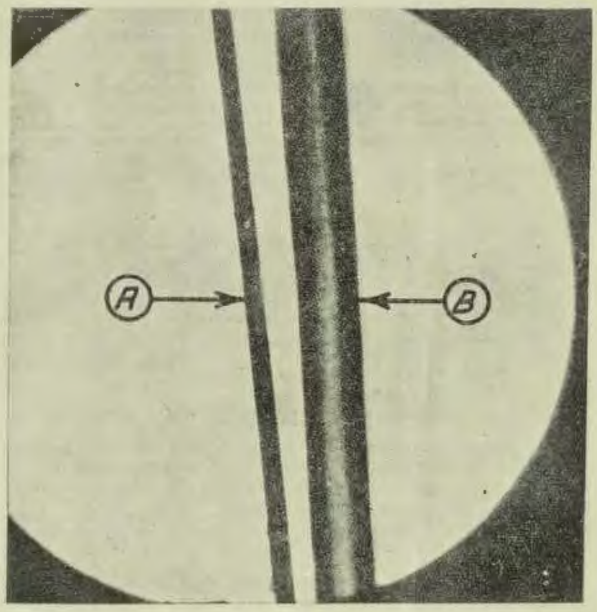


FIG. 7.
A suggested hook-up. The oscillation control condenser is shown as C2. Note that there is no grid condenser or grid leak.

Dry Cells and UV-199.



A Comparison between the Filament of a UV-199 and the Human Hair "A" Filament "B" Human Hair.

The UV-199 vacuum tube is the latest and smallest member of the Radiotron family. The men responsible for its development, realising the handicaps of the storage battery for radio receiving, have made it a dry cell tube. And while the voltage required to operate this tube is higher than for other dry-cell tubes, it is so sparing of current that under certain circumstances it is entirely feasible to operate it from a battery made up of flash-light cells!

This remarkable decrease in filament energy, compared with storage battery tubes, has not been accomplished at a sacrifice of other desirable features. As a matter of fact, the electron emission from the tiny UV-199 filament is greater than from the husky filament used in the UV-201, which requires 1 ampere at 5 volts for normal operation. This gives the UV-199 somewhat better characteristics as an amplifier, because with greater electron emission, larger B battery energy is made available for the operation of the telephone receivers.

Prior to the introduction of the UV-199, about the only dry-cell vacuum tube available to the public was WD-11. This was really the first tube put out which gave successful results on dry cells. The phenomenal popularity of the WD-11 is due to its ability to use dry cells, with advantages of low cost, reliability, freedom from attention, and ease of renewal. It is not surprising, therefore, that the WD-11 should prove to be the forerunner of the dry-cell class of tubes.

The filament of the UV-199 differs somewhat from that of the WD-11 in its electrical characteristics, in that the UV-199 is what we might call a high-voltage, low-current tube, while the WD-11 is a low-voltage, high-current tube. Although both tubes were designed to utilise the energy of dry cells, this outstanding difference in filament characteristics makes it necessary to employ different battery connections for the two tubes.

The current required by the UV-199 tube is .060 ampere (60 milliamperes). The voltage necessary to force this current through the filament is 3.0 volts, and in order to get this voltage, three dry cells connected in series must be employed. Herein lies what to some is considered a discrepancy. It is generally known that the voltage of an unused dry cell is 1.5 volts. Actually, it is usually in excess of this figure, sometimes running as high as 1.6 volts in new cells, but for convenience, and to employ round numbers, it is usually stated as being 1.5 volts. Since the UV-199 requires only 3.0 volts, the question naturally arises, "Why is it necessary to use three dry cells? Why not two?"

It must be remembered that one of the characteristics of dry cells is that the voltage drops slightly when current is drawn from them. The nominal figure of 1.5 volts per cell is what is known as the "open circuit voltage"; that is, the voltage of the cell when delivering no current. As soon as the cell is connected to any device which draws current from it, a different voltage (called the "closed circuit voltage") is obtained. The closed circuit voltage of a dry cell is always less than the open circuit voltage.

Obviously, it is the closed circuit voltage of the cell that we are primarily interested in. And while a battery made up of two cells connected in series will have an open circuit voltage of 3 volts, the minute such a battery begins delivering current to one or more UV-199 tubes the voltage will drop to something under 3 volts, which is less than that required by the tube for satisfactory operation.

Another important reason for using a battery of three cells connected in series for UV-199 tubes lies in the matter of service obtainable from the cells. As more and more energy is drained day after day from them, the voltage gradually drops, until eventually the available closed circuit voltage is just equal to that required by the tube. Any further withdrawal of energy will reduce the cell voltage to a point lower than that required by the tube, and unsatisfactory operation will result. It is evident that the lower this permissible minimum voltage (called the "cut-off voltage"), the more energy may be obtained from the cells. The cut-off voltage is determined by the electrical characteristics of the filament, which, in the case of the UV-199, is 3.0 volts.

Therefore, when three cells are used, the range through which they can be worked is the difference between the initial 4.5 volts and the final 3.0 volts, which is 1.5 volts for the battery, or .5 volt per cell. On light current drains, a cut-off of 1.0 volt per cell is sufficiently low to insure obtaining a major portion of the total energy originally stored in the cell, whereas, if the cut-off is made 1.5 volts, which would be the case if only two cells were used, the amount of service obtainable would be very small, indeed.

On account of the extremely small current taken by the UV-199 tube, filament rheostats having much more resistance than common must be employed. If the voltage of a new dry-cell battery is 4.5 volts, the rheostat must be able to absorb 1.5 volts with a current of only 60 milliamperes flowing through it. This immediately establishes the minimum resistance necessary at 25 ohms, but in order to provide a reasonable factor of safety, and to allow for flexibility in making adjustments, a rheostat having at least 30 ohms should be used.

The greatest amount of service from the battery will be obtained by always adjusting the filament rheostat as close to the "off" position as possible, consistent with good performance. Incidentally, this method of control will also result in prolonging the life of the tube.

When so used, the filament rheostat can be looked on as a rough indicator of the condition of the battery. With new cells, it will be necessary to move the rheostat only a very short distance away from the "off" position. As the voltage of the cells is reduced through service, the handle must be moved farther and farther over to obtain good results, until finally, it must be thrown all the way over. This is an indication that the voltage of the dry cells has fallen to the voltage of the tube, and when this happens, the cells are exhausted and should be discarded and new ones installed.

The capacity of a dry cell is measured in ampere-hours, the same as a storage battery. An ampere-hour is the amount of electricity taken from a battery when a current of one ampere flows for one hour, or $\frac{1}{4}$ ampere for four hours, or $\frac{1}{8}$ ampere for eight hours, etc. It is always obtained by multiplying the time in hours by the current in amperes.

It is impossible to state the capacity of a dry cell, unless all the conditions under which the cell will work are known. The question, "What is the capacity of a dry cell?" is quite similar to that old one, "How high is up?" It is as easy to answer one as the other.

There are three major factors, each having an important bearing on the capacity of a dry cell, and all three are under the control of the user. They are: the cut-off voltage, the current drain, and the average number of hours the cells are used daily.

Just how can the user control these factors? Take the cut-off voltage. This, in connection with the UV-199 tube, is determined by the number of cells, connected in series, used to operate the tube. For example, the tube voltage is 3.0 volts. If two cells are used, the cut-off for the two cells is 3.0 volts, or 1.5 volts per cell. With three cells, the cut-off becomes 1.0 volt per cell, and with four cells it is $\frac{3}{4}$ of a volt per cent. In general, the lower the cut-off voltage, the greater the capacity of the cell, but in this case it is inadvisable to reduce the cut-off of $\frac{3}{4}$ of a volt by using four cells, for two reasons. First, the cost of a fourth cell is a 33 1-3 per cent. increase over the cost of three cells, while the extra amount of service obtained by using four cells is less than 33 1-3 per cent. greater than from three cells. In other

(Continued on Page 20)

Continued from Page 9

prevent the amplifier from oscillating. When the arrow is at the extreme right, the grid of the tube is most positive, and when it is at the extreme left, the grid is most negative. As the arrow moves towards the left, the circuit is more and more likely to oscillate. A radio-frequency amplifier should operate without regeneration and without oscillating. Those who have operated a regenerative receiver know that as the tickler is moved up to a certain point no sound is heard, but suddenly a definite point is reached where a click is heard in the telephones. This click is due to the fact that the tube has begun to oscillate at a radio-frequency. When the tube oscillates, the current furnished to the tube by the B battery changes and it is the change of this current through the receivers that produces the click. When the tickler is moved still further, another click will be heard. This second click indicates that the oscillations have ceased. In tuning in a station, regeneration is obtained (if the setting of the tuner is correct for the particular station) just before the first click occurs. If a radio-frequency amplifier is oscillating at a radio frequency, this fact can be detected by touching the finger to the grid of the tube. If oscillations are present, they will be stopped by this act so that a distinct click will be heard in the telephones. This is not the proper state of a radio-frequency amplifier.

Fig. 2 shows a simple type of radio-frequency amplifier involving an air core coupling transformer. The operation of such a circuit is very difficult at short wavelengths because the tubes are almost bound to oscillate unless the potentiometers shown are so adjusted that the grids of the tubes are positive. When the grids are positive, the possibility of oscillation, and therefore of regeneration, is reduced, but it will usually be found that under these conditions the ordinary radio-frequency amplifier is not of much use. In other words, if the grids are made positive and then are slowly made negative, in the act of tuning, it will be found that the operation of the circuit will depend upon a critical adjustment of the potentiometers. This means that the circuit is operating on the border of oscillation; that is, it is acting as a regenerative circuit. This can be definitely determined by having the circuit in operation under such conditions and by sliding the potentiometer dial in such a position that the grid is as negative as possible (that is, by sliding the potentiometer to the extreme left in the figure). Under these conditions, if the amplifier is oscillating, a distinct click will be heard on touching the grid connections of either tube.

The action of radio-frequency circuits may be understood more clearly by considering some of the units which make them up. For instance, a coil of wire in an electric circuit offers no more opposition to the flow of direct current (that is, current flowing in one direction only and interchanging in value) when the wire is in this form than it does when the wire is unwound. For currents which alternate in direction, the situation is different. The higher the frequency, the more opposition the coil offers to the flow of current.

Further, an electric condenser is made up of two adjacent conducting surfaces separated by an insulating material. It does not allow any direct current to pass through it, yet, if an alternating voltage is impressed on a circuit containing a condenser, the current which flows depends upon the frequency. The higher the frequency of the alternations of the impressed electric force or voltage, the greater the current. Short wave-lengths correspond to high frequencies. For example, a wave length of 300 metres represents a frequency of one million cycles a second. A wave length of 100 metres represents a frequency of three million cycles a second. Keeping these facts in mind, the result can be illustrated by means of the circuit shown in Fig. 3, where there is an alternating current generator capable of producing an electric force or voltage of any desired frequency. If the frequency is very low, all the current will flow through the coil L, for the lower the frequency the less will be the opposition which the coil offers to the flow of current through it. At high frequencies, the tendency of the current will be to flow through the condenser C, for the higher the frequency the lower will be the opposition which the condenser offers to the flow of current through it. It is possible, then, to have a frequency o high that much of the current will be passed by the condenser C. When the frequency is such that the opposition offered by the condenser is practically the same as the opposition offered by the inductance, then the circuit is said to be in resonance. Such is the case, for example, when the parallel circuit of Fig. 1, made up of the condenser and inductance, is properly tuned to a particular wave.

A very small capacity may have a very harmful effect at high frequencies. In the case of radio-frequency amplification, the little condensers in the vacuum tubes themselves cause much mischief. Small condensers are formed by the grid and filament, and by the plate and grid, so that if we were to represent these little condensers on the outside of a vacuum tube, we would have a picture much like that shown in Fig. 4. These little condensers are capable of causing oscillations at high frequencies, for if a pressure exists between the points AB, it will not only send a current through the little condensers represented by the plate and filament, but it will also send a current from B to C through the little condensers represented by the plate and grid, and by the grid and filament, respectively. The current flowing through the condenser between E and C causes the proper kind of voltage to be impressed on the grid of a tube to produce an oscillating current in the plate circuit, if the plate circuit contains a small amount of inductance, as shown. Usually the grid circuit also is tuned by an inductance, as shown by the dotted line. This aggravates the tendency for the tube to oscillate. Therefore one may construct a radio-frequency amplifier with apparently no condensers, and yet the amplifier may oscillate and give no results whatever.

Tuning the transformers of a radio-frequency amplifier has the effect of building up parallel circuits of capacitance and inductance eager to oscillate, but in the receiver illustrated in Fig. 5, this tendency is curbed as shown in Fig. 6.

The tuning element consists of a series antenna condenser C1 in series with a variometer V. The first tube is used as a radio-frequency amplifier, and it is coupled to the detector tube by means of a tuned primary radio-frequency transformer which is prevented from oscillating by means of the control condenser C2. This little condenser is a variable of about .0002 mfd. capacity. The primary of the radio-frequency transformer is tuned by means of the condenser C3, which has a maximum capacity of .001 mfd. The secondary of the radio-frequency transformer is not tuned in any way, but it is connected directly to the grid of the detector tube, as shown. The control condenser in the plate circuit makes it necessary to furnish the B battery voltage to the plate through the radio-frequency choke shown. This is an iron cored coil. No grid bias is used in this set and there is no stabilising device such as a potentiometer. It is interesting to observe that the detector tube contains no grid leak or grid condenser. The designing engineer for this company has found that the insertion of the grid leak and grid condenser in the set actually hinders its operation.

The detector tube works with two stages of audio-frequency amplification, as shown. These are of the usual form. The dial marked "Osc. Control" (Fig. 5) operates the condenser C2 (Fig. 6). The dial marked "antenna inductance" operates the variometer V, and the dial marked "radio-frequency control" operates the condenser C3. These dials are unique in that they operate at all times with a micrometer adjustment; that is, the knob makes several revolutions in order to advance the dial through its full scale. The condensers C2 and C3 are so arranged that the shaft supporting the movable plates, and running to the knob, is always farthest from the plate side of the condenser: that is, it is always at the potential nearest that of the filament. In this way, both capacity effects are nearly eliminated.

A variation of this circuit is shown in Fig. 7. In this circuit a loop is used in conjunction with a small tuning condenser C1. The control condenser is shown as C2, and the transformer tuning condenser as C3. The radio-frequency transformer may be made up of cardboard tubes. Bakelite apparently does not work as well under ordinary conditions. The two windings may be placed one inside the other as shown in Fig. 8. The inner winding may be used as the primary and the outer winding as the secondary. Both coils should be wound in the same direction. They can be made up with ordinary cotton covered or enamelled wire of from Nos. 22 to 26. The primary should have comparatively few turns compared to the secondary. The exact number can be determined only by practice. Roughly, from 30 to 40 turns on the primary and from 75 to 100 turns on the secondary will probably give good results if the ratio of the diameter of the primary winding to that of the secondary is about 0.6. The radio-frequency choke may consist of an old primary of an audio-frequency amplifying transformer or any iron-cored coil of only a few layers in which the wire is not too fine.

This set is subject to almost perfect control by means of the series plate condenser C2, and with it, radio-frequency at short wave lengths is very satisfactorily accomplished.

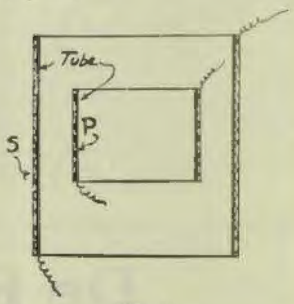


FIG. 8.
A cross-section showing the arrangement of the coils that make up the primary and secondary of the R.F. transformer. The two lower leads should go to the filament and B battery if both coils are wound in the same direction.

LIGHTHOUSES TO FLASH RADIO BEAMS.

A new phase in the history of radio as a means of insuring a greater safety to ships at sea will open with the installation on all lightships and lighthouses during the next three months of radio "beacons" for the purpose of sending directional signals which will enable mariners to establish their exact location. These "beacons" will be of enormous value in foggy weather, when a lighthouse is virtually out of commission; even in clear weather they will carry farther than the ordinary light.

WAVERLEY AMATEUR RADIO CLUB.

At the meeting of the Waverley Amateur Radio Club, held on the 26th July, with Mr. M. Perry in the chair, it was decided to endeavour to arrange debates with the Bondi Club, the Metropolitan Club, and the Railway Institute Club, which is just forming. Two subjects would be suggested: "Isolated sets versus panel sets," and "Home-made versus bought apparatus." Four speakers would represent each club.

A short impromptu debate was then held, Mr. Perry adjudicating. The question of the "isolated" and "panel" sets was discussed. The case for the panel apparatus was fought by Messrs. Bowman, Tatham, Burrows and Plumb, while Messrs. Thomson, Howell, Anderson, and Nott spoke fluently for the isolated set.

In summing up, Mr. Perry said that although he was personally convinced that the isolated set was the better, on the arguments put forward he must award the verdict to the "panel" advocates. The announcement was greeted with cheers by the winners, after which the meeting closed.

CROYDON RADIO CLUB.

At the last meeting, held at the club rooms, "Rockleigh," Lang Street, Croydon, on Saturday, July 28th, a large number of members welcomed the President of the club, the Rev. W. E. Maltby.

Club badges are now available to members at meetings, or upon application to the Secretary.

Morse practice was given to members.

Mr. Fry (2KC) was present, and gave a very interesting talk to all present upon technical questions, and then upon his transmitting experiences.

The club hopes to start building a unit receiver shortly, so that members may be able to see the construction of each unit.

The Hon. Secretary will be pleased to hear from anyone wishing to become a member of the club. Address, "Carwell," Highbury Street, Croydon.

LEICHHARDT AND DISTRICT RADIO SOCIETY.

One of the most successful meetings of the Leichhardt and District Radio Society to date was held on Tuesday, July 31st, when members rolled up in force to entertain members of the Leichhardt and Annandale Municipal Councils, at a demonstration at the club room, 176 Johnston Street, Annandale. The gathering was a large one, and those present were treated to the reception of music, speech and Morse signals from several stations. By means of a Magnavox loudspeaker, kindly loaned for the occasion by Messrs. Colville-Moore, the signals were amplified to a considerable extent.

Later in the evening a number of musical items were rendered by the Society's orchestra, and refreshments were partaken of.

Before dispersing, a number of appreciative speeches were made by both members and their guests, the latter especially expressing pleasure with the night's amusement and instruction.

The next meeting is to be held on Tuesday next, when all interested are invited to be present. All communications should be addressed to the Hon. Secretary, Mr. W. J. Zech, 145 Booth Street, Annandale.

NEW RADIO CLUB AT NEUTRAL BAY.

On Wednesday evening, August 1 wireless experimenters of Neutral Bay were brought together and a club known as the Neutral Bay Radio Club was formed.

Preliminary business only was dealt with, but about twenty members were enrolled, and in order to finalise the actual formal procedure of the Club's formation, another meeting is being held next Thursday, August 9th, at 8 p.m., at "Belle Vue," 180 Kurraba Road. All experimenters are especially invited to attend.

Communications relative to the Club should be addressed to the Hon. Secretary, Neutral Bay Radio Club, at the above mentioned address.

To the Editor

Melbourne,
1st August, 1923.

The Editor,
"Wireless Weekly."
Sydney.

Dear Sir,

With reference to "2X's" letter in your paper, anent the question, "Why don't N.S.W. experimenters listen in?"

"2X" appears to have a most distorted and biassed idea of wireless phenomena, particularly with regard to the absorption powers of mountains. He should realise firstly that the regulations regarding power hold good in Sydney as well as in Melbourne, and that even though some of the power inputs of Victorian stations are not as high as those in Sydney, the useful outputs compare very favourably both in radiation per H.W.A., and according to reports received.

At least one Melbourne experimenter has been read on one tube at Charters Towers, Queensland, even though the signals had to go over the very same erratic mountains to which "2X" refers, whilst verified reports of phone reception on one or two tubes from the northern parts of New South Wales—and in fact a few of the more efficient Sydney stations—are numerous.

With regard to the New Zealand tests. "2X" seems to think this is "freak" work. The Victorian two way tests extended over a period of seven nights, and on every night in question C.W. communication was maintained without defect. Two of our stations were able to work Mr. Bell, of New Zealand, with phone, using 5 watts input. Is this "freak" work? Naturally communication could not be maintained on a commercial basis, but what 10 watt C.W. station could work 1500 miles continuously? The statement regarding the paucity of experimental stations is absolutely ridiculous, and the absence of the howling valve nuisance would appear to be due to the more skilful handling of receivers in this State.

After carefully considering "2X's" letter, I still maintain that the fact that we cannot work New South Wales is due to the receiving sets in operation there, in spite of the suggestion of "2X" that the intervening mountainous system is a rectifier or a unilateral conductor of ether waves favouring transmission from New South Wales. If, however, this suggestion is correct, I wish to protest against this iniquitous discrimination, and I hope our geologists will see that the use of the mountains is made a Federal matter, and that their absorbing qualities be made to affect all States equally.—Yours, etc.,

"3X."

The Editor,

"Wireless Weekly,"

Dear Sir,

I notice in your last issue that Mr. P. Renshaw, the Chairman of the New South Wales Radio Association has seen fit to make some typical statements regarding the Victorian Division of the Institute.

The Victorian Division has not expired, in fact, it is rather lively at present, its membership being over 300. To say that things are unsettled in this State is wilful. And let me tell Mr. Renshaw that this Division has never washed its dirty linen (it has never had any) publicly, and its officers do not indulge in promiscuous publicity for pure self-glorification. They work for the good of the experimenter all over the Commonwealth. Our conduct of the Trans-Pacific Test for example—the idea originated from the Victorian Division—does not include public haggling over the allotment of prizes, nor do our leading experimenters criticise one another in derogatory terms in public.

The cool effrontery of N.S.W. Division in sending a member of the wireless trade over to represent the whole of the Institute in Australia at the Broadcast Conference left Victorians speechless. No other divisions were consulted in this regard, and the Department had told N.S.W. that Victoria would represent them in this instance as before. West Australia, South Australia and Tasmania were content to leave the matter to this Division. There has been no proper courteous communication from N.S.W. since Mr. Malcolm Perry ceased to act as Secretary. Mr. Perry enjoyed the fullest respect of all the officers of this Division, and I may state that Mr. Renshaw most emphatically does not. This Division does not take orders from New South Wales any more than that Division takes orders from us. Again, we are an experimental body, not an offshoot of a large monopolistic business concern. We are not governed by profit-making bodies, but by purely disinterested persons.

Mr. Renshaw felt aggrieved that the Waverley Club handled the Trans-Pacific Test for New South Wales. We have had very satisfactory relations with that body, and are on excellent terms with its officers. Did Mr. Renshaw think that the Test was to await his pleasure for three months? Does the whole conduct of the New South Wales Division rest on his shoulders alone? Could not authority for action be delegated. Over three months elapsed before Mr. Renshaw saw fit to answer the letter from the Trans-Pacific Committee, and the President very sensibly asked a leading Sydney experimenter for advice, and when he obtained the same, followed it without delay, that is why the Waverley Club—which, by the way, I understand is the leading Club in New South Wales—acted in New South Wales.

This is not an official letter, but the expression of a private opinion held by one who has been identified with experimental wireless since 1910, and who objects to ignorant criticism being levelled at a body which has done more for experimenters than any other unit in Australia.—Yours, etc.,

"SEMPER VERITAS."

VICTORIAN NOTES.

MR. MALONE'S ADDRESS.

A highly successful meeting of the Wireless Institute of Australia, Victorian Division, was held in the Rialto, on Tuesday, the 31st July. Over 300 members were present, and they taxed the increased accommodation to the utmost. The features of the evening were an address by Mr. Malone regarding the new experimental regulations and a description and exhibition of his famous receiving by Mr. M. Howden, the Commonwealth winner of the Trans-Pacific Test.

Mr. Malone first read the new Regulations, and explained the bearing of each section, and announced he would be prepared to answer questions. He said that rumours to the effect that experimenters would be adversely affected by broadcasting were not correct, and that experimenters would actually be in a better position than before as they would have a better status. The wave lengths allotted to transmitters would be between 100 and 250 metres, though provision had been made to allot waves outside that band in special circumstances. Applicants for licenses must be bona-fide experimenters, and would be required to state specifically what experiment they would be engaged in. Transmitting licenses would only be issued to competent persons. The fees were 10/- receiving, and £1 transmitting per annum. The present transmitters would probably not be interfered with until broadcasting actually started, and then the wave-length would probably have to be altered. Mr. Malone pointed out that there would be a marked distinction between persons who merely wished to listen to broadcasting and genuine experimenters, and it was evident that an experimenter must not use his apparatus to entertain a circle of friends.

Mr. Malone's kindness in giving the Institute this opportunity of asking questions was keenly appreciated and the termination of his address was the signal for great applause.

Mr. Selby, who was unanimously appointed an honorary member of the Institute, was present at this meeting ,and Mr. Malone made reference to this gentleman's early experiments. Mr. Selby gave a brief explanation of his work in 1896 between a station at Brighton and the old "Cerberus." He carried out tests up to five miles by means of a coherer, which were quite successful. The first message he received was "What ho she bumps," sent from the "Cerberus," and received at Brighton. Mr. Selby then gave a series of demonstrations of the utility of wireless, but was laughed at for his pains. He prophesied the advent of wireless telephony, but this prognostication was treated with levity, the newspapers of the time refusing to take it seriously. Mr. Selby's remarks were received with deep attention.

Mr. Howden then gave a description of the working of his set, and exhibited his apparatus, which is of a very simple and clean-cut design. He drew his circuit on a blackboard, and pointed out the method in which he handled it during his experiments. This demonstration was received with rapt attention by the large gathering, and vociferous applause broke out when Mr. Howden was announced the Commonwealth and State winner of the Trans-Pacific Test.

It has been decided that the old Wireless Institute will not drop its present organisation until the work of affiliation is complete. Nine clubs are now practically affiliated, but the need for an experienced central body is still apparent, so the old Division still flies the flag proudly. The membership is going up by leaps and bounds, and it is hoped that 1924 will see the 1000 mark passed.

Messrs. O. J. Nilsen and Co. recently gave a very interesting demonstration by radio from their new showrooms. Music was supplied by five artists in the special studio fitted up for the purpose. A small power radiophone supplied the necessary energy. Very encouraging reports were received from various sources, and Messrs. Nilson and Co. will continue to experiment along the same lines.

Important Request to Radio Clubs.

Mr. Charles Maclurcan has received the following lettter from the American Radio Relay League, and requests all Radio Clubs to discuss the proposal contained therein at their next council meeting. He would like them to notify him of their views on the subject not later than August 31st, so that he will be able to convey their ideas to the A.R.R.L.

The American Radio Relay League
Executive Headquarters,
Hartford, Connecticut,
June 16, 1923.

Mr. Charles Maclurcan,
13 Brisbane St.,
Sydney, Australia.

Dear Mr. Maclurcan:

I am writing to you as one interested in amateur radio and hope you will give the subject matter of this letter your earnest consideration and let me have your best judgment on the matter. I would suggest that it be referred to your amateur organisations in Australia so as to get a consensus of opinion.

During and subsequent to the last Transatlantic tests the question came up of the best way of distinguishing or differentiating the nationalities of various amateur stations, especially when there is intercommunication between those of different countries. Various suggestions have been made, all with more or less merit, and I would like to present for your consideration the one which seems to have found the most favour and is the simplest.

While our present arrangement between Canadian and U.S. amateurs of designating the nationality by the separation signs "fm" and "aa," instead of "de," is satisfactory, when applied to communications between British, French, Australian, South American, Mexican, Cuban and other amateurs, you can readily see that in each case it would mean an individual separation sign of some sort or combination of letters, and if these combinations were simply arbitrary and did not mean anything, we would be required to learn practically a whole new alphabet in order to know who was being called and who was doing the calling.

It therefore is apparent that a simpler method of identification is in order and we believe that by using the initial of the country to which the station belongs as the separation sign will solve this difficulty. To illustrate, if Canadian 9AL is called by U.S. 1AW, he would call as follows: "9AL cu 1AW"; the letters "cu" designating the nationality of the station called and the station calling. As another example, if British 2SH call French 8AB, he would use this procedure: "9AF fb 2SH." British "b"; French "f"; Canadian "c"; United States "u."

This arrangement is on the same order as that now existing between Canadian and U.S. amateurs, except that instead of using the arbitrary letters as separatives we use the initials of the countries in question; this makes identification easy and sure, requires no additional explaining of the intermediate or separative sign by the amateurs and does not increase the length of call as the other systems suggested would do.

I have had the matter of the legality of this arrangement up with our Department of Commerce, who advise that while it is not strictly in accordance with international regulations, yet at the same time they do not think it would give rise to any international or governmental complications and if the amateurs of the various countries were to adopt it, they could present their recommendation or request for its official recognition at the next international radio-telegraphic congress.

I wish you would think the matter over carefully, and if you have objections, let me hear from you in the near future, or if you see no objections will you talk it over with your own amateurs, and if it meets with their favour, give it what publicity you can in order that we may know whether Australian amateurs as a whole endorse this plan or not. We would like to have their endorsement, in order that a uniform arrangement may be used and that we can present a uniform plan at the next congress.

Please let me hear from you at your earliest convenience.

Yours sincerely,
(Sgd.) C. A. Service, Jr.
C. A. Service, Jr., Assistant Secretary.

South Australian Experimental Transmitting Stations.

5 A C	V. R. Cook	37 John's Road, Prospect.
5 A D	A. R. Snoswell ..	..Harris St., Exeter.
5 A E	J. M. Honner	Alpha Road, Prospect.
5 A G	W. J. Bland	Buller Terrace, Alberton.
5 A V	C. E. Ames	25 Dequetteville Terrace, Kent Town.
5 A H	F. L. Williamson	(Wireless Institute, S. A. Division), 20 Grange Road, Hindmarsh.
5 A W	Adelaide University	Adelaide.
5 B D	F. E. Earle	Fifth Avenue, St. Peters.
5 B I	School of Mines	North Terrace, Adelaide.
5 B N	H. L. Austin	8 Parade, Norwood.
5 B Q	L. C. Jones	Carlisle Rd., Westbourne Park.
5 D P	R. B. Caldwell	53 Hughes St., North Unley.
5 F T	J. S. Fitzmaurice	St. Andrew's St., N. Walkerville.

Continued from Page 11

words, it is not economical. Secondly, there are no filament rheostats generally available having sufficient resistance to absorb the extra voltage of the additional cell. As far as the UV-199 tube is concerned, therefore, the cut-off becomes established at 1.0 volt per cell.

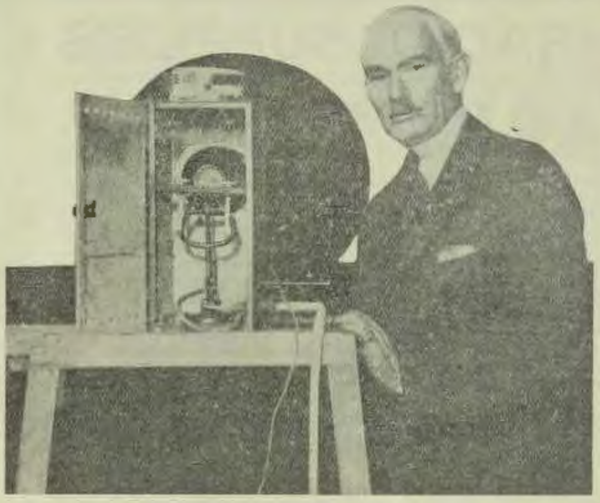
The effect of different current drains on the capacity of a dry cell is somewhat involved. In general, the smaller the current, the greater the capacity, but this is true only within certain limits. If the current taken from the cell is too small, the time required to exhaust it is so great that the factor of natural depreciation becomes active, thereby reducing the capacity. If the current is too great, the capacity is again reduced, due to the lowered battery voltage. So, in choosing a current drain for dry cells, one must be taken which is somewhere between these two extremes. It is necessary to choose between a heavy current, which discharges the cell rapidly, but reduces its capacity, and a very light drain which prolongs the time of service but also reduces the capacity. On radio loads, where current is drawn from the cells for an average of two or more hours per day, this happy medium occurs somewhere in the neighbourhood of ⅛ ampere.

In both cases, maximum capacity is obtained at a current drain of about one-eighth (.125) ampere. At smaller drains than this, the capacity falls off, due to the natural depreciation of the cell, and, as is to be expected, the decrease in capacity is greater for the cells which were in use only two hours per day, because the length of time required to exhaust them was so much greater. Thus, at a current drain of .06 ampere (the current taken by one UV-199 tube) the capacity at 2 hours per day was 21 ampere-hours, which means that the number of hours' service obtained was 350. Since the cells were discharged only two hours per day, it required 175 days, or approximately six months to complete the test. In the case of the 4 hour per day cells, the capacity was 26.4 ampere hours, which was 440 hours of service. But since these cells were in use 4 hours per day, the test only lasted 110 days, or about 3 2-3 months instead of six, and it is this shorter time which explains the increase in capacity.

Although it is in the power of the user of a radio set to regulate the number of hours of service each day, it is unreasonable to expect him to do it. Under certain conditions, greater capacity will be obtained from dry cells by reducing the number of hours they are in use daily, but can you imagine a radio enthusiast shutting down his set at 8.57 p.m. right in the middle of a good programme, merely because by so doing he will be adding a possible 5 per cent. or 10 per cent. to the life of his A battery? It is to laugh.

The number of hours the average set is used daily is a moot question. At one time, it was generally felt that two hours a day was fairly representative of average performance. But of late, loud speakers are coming into more general use, and because of this, the amount of time put in by the average set has gone up considerably. Eventually, of course, all receiving sets will employ loud speakers. A receiving set without a loud speaker will some day be as much of a curiosity and excite as much comment as an automobile without a top. Because of the tendency toward universal loud-speaker operation, it is felt that the time the average set is used daily is closer to four hours than two. There are some individual cases known where the set is used an average of eight hours a day!

The most economical current drain on the dry cells used as an A battery can be obtained by connecting the proper number of cells in multiple, when this is done total drain is equally divided between the cells, so that each one delivers only a fraction of the total. In connection with UV-199's, however, the situation is somewhat complicated, because of the necessity of using three cells connected in series to obtain the correct voltage.



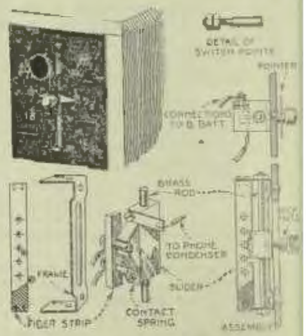
Dr. de Forest and His New Microphone Which He Developed for the Phonofilm. Inside the Box May Be Seen the Burner and Electrodes.

UNIQUE SWITCH GIVES DISTINCTION TO HOME-MADE RECEIVING SET.

If you wish something original for one or more of the switches on your radio set, the simple sliding switch mechanism illustrated will be found a neat, serviceable, and distinctive arrangement.

I use it to vary the plate voltage current for the B battery, but it would serve equally well, of course, for the taps of a vario-coupler or other variable inductance. Although not as easy to instal as the common radial type switch, it gives one the satisfaction of having a radio device that is a trifle out of the ordinary.

A slider with a contact spring is arranged on a brass rod behind the panel in such a way that it can be moved by means of a knob into engagement with switch points. A brass strip soldered to the spring and projecting to one side about 1in. carries the current to the phone condenser through a flexible wire, and the terminals of the B battery are connected with the switch



The switch points of this unusual sliding radio switch are concealed behind the panel.

points. These are mounted one below the other on a fibre, hard rubber, or composition strip.

A strip of sheet brass about 1-16in. thick is bent up, as shown, to form the frame, and a slot is provided for the slider, as well as holes for the screws to attach the strip for the switch points. The slider itself is made of fibre, and the contact spring is a light gauge of spring brass.

A brass rod is mounted on the frame by means of terminal nuts to act as a guide for the slider, which is kept from turning by the guide slot in the frame.

The slider is manipulated from front of the panel by moving a brass screw with a knurled edge. This knob is provided with a pointer held in position with locknuts.

Graduations engraved on both sides of the panel slot and filled with white paint give the finishing touch to this novel switch.

—A.M.C.

It may interest the novice to know that the ordinary vacuum tube used for receiving is rated at a power of approximately one watt, or about one-fiftieth of the power that is used to light the ordinary electric-light bulb.

RADIO SAVES A LIFE AT SEA.

John H. Steel of the U.S. Lighthouse Service, owes his life to radio. He was on duty on the Fenwick Island light-ship, thirty miles south-east of Cape May, when he was taken suddenly with an acute attack of appendicitis; immediately a radio call for help was sent out, and a Coast Guard cutter, in spite of a storm that was raging, made its way out to the lightship. He was transferred to the cutter, and rushed ashore in time for an operation that saved his life.

A TRANSMITTING MACHINE THAT SENDS 80 WORDS A MINUTE.

In tests recently conducted between the Majestic and a short station a speed of 80 words a minute was attained by the use of sending and receiving machines, and was shown to be practicable for commercial use. Some idea of what this means may be gained from the fact that it is virtually impossible to maintain a speed higher than 25 words a minute when messages are transmitted and received by hand.

Experimental Wireless Licenses.

VICTORIA.

Wireless Licences for experimental purposes have been issued during the month of May, 1923, to the following:—

RECEIVING ONLY.

Call Sign.	Name.	Address.
3 X T	Geelong High School Radio Club (J. W. Brown)	Ryrie St., Geelong. R.
3 X V	Bryan, E.	5 Hill St., South Melbourne. R.
3 X W	Cullinan, C. A.	Diggers' Rest. R.
3 X X	Boileau, R. J.	126 Chapel St., Windsor. R.
3 X Y	Debney, B. R.	24 Hoddle St., Essendon. R.
3 X Z	Jackson, C. W.	179 Johnson St., Collingwood. R.
3 Y A	Geelong Wireless Club (S. H. Milligan)	Myers' St., Geelong. R.
3 Y B	Corrie, R. T.	8 Howard Rd., Mount Albert. R.
3 Y C	Smith, J. P.	Hunt St., Yarrawonga. R.
3 Y D	Wetherston, W. S.	20 Denman Ave., East St. Kilda. R.
3 Y E	Heinrichsen, N. B.	3 McIver St., Brunswick. R.
3 Y F	Harvey, L. E.	35 Mary St., Glenferrie. R.
3 Y G	Mackinder, W.	18 Strathalbyn St., Kew. R.
3 Y H	Wakeum, E. J.	81 Westgarth St., Northcote. R.
3 Y I	Doig, C. E.	27 Laura St., Moonee Ponds. R.
3 Y J	Lowe, T. E.	12 Haverbrack Ave., Malvern. R.
3 Y K	Shirley, H.	48 Reeding St., North Brighton. R.
3 Y L	Alder, W. L. V.	Embankment Grove, Chelsea. R.
3 Y M	Mackay, P. A.	Kyneton. R.
3 Y N	Harkin, D. J.	17 Athol St., Prahran. R.
3 Y O	Seidel, H. E.	47 Kent St., Kew. R.
3 Y P	White, W. F.	Dickson St., Euchuca. R.
3 Y Q	Wells, A. E.	245 Grant St., South Melbourne. R.
3 Y R	Bird, G. H.	Amphitheatre. R.
3 Y S	Filshie, D.	35 Myrtle Rd., East Camberwell. R.
3 Y T	Arnoldt, E. F.	Nolan St., Kerang. R.
3 Y U	Gillingham, O.	24 Gadd St., Croxton. R.
3 Y V	McEvoy, J. T. V.	"Maribyrnong," Thames Promenade, Chelsea. R.
3 Y W	Parish, L. C.	16 Royal Crescent, Armadale. R.
3 Y X	Onus, J. G.	Macquarie St., Windsor. R.
3 Y Y	Cheers, R. A.	73 Munro St., Brunswick West. R.
3 Y Z	Rose, H.	86 Thames St., Box Hill. R.
Nature of Licence.		
C	Butler, C. E.	"Clinton," Mountain Rd., Montrose. R.
C	Pollard, J. A.	45 Clyde St., St. Kilda. R.
V	Sly, L. J.	Sloane St., Stawell. R.
C	Lane, K. L.	26 Derbey St., Camberwell. R.
C	Alcock, H. U.	14 Denbigh Rd., Armadale. R.
V	Rafferty, J. J.	68 Studley Park Rd., Kew. R.
C	O'Brien, T.	Mortlake. R.
C	Kells, A. C. E.	366 Ascot Vale Rd., Moonee Ponds. R.
C	Wearne, T. S. P.	6 Graham Place, Upper Hawthorn. R.
C	Mepham, W. G.	133 Hamburg St., Richmond. R.
C	Moran, A. L.	14 Epping St., East Malvern. R.
C	Melville, W.	98 Lennox St., Moonee Ponds. R.
C	Burman, A. A.	331 Punt Rd., Richmond. R.

SHIPS YOU SHOLD HEAR.

Ellaroo	VZDN
Emita	VHG
Encounter	GABK
Enoggera	VXG
Era	VZBM
Eromanga	VHH
Erriba	MVHJ
Eudunda	CGG
Eurelia	CGF
Eurimbla	VZBY
Fantome	GABL
Fiona	VHQ
Flinders' Naval Base	VKP
Flora	VHR
Gabo	VZBK
Garden Island Base	VKQ
Geranium	GABM
Gilgai	VJK
Goulburn	VKX
Governor Musgrave	VZG
Hexham	VZBJ
Hobart	VHA
Hobson's Bay	VZBW
Huron	GABN
Iron Baron	VHI
Iron Chief	VZBU
Iron Monarch	VXI
Jervis Bay	VZDK
Junee	VZF
Kadina	VZI
Kangaroo	VHM
Kanowna	VHD
Karoola	VHE
Karuah	VZH
Katoomba	VHN
Komura	VZBC
Koolonga	VZBT
Koonda	VZRD
Koonda	VZBD
Kooringa	VXJ
Kooyong	VXH
Kowarra	CGS
Kurumba	CGQ
Lady Loch	VHS
Lammeroo	VZJ
Largs Bay	VZBS
Levuka	VHB
Loongana	VJH
Macedon	CGX
Makarra	VXX
Macumba	VXY
Makambo	VZB
Malina	VKI
Mallow	GAPB
Marguerite	GABQ
Marrawah	VZZ
Marsina	VKY
Mataram	VHU
Melbourne	GABB
Melbourne	VZBF

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