THE AUSTRALASIAN

Radio World

VOL. 7 ..... NO. 8 JANUARY 15 1943

- **Substitute circuit details to overcome converter valve shortage.**
- **Standard four-watt amplifier has several useful applications.**
- **Modern dictionary of radio terms explains many interesting points.**
- **Short-wave review is guide to overseas reception conditions.**

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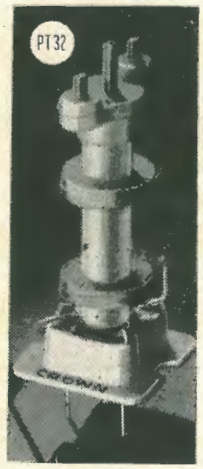

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Devoted entirely to Technical Radio

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ALL-WAVE ALL-WORLD DX NEWS

★ Proprietor —

★ Publisher —

★ Editor —

A. G. HULL

★ Technical Editor —

J. W. STRAEDE, B.Sc.

★ Editorial Offices —

117 Reservoir Street, Sydney
Phones: M 4078 - M 4079
and
187-193 Berkley St. Carlton
Victoria — Phone F 4136

★ Office Hours —

Week-days: 9 a.m. - 5 p.m.
Not open Saturday morning

★ Subscription Rates —

6 issues 5/3
12 issues 10/6
24 issues £1
Post free to any address

★ Service Departments —

Back Numbers, 6d. ea., post free
Reply-by-mail Queries, 1/- each
Laboratory Service, 2/6 per set

Vol. 7. JANUARY, 1943 No. 8

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EDITORIAL

From what we can gather there has been an order issued which prohibits the manufacture of radio sets.

Up till now we have not been able to find out whether the order will apply to those of us who assemble a set for ourselves once in a while, but it is only reasonable to expect that the prohibition will apply to all.

The idea is to conserve stocks of component parts and make them available for the maintenance of existing receivers.

With such a difficulty facing the radio trade it might be opportune to reassure our readers that there is little likelihood of the order affecting the progress of "Australasian Radio World."

It is now some months since it was possible to order a kit of parts for a set ond obtain them without difficulty. Yet over this period our little magazine hos enjoyed unexpected popularity. Sales have risen steadily and, for our October issue, represent a peak in the seven-years' history of the publication.

As might be expected, our advertising section is not as strong as in the good old days, but we still have a valuable list of loyal supporters.

Annual subscriptions are as solid as ever.

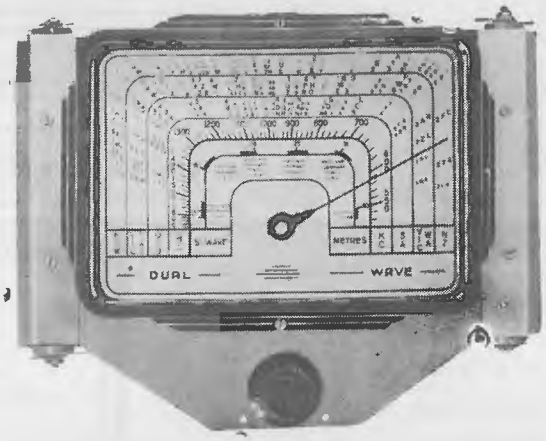
As a result, we have decided upon a policy of improvement and expansion starting with the appointment of Mr. J. W. Straede to the position of Technical Editor.

Mr. Straede is a Bachelor of Science, and a radio engineer with a nicely blended balance between the theoretical and the practical and plenty of bright ideas. We are confident that his contributions will be even more popular in the future than in the past.

Whatever the set . . .

USE GENUINE R.C.S COILS AND COMPONENTS

You may find it difficult to get genuine R.C.S. Trolitul coils and R.C.S. components for your new circuit, because Government requirements come first, and our staff is engaged in the manufacture of precision equipment for the defence forces. However, if you can get R.C.S. parts, snap them up quickly. Featuring the exclusive TROLITUL method of construction and other R.C.S. features, they are preferred by keen amateurs and professional set manufacturers alike for their improved efficiency, dependability and outstanding value .



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Types DA1 and DA2 are single glass dual-wave, the type DA2 having been designed especially for use with the Five-Band Communications Coil Kit and "H" type condenser. Type DA1 is a standard dual-wave dial for use with R.C.S. coils and "F" type condenser. The DA-5 dial is for use on the 1600 to 550 k.c. and 13.7 to 40 metre bands, with "H" type condenser. All this series is edge-lit and wedge-driven. Aperture for the escutcheon is approximately 7" x 4-7/8."

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TB35	"A" Class High Fidelity, steel case	67/7
TB36	"B" Class Input High Fidelity, steel case	67/6
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These coils are available in both Air Core and Permeability tuned types. The latter are adjusted to ensure maximum efficiency in our laboratories.

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E343	R.F.	6/6
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PERM. TUNED "H" GANG

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E346	R.F.	8/6
E347	Osc.	8/6

T.R.F. TYPE-AIR CORE

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T89	R.F.	6/6
T87	R.F. with reaction	6/6
T81	Reinartz	6/6

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STANDARD 4-WATT AMPLIFIER

IN this article is described a simple, straight-forward amplifier, using parts that are still obtainable and which provides a useful output of about 4 watts.

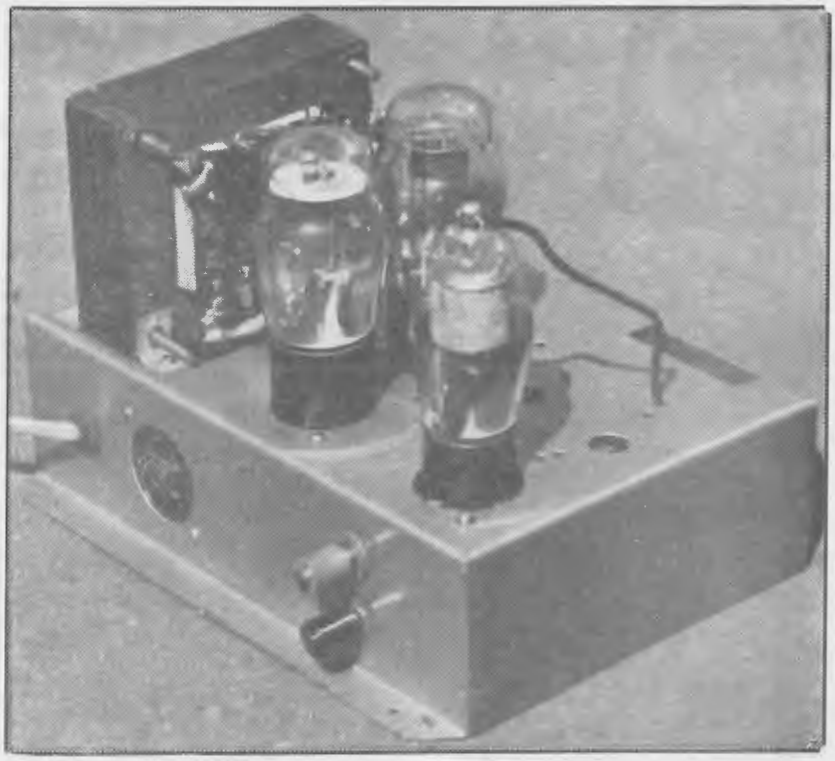
So simple and non-critical is the circuit, that anyone of about a dozen types of valves can be used for the first tube; any one of about eight types for the send, and any one of half-a-dozen types for the third. Naturally, the valve sockets should correspond and the optimum values of a couple of resistors are slightly different, but the amplifier will work even if the resistors are 50 per cent. out.

Kits Available

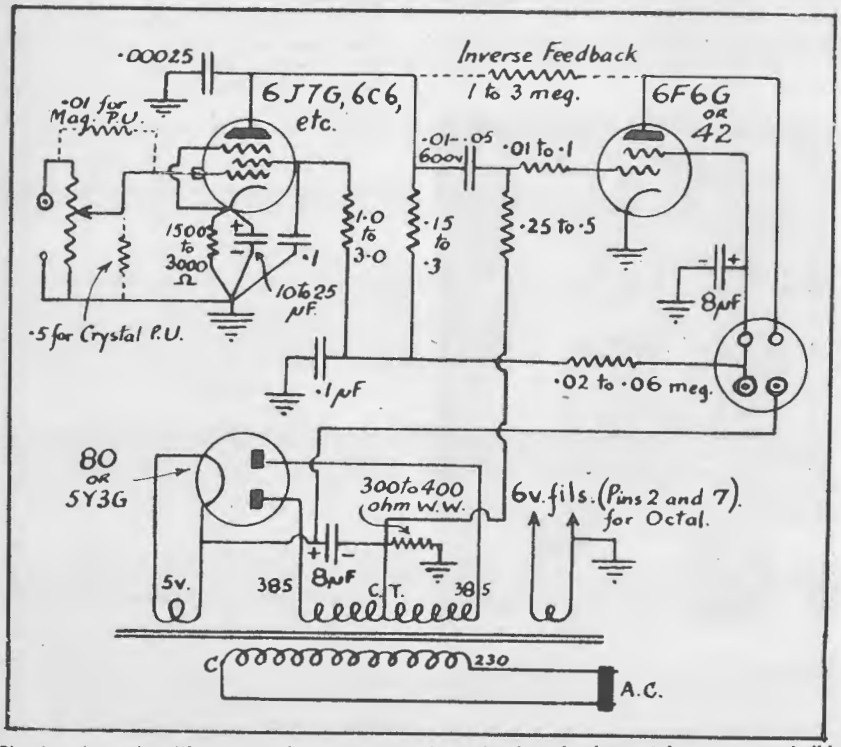
At least two of the Melbourne trade houses can supply a suitable kit of parts, ours being obtained from J. H. Magrath Pty. Ltd.

The Circuit

The circuit consists of a voltage-amplifier, or driver tube, resistance-capacity coupled to a pentode power tube, the latter being transformer-coupled to the voice coil of the speaker in the usual way. Current at high tension is rectified by the 80, 5V3G or 5Z4 valve and supplied via the speaker field to the amplifier, the actual voltage across the valves depending on the resistance of the speaker field. If the resistance is too low, then the voltage may exceed the maximum specified by the makers, while if the resistance is too great the consequent low voltage means a reduction in power output. The limits are approximately 1,000 and 2,500 ohms, although on test, our amplifier worked quite well with both 600 ohm and 3,000 ohm fields.



A photograph of the completed amplifier



Circuit schematic with suggested component values showing the large tolerances permissible

The Base

Constructors can save themselves money and, at the same time, can relieve the present shortage of chassis types by building one of wood. A sheet of ply screwed or nailed to a rectangular frame of 2 inch x ½ inch pine provides an excellent substitute.

With this idea in mind, a midget amplifier was wired up on a Monopole cigar box with a 5 inch speaker squeezed into the front. All the electrolytics had to be mounted on top, but everything fitted in nicely with only one snag—the midget speaker was an old one, of 1936 vintage, and would not handle the power.

Quite a number of ideas have been tried out on this midget chassis, one crazy circuit getting as far as push-pull using unorthodox two-in-one tubes and a filament-less rectifier.

(Continued on next page)

4-WATT AMPLIFIER

(Continued)

Many Uses

Small amplifiers have a number of uses:

The most obvious use is the reproduction of music from records. Second is the amplification of music from "electric" guitars and violins. Another is with a high-level microphone for public address work (a carbon mike, or a baby permag. speaker is recommended as the microphone). Other uses are the amplification of signals from an A.C. bridge in a laboratory and boosting the output of a low-powered mantel radio.

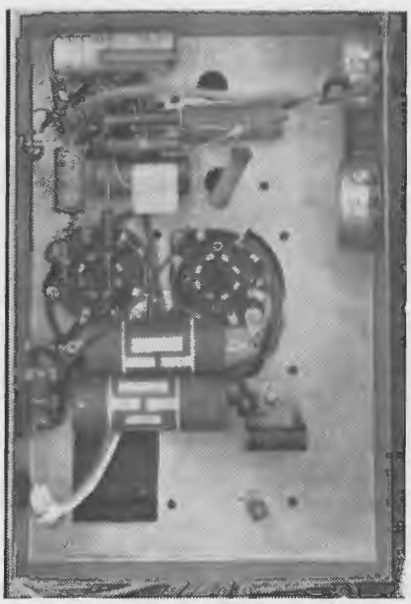
LISTENERS CONDEMNED TO DEATH

The authorities at present governing Norway take more and more severe measures against those who listen to forbidden stations. Several of these "criminals" have been condemned to death, and not, as hitherto, only to forced labour.

—"Wireless World."

Adding the Frills

First and most necessary is a tone control. This consists of a .25 or .5 megohm variable resistance in series with a .003 to .01 microfarad condenser and connected between the anode (plate) of the first valve and the chassis. The central and one other lug of the "pot" are connected together and to the nearest solder lug. The condenser is wired directly from the third lug to the anode of V1.



A photograph of the wiring, showing the spare input potentiometer

Inverse Feedback

If records are to be played, only a moderate gain is necessary, so part of the gain can be sacrificed to improve the tone by adding inverse feedback.

The anodes of the first and second valves are directly connected by a fixed resistor of value anywhere between ¾ and 2 megohm.

Tone Compensation

Tone-compensation to make the tone more "bassy" at low volumes and more brilliant at full volume is obtained by connecting a resistor between the moving arm of the volume control potentiometer (central lug) and either the input end or the earth end depending on the type of pickup. For magnetic pickups use a small resistor (3,000 to 15,000 ohm) to the input or "hot" lug. For crystal pickups, use a large resistor (.4 to 1 meg.) to the earthed lug or to the chassis.

PARTS LIST

- 1 Power Transformed 6 volt fil., 60 ma. standard type.
- 1 Kit valves with bases to suit.
- 1 Speaker, field 1,000 to 2,500 ohms, transformer to suit output tube 6,000 to 10,000 ohm).
- 1 Wire-wound resistor to suit output tube (350 to 500 ohms). (2-watt carbon type can be used.)
- 3 .25 meg. (.15 to .35) resistors ½ or 1 watt types.
- 1 Meg. (.75 to 1.5) resistor, any wattage.
- 1 .03 meg. (.02 to .05) resistor, ½ or 1 watt.
- 1 2,000 ohm (1,500 to 3,000) resistor, 1 watt.
- 2 .1 mfd. 400 volt condensers.
- 1 .01 to .05 mfd., 600 volt condenser.
- 1 .25 to 1 meg. potentiometer with knob.
- 1 .0001 to .0005 mfd. condenser.
- 2 8 mfd., 525 volt electrolytics.
- 2 Terminals, one insulated.
- 1 (UX socket or socket to fit speaker plug.
- 1 Chassis.
- 1 Grid cap.
- 1 Length flex with suitable plug.
- 1 Yard hook-up wire.
- 1 Dozen screws and nuts
- ½ Dozen solder lugs.
- 1 Grommet.
- 1 Chassis (or wood to make one).

INTERESTING IDEAS IN CIRCUITS

Neutralisation of 6A8G

The performance of the 6A8G (or 6A7) pentagrid converter can be somewhat improved by the neutralisation of the space charge effect.

A simple way of accomplishing this is to connect a small condenser between the input and oscillator grids (Nos. 1 and 4 of the grids). A small old-fashioned neutralising condenser will do if its minimum capacity is not too great or a length of insulated wire may have its ends wrapped around leads connected to the grids. Probably the simplest way is to connect two short leads to the fixed plates of the gang condenser (one to the R.F. tuning section, the other to the oscillator section), leaving the insulation on the wires and twisting them together until the optimum capacity, usually between 1 and 5 micro-microfarads, is obtained.

Don't overdo the neutralising business.

A similar method may be adopted for 1C6 converter tubes.

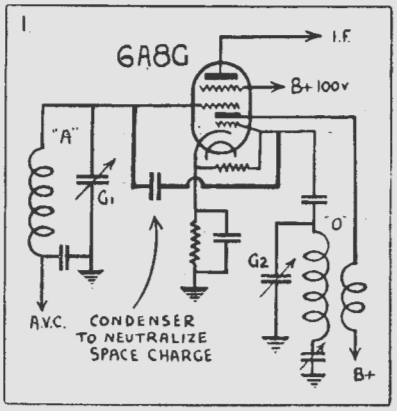
* * *

This Month's Series:

- **Neutralisation of 6A8G.**
- **A.V.C.-A.V.E. Circuit.**
- **Fixed Bias for Mobile Amplifier.**
- **"Magic Eye" Detector.**

A.V.C.-A.V.E. Circuit

The 6B7S, a variable-mu edition of the 6B7, or its octal equivalent, the 6G8G, may be used to provide either A.V.C. (Automatic Volume Compression) or A.V.E. (Automatic Volume Expansion) at will, by means of a comparatively simple circuit.



Circuit of a typical converter stage, showing how a small capacity can be fitted to improve performance.

In addition to a fixed bias supplied by a cathode resistor and a bleed resistor, a controlling bias is applied to the control or input grid. This control voltage is obtained from one of the diodes of the 6G8G, which is supplied either with an I.F. signal in the case of a radio receiver, or with some A.F. from the voice coil in the case of an "amplifier."

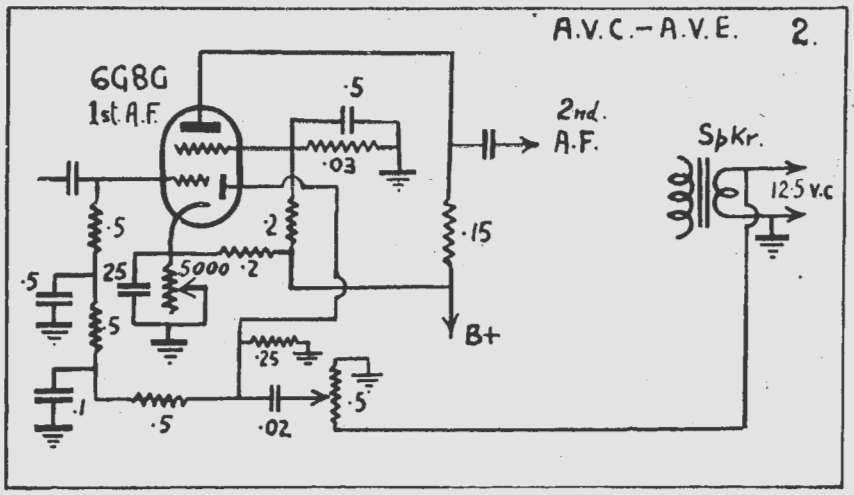
The amplification of the 6G8G varies surprisingly with grid voltage. At zero bias, the amplification is low.

As the voltage becomes negative, the gain rises to a maximum and then drops off.

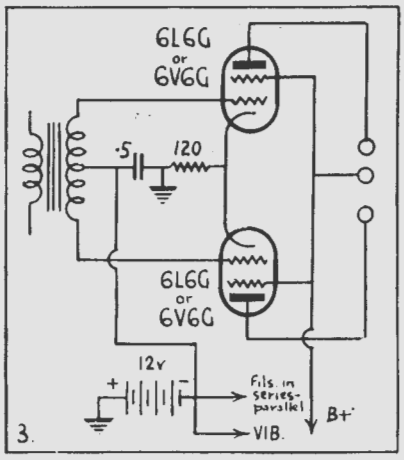
To obtain A.V.E. we require the gain to increase with signal level so the initial fixed bias (from the cathode resistor) is made low, say .5 volt and the diode is given just enough signal so that the maximum gain is produced at maximum signal.

The bias for maximum gain depends on the screen and anode voltages and is usually about 1½ volts.

For A.V.C., the initial, or fixed bias, is made larger, say 1½ to 2 volts and the control voltage may be as large as 2 to 5 volts (extra) at full volume.



Arrangements for automatic volume expansion as well as the usual A.V.C.



Semi-fixed bias is an assistance when seeking maximum power output. With mobile amplifiers it can be obtained as shown here.

Fixed Bias for Mobile Amplifier

It is well known that more power is obtainable (usually with increased sensitivity) when valves are operated with fixed bias. This is especially true of push-pull operation.

In constructing an amplifier to be operated from a 12-volt accumulator, we partly solved the problem by using the accumulator voltage as part of the bias and obtaining the rest from the usual cathode resistor. As 6L6G valves were used in push-pull with approximately 270 volts on both screen and anode, a total bias of about 25 volts was required. The cathode resistor was about 120 ohms. If EL3 valves were used in push-pull with

(Continued on next page)

By
J. W. STRAEDE, B.Sc., A.M.I.R.E.
7 Adeline Street, Preston, Vic.

CIRCUIT IDEAS

(Continued)

250 volts on screen and anode, then three-quarters of the battery voltage could be used, giving 9 watts output for a high-tension current of only 56 milliamperes — rather efficient operation!

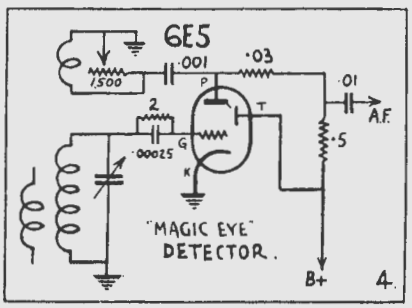
* * *

"Magic Eye" Detector

Both the American-type 6E5 cathode-ray tuning indicator and the Philips' "Electron Star" make efficient detectors of the cumulative grid type.

Not only does the triode section act well in a resistance- capacity-coupled circuit, but the grid-leak bias developed actuates the indicating section so that the tubes act as a tuning indicator (though not so well as in the usual way).

For the 6E5, a grid leak of 2 or 3 megohms may be used in conjunction with a grid condenser of from .0001 to .00025 microfarad capacity (the lat-



ter capacity seems to a time-honoured value).

The anode resistor can be approximately ½ or 1 meg. coupled by a .01 mfd. condenser to the succeeding stage.

Reaction is obtained in any of the usual ways, control being by a variable condenser, a variable shunt resistor or by varying the anode voltage.

COLD HEAT

The apparent anomaly of using refrigerated electrodes for spot welding is, however, a practical fact. The electrodes are kept so cold that frost forms on them even while heat is produced during the welding process. It is claimed that keeping the welding points cool, prevents softening and deformation and in the case of aluminium, welding prevents the pick-up or alloying of the tip with the material being welded.

MODERN GRAMOPHONE PICK-UPS

WITH improved amplifiers and reproducers, the phonograph industry has surged to the fore. Engineers are concentrating on higher-fidelity pickups, which incorporate such other desirable features as reduced record wear. A further refinement also affords a lighter armature in pickups.

The reproduction of recorded music is dependent on 3 major factors: (1) the pickup, (2) the amplifier, and (3) the reproducer, or, as most of us call it, the loudspeaker.

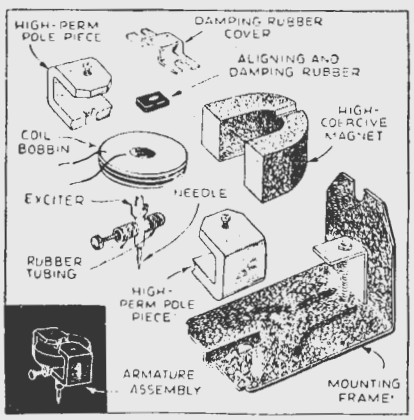
So much information and space has been devoted to the amplifiers and the speakers used in such equipment that one would be tempted to be lax when considering the pickup. Needless to say, the importance of the pickup is distinctly comparable to that which is attached to the amplifier and other associated components.

Pickup Must Match Audio System

To illustrate, let us assume that we have an amplifier, flat in frequency characteristic and low in harmonic content at the volume levels involved. A speaker with satisfactory "highs" and well baffled so that the low-frequency response is adequate. With this system let us test a pickup that is "down" at the low-frequency end. If we want good reproduction it will be necessary to incorporate one or more of the following means of correction which will surely take time and increase the cost.

(1) Equalise the pickup:—

This will drop the output voltage of the pickup and require more gain from the amplifier.



Internal construction of latest type of magnetic pick-up.

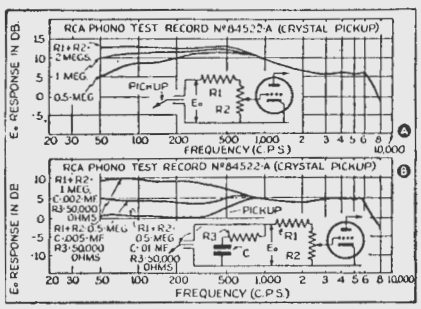
(2) Put a "bass booster" in the amplifier:—

Means at least one extra tube, or major changes in one or more stages of the amplifier.

(3) Change the speaker to one that has a high degree of efficiency at the lower frequencies:—

Here cost is a great factor. A speaker with good over-all frequency characteristics and a reasonable degree of sensitivity is much more expensive than the average good-quality pickup available on the market to-day.

While the above paragraphs are common knowledge to many, it was felt that the information contained would be helpful to those who have been struggling to make poor pickups sound good.



Response curves of crystal units, showing effect of loading on the bass response.

In passing, do not try to use the tone control of the average amplifier as a means of compensation. The tone control will only cut "highs" and with a pickup deficient in lows the resultant frequency response of the system will look like an ant hill (high in centre).

What Constitutes a "Good" Pickup?

The qualifications of a good pickup can be stated very simply.

Frequency response:—

50 to 5,500 cycles. This is the range that can be obtained without high cost. There are many pickups available that will cover this range, and at reasonable prices.

70 to 4,500 cycles. The better low-cost units have frequency characteristics within this range.

Needle Point Impedance:—

Should be as low as possible.

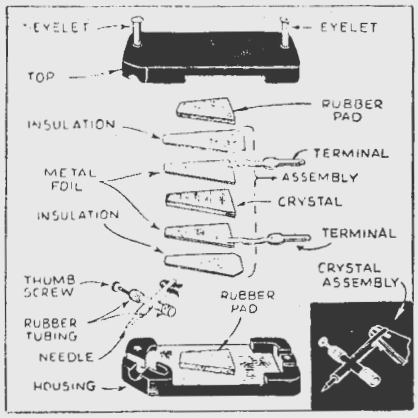


Diagram showing the construction and assembly of the crystal type pick-up.

Needle Pressure on Record:—

Not more than 4 ozs. maximum. Preferred weights, 2½ to 3 ozs.

Stability of performance with changes in temperature, ability to maintain response under conditions of wide amplitude variations, plus an arm design that is free from natural vibration periods that will affect the response characteristic are also desirable. The arm should have free vertical and horizontal motion without side sway or chatter.

Crystal Pickups

Two types of pickups are being used to-day, both of which have their own good points. They are the **crystal** (Fig. 2) and the **magnetic** (Fig. 1), operating on principles which have been described time and time again. Both have found acceptance and have staunch backing in discussions as to which is the superior type.

In crystal pickups, the development of the "bimorph" crystal was the key to successful operation on a commercial scale.

The crystal element is essentially a capacity, and the impedance across it increases as the frequency decreases and the voltage drop through it increases with the impedance. As most records are amplitude recordings, in the lower frequency ranges it is apparent that the crystal pickup has the highest output in the range of frequencies where the record output is lowest.

This point is well illustrated in the curves of Figs. 5 and 8. Note the effect on the low-frequency response of various values of loading resistance.

(Continued on next page)

PICK-UPS

(Continued)

Effect of Needle Types

In the curves of Fig. 5 the variation in response caused by differences in needle type as well as resistive load is shown. Here the change from a full-tone to the half-tone needle alters the response at both ends of the frequency range. Note the difference in voltage output of the two types of needles.

A great deal of attention has been devoted to the elimination of record wear by minimising the **tracking angle** or **error.** The two most popular solutions will be found using the **bent arm** or the **needle tilt** principles.

"Tracking error" is caused by the fact that, in recording, the cutting head is moving radially across the record and cuts a close-pitch spiral groove which can be considered as a series of closely-spaced concentric circles. When reproducing from this record with the ordinary straight arm which is pivoted at one end and carries the reproducing head and needle at the other, it would be impossible to obtain the same degree of tangency (as that of the cutter) unless the arm were infinite in length. In the finite arm, the needle describes an arc of a circle across the record, and the projection of the needle on the record make an angle with the tangent to the groove at the point of contact. It is this departure of the needle projection from tangency which is called the tracking error or angle.

The actual value of the tracking angle depends on the length of the arm, the distance between the arm pivot and the centre of the record; and, the radial distance from the centre of the record to the needle point. The tracking angle for an ordinary straight arm has a rapid change when the distance from the pivot to record centre is equal to or greater than the arm length. Conventional arms are placed so that the arc of needle travel passes through the centre of the record (d=0.) This gives the maximum tracking angle at the outside of the record and a straight-line decrease in angle as the needle traverses the record. This rapid change in tracking angle is objectionable since the needle point wears out to fit groove. The constant reshaping of the needle point is done at the expense of the record, causing excessive wear.

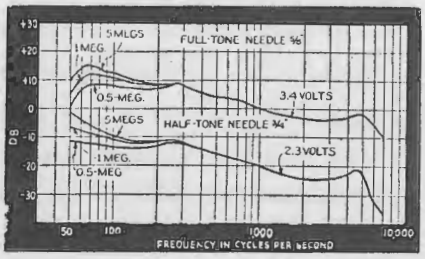


Fig. 5. Curves on Shure crystal pickup, model 998 Input resistor controls L.F. response over 10 db

AIR SPOTTERS CO-OPERATE WITH ARMY

Army units and members of Volunteer Air Observer Corps are now co-operating in reporting aircraft movements. Spotters transmit reports of all aircraft, unless obviously friendly, to the nearest Air Observer Post, to higher headquarters, and if necessary to other units.

Reports from spotters in isolated localities are particularly valuable, as they may disclose unsuspected aircraft movements, or the location of our own aircraft which might be in distress.

SUBSTITUTE VALVE ARRANGEMENTS

IN England, there are millions of radio receivers entirely out of action owing to the shortage of valves and other components. More and more radical are becoming the changes made and devices tried to get sets working. Even here in Australia, some types of valves are becoming scarce.

Converter valves are probably the most scarce types, so these will be considered first. The disappearance from the domestic market of the 6J8G and 6K8G has been followed by a pronounced shortage of pentagrid (6A8G) types.

This is the first of a series of articles on the subject of how best to overcome the problems which arise when a wanted valve type proves to be unobtainable.

Before the Pentagrid

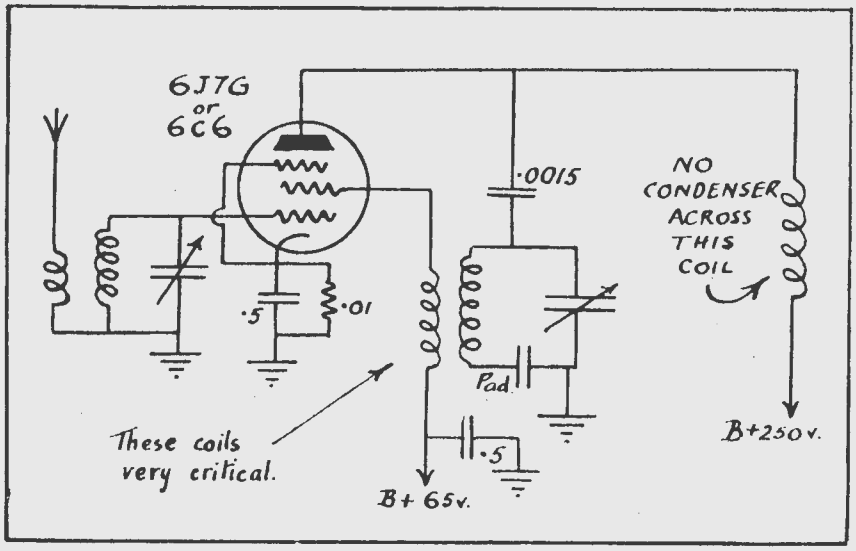
Before the pentagrid valve was invented, there were two popular types of converter systems, one the autodyne, in which a screen grid, or pentode valve, did the entire job; the other, a two valve job, in which a screen grid, or pentode tube, acted as a mixer, a seperate troide being the oscillator. The autodyne usually had the lower noise level, but was more difficult to get going — coils had to be "just so," and a little extra humidity in the oscillator coil produced a mountain of a headache.

The separate oscillator scheme can be tried in most modern receivers when the converter gives up the ghost. An extra valve socket is required, or maybe the I.F. stage can be omitted as a working set rather than extreme range is desirable. Both the mixer and oscillator can be 6J7G (or similar) pentodes. For the mixer, the plate screen and suppressor are wired together to form the "oscillator anode," the grid cap on the top of the tube being the oscillator grid. The grid resistor of approximately 50,000 ohms is wired between this grid and the mixer cathode, which is earthed Coupling between the valves is obtained by feeding the 6J7G mixer screen through the oscillator plate coil. The mixer requires a rather high bias resistor—about 6,000 ohms.

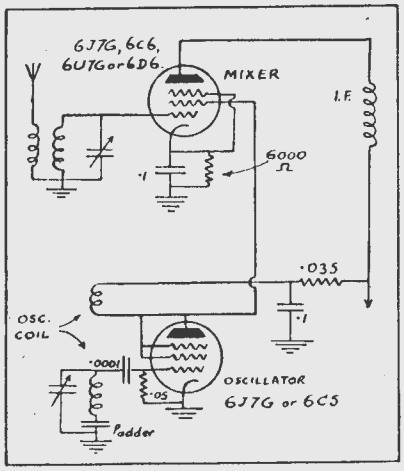
If audio oscillation is produced at one end of the dial, it will probably be due to the oscillator grid resistor being too large, or the combined screen-grid-oscillator-plate voltage being too high.

Other tubes which can be used are: 6U7G, 6C6, 6D6, 6B7, 6K7 and 6B8G.

Next month, in Part 2, will be described the replacement of the 6B6 and 6B8 types.



A possible alternative is this autodyne converter which was popular a few years ago.



Circuit for a separate oscillator with a superhet first detector stage.

RADIO BATTERIES

The needs of country listeners using battery sets will, it is expected, be shortly met as the result of the Control of Electric Dry Battery manufacture. Order recently issued, under which manufacture of radio dry batteries will be concentrated upon simplified types in order to increase production to meet essential requirements for civilian and defence needs.

A spokesman of the Department of War Organisation of Industry explained that most materials required in the manufacture of radio batteries have been imported. These included strip zinc, manganese and carbon rods.

Added to manpower problems and increased defence requirements, a serious shortage of radio batteries developed which imposed some hardship on people in the country compelled to rely on battery sets for their radio entertainment. Until recently a considerable variety of radio batteries were made, including light, heavy and triple-duty types.

In reaching its decision to simplify types in order to assist increased production, the Department had been in close touch with manufacturers and the trade generally, and manufacturers had suggested that the triple-duty type would prove the most suitable upon which to concentrate. This type, although costing slightly more than the other two, gave far greater service, because of its longer and more economical "life."

Simplification of types to be manufactured and discontinuance of non-economical varieties should considerably increase the output of dry batteries for country radio listeners, and for defence needs.

EVOLUTION OF THE DETECTOR

THIS is the first of a series of brief articles tracing the development of wireless from its infancy.

It is a mistake to think that because an idea has been used once, it will not be used again. Note the return of the diode detector and the revival of the reflex a few years back.

The Coherer

One of the earliest detection systems employed the "coherer," a tube filled with metal filings. Under the action of R.F. current, the filings cohered and acted as a conductor for D.C. Unfortunately they didn't decohere, so the signalling device, an electric bell was made to rattle against the tube of filings.

Crystal Detectors

Devices permitting only uni-directional flow current were used, the crystal detector and the diode valve (see Figs. B and C) being very popular. Crystals were commonly employed with an adjustable D.C. potential obtained from a potentiometer across a couple dry cells (the same device can be used to-day with some crystals to obtain better reception).

No matter how the crystal circuit is handled, however, it cannot give any amplification and therefore can never be expected to compare with the valve set.

The crystal set can only depend on the power actually received in the aerial, which is usually of infinitesimal proportions. Even so, some remarkable results have been reported in years gone by. Comparatively satisfactory verification has been made of reception of broadcast stations over a distance of more than a thousand miles on a simple crystal set.

The circuit of Fig. C was once advertised thus: "Signals may be received up to distances of a mile using only an umbrella as the aerial."

Triode Valves

In Fig. D we see the triode valve in which not only detection, but also amplification is obtained. Next came regeneration (Major Armstrong had most of the patents) which gave an enormous increase in amplification and distance of reception.

The application of regeneration meant a remarkable increase in both range and selectivity and extraordinary results can be obtained with an efficient regenerative set under suitable circumstances. A single-valve set along the lines indicated in Figure E can be expected to give quite good results with headphones connected in place of the audio transformer primary shown in this circuit.

The Pentode

The pentode valve, first popularised by Philips, was soon used as a detector and the regenerative pentode circuit is still to-day one of the most powerful one-tube receiver, giving reception over thousands of miles with headphones. The circuit in Fig. F is fairly typical of good short-wave practice with a pentode detector.

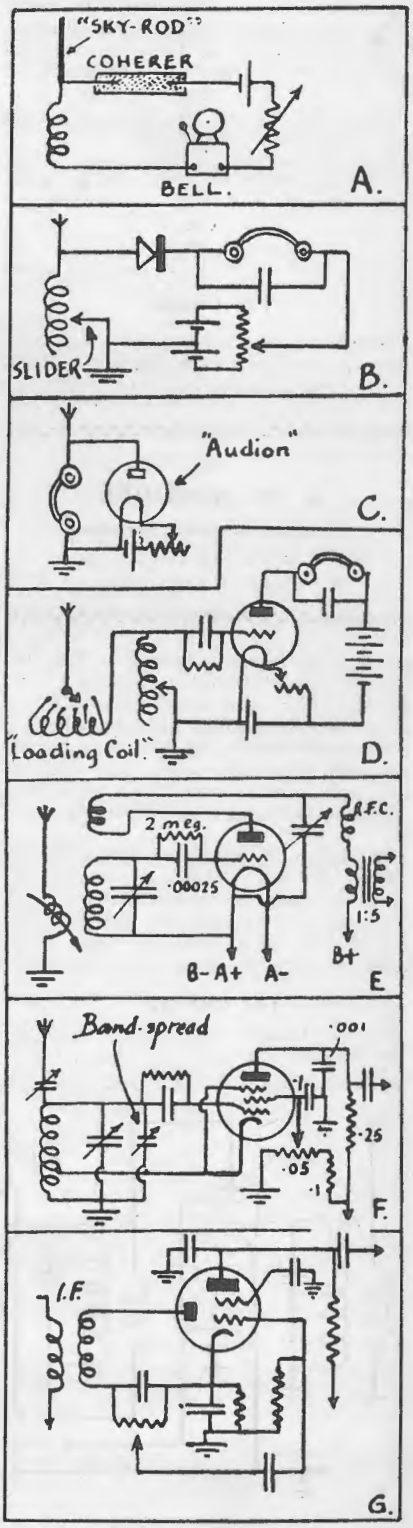
Modern Diodes

The last circuit shows how the diode has become once more the popular detector, an amplifier valve usually being built into the same bulb.

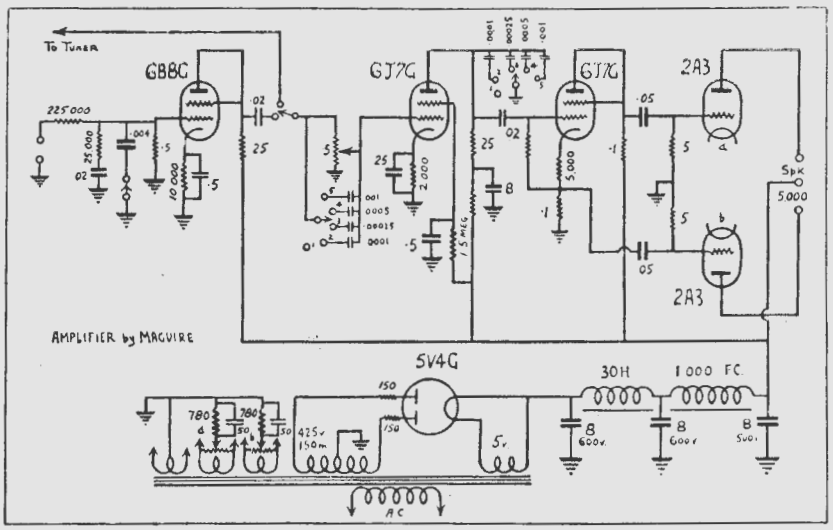
Other Old-timers

Space does not permit us to describe them, but old-timers will remember some of these: Magnetic detector; Electrolytic detector; Flewellyn (a super-regenerative), Autoplex, Cockaday.

The circuit in Fig. E was the first half of the two-tube "Interstate on Loudspeaker" sets sold with much blare and boloney around 1927-28.



ANOTHER QUALITY SET DESIGN



By
S. W. MAGUIRE
37 Lawn Avenue, Earlwood
(Late Radio Service Manager, David Jones Ltd., Sydney

AFTER experimenting for some time with all types of amplifiers and pick-ups, I have come to the conclusion that the arrangement set out here will give the finest possible quality from the local stations and from good recordings.

Due consideration has been taken of the fact that the set will be used in a cabinet and with a commercial speaker, such as the Rola K12, and not with a special speaker on a large baffle board, or with a loading horn.

The Circuit

Briefly the circuit consists of a t.r.f. tuner, in order to avoid high note loss, as so many superhets are prone to do, a high-fidelity detector, feeding a more or less standard amplifier, consisting of a low-gain pre-amplifier for a pick-up, which is coupled to a screen-grid driver, in turn coupled to a triode phase-inverter, followed by push-pull output.

Triode valves are used in the output.

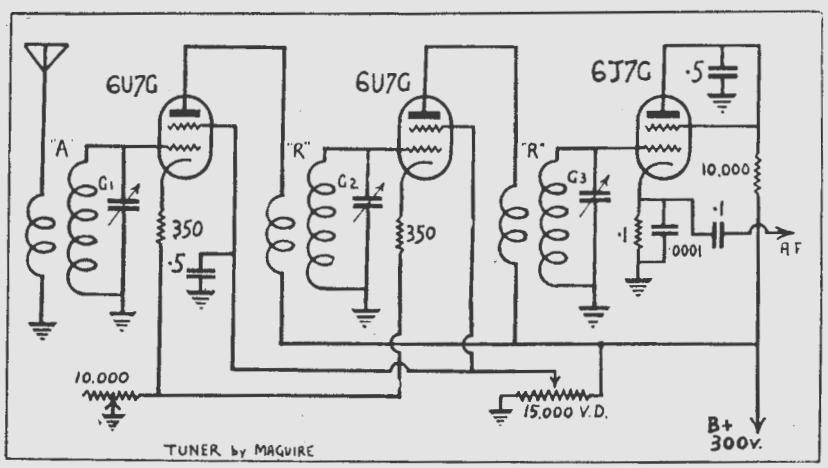
Triodes were decided upon, because I have not yet heard a pentode or beam tetrode amplifier that could compare with triodes for quality, not even when fitted with the most complicated systems of inverse feedback.

The Pick-up

Before finally selecting a pick-up I tried a considerable number of the crystal and magnetic types and was left with the impression that the crystal types were all too harsh. Some had a pronounced bass resonance which was most objectionable, others were inclined to be shrill with a very thumpy bass. Now all of these troubles can be ironed out with suitable loading networks, filters and such-like arrangements. Naturally, I tried all these schemes, but I was still not favourably impressed with crystal types, and so they were all discarded. I then selected a few magnetic types and many of these were also far from ideal. Eventually, however, I found a pick-up which gave me just the type of output I required, after it had been suitably adjusted by the application of a corrective device. This pick-up was the H.M.V. type 25. These may be hard to obtain at the moment, but there must be a few of them about.

As with all types of corrective filters, the one used cut the gain quite a bit, in fact so much that I included a low-gain pre-amplifier in the set in order to make quite sure that full power could be obtained, even from those recording which normally do not give a high output. Under normal circumstances the output of the pick-up is sufficient to make the pre-amplifier unnecessary, but its inclusion makes it possible to go further with corrective devices than would be possible without it.

Looking at the circuit it will be noticed that there is a treble control in the plate circuit of the driver valve, consisting of a switch and a group of fixed condensers. This control is used to cut the treble, but can be used in conjunction with the novel method of treble boost control which is fitted in the coupling between the pre-amplifier and the driver valve.



The Tone Controls

One switch has five positions. The selector, or rotor arm, is earthed and four positions connect up to four condensers, each of different capacity and the four of them connects to the plate of the driver valve. The fifth position for the rotor arm is left vacant and classed as normal. On the other positions a portion of the high note response is by-passed according to the capacity switched into circuit.

The second switch is also a unit with five positions. The first position is left vacant and is classed as normal. Position 2, 3, 4 and 5 have condensers running to the moving arm of the volume control. The rotor of the switch is connected to the hot end

of the volume control. This gives the treble boost and is quite novel in its action.

A scratch filter is connected so that it can be switched in acrross the output of the input corrective filter at the pick-up.

All this, as I have said before, gives a versatile control over the response.

The Detector

I long ago realised that the detector used is the most important part of a radio receiver. So I compiled a booklet in which all known types of detectors were detailed and notes made regarding the perfomance obtained. By far the most outstanding detector was found to be the type known as the "Infinite Impedance" arrangement. With this type the quality of the detection is of the highest. Modulation percentages of up to 100 are handled with a minimum of distortion.

Yet the infinite impedance detector is not complicated.

It can be readily applied to both superhets and t.r.f. tuners, which is more than can be said for most types of diodes.

Bias for the Output Valves

Getting back to the amplifier circuit there are one or two details worth mentioning. One is the way in which two separate filament windings are used for the output valves, each then having its own bias resistor, suitably by-passed with 50 microfarad electrolytics with a 250 volt rating. Across each of the filament windings is a 30 ohm potentiometer, with the bias resistor going to the rotor arm. By this arrangement it is possible to adjust the rotor arm to produce an artificial hum which will buck out the normal hum of the amplifier, thereby giving absolutely hum-free operation, a highly desirable feature in a set designed to give superlative reproduction.

If a normal power transformer is available, however, and a special job with twin filament windings for the output valves is not available, then it is possible to get satisfactory results with an ordinary bias resistor. Under such circumstances the bias resistor will have a value of 375 ohms, will need to be capable of carrying a current (rated) of about 200 or 250 milliamps, and will not need to be bypassed.

Pick-up Switch

Although not shown in the circuit, it is a simple matter to fit a switch which may prove handy in practice. This switch will be connected in the input circuit, so that when desired the pick-up can be switched straight into the driver grid circuit, thereby eliminating the pre-amplifier valve when it is not required.

The Speaker

As remarked earlier, the speaker used with the original set is a Rola K12, and it might be asked why a better type of speaker, such as one of the heavy high-fidelity models, is not used. In my opinion the difference in quality is not so marked as to justify the difference in price. Unless it is a matter of handling more than ten watts of power, I think that the K12 is a speaker quite adequate for the job.

Conclusion

In conclusion, I can heartily recommend this circuit as it stands, and would be pleased to answer queries regarding same, or any other queries appertaining to radio, on receipt of a stamped and addressed envelope.

Mr. KEAST'S OPINION

Mr. L. J. Keast, who conducts our short-wave pages, has seen this set and says: "The finest radiogram I have heard."

A DICTIONARY OF RADIO TERMS

(Continued from last month's issue)

DIODE—A valve containing two elements, a plate and filament or cathode.

D.S.C.—Double silk covered.

DISTORTION—Condition when the output wove-form differs from thot of the input signal.

DUPLEX—In radio telephony the simultaneous tronsmission and reception of signals.

DYNAMO—Machine for converting mechanical energy into an electrical form.

D.X.—Abbreviation meoning "distance."

EARTH—The point in a circuit to which negative return leads are generally made, usually the same potential as the chassis.

EBONITE—An insulating material used for panels, etc.

EDISON EFFECT—An effect said to have been observed by Edison that when a filament was heated and another electrode placed in the same bulb, current would flow when a positive potential was applied to the electrode.

ELECTRO DYNAMICS—Science of electricity in motion.

ELECTROLYTE—A liquid which is subjected to decomposition by an electric current.

ELECTRO MAGNETISM—Study of the relation between electricity and magnetism.

ELECTROMOTIVE FORCE—Pressure or voltage at which an electric current flows in a circuit.

ELECTRON—One of the fundamental constituents of matter. A minute particle of negative electricity.

ELECTRON EMISSION—The liberation of electrons from an electrode into the surrounding space. In a vacuum tube it is the rate at which the electrons are emitted from a cathode. This is ordinarily measured as the current carried by the electrodes under the influence of a voltage sufficient to draw away oll the electrons.

ELECTROSCOPE—Device used for detecting static electricity.

ELECTRO STATICS—Science which deals with the phenomena occasioned by electricity at rest.

ELIMINATOR—Device used with battery receivers to make the use of batteries unnecessary. Power being supplied from the mains.

EMISSION—Electrons released from the heated filament of a tube.

EMISSION CHARACTERISTIC — A graph plotted between a factor controlling the emission (such as the temperature, voltage, or current of the cathode) as abscissas, and the emission from the cathode as ordinates.

E.M.F.—See Electromotive force.

ETHER—Medium which is presumed to be diffused throughout all space and matter.

FACSIMILE TRANSMISSION—The electrical transmission of a copy or reproduction af a picture, drawing ar document. This is also called picture transmission.)

FADER—Consists essentially of a centre tapped volume control so that it is possible to change from microphone or radio to pick-up without a sudden break. Rotating the control gradually fades one unit out and brings up the strength of the other.

FADING—The variation of the signal intensity received at a given location from a radio transmitting station as a result of changes occurring in the transmission path (see Distortion.)

FARAD—Practical unit of electrical capacity. A condenser is said to have a capacity of one farad if a charge of one coulomb causes a potential difference of one volt.

FEED BACK—The feeding back of energy from the plate to the grid of a valve.

FIDELITY—The degree to which a system, or a portion of a system, accurately reproduces at its ouput the signal which is impressed upon it.

FIELD—Name given to lines of force built up round a conductor during the passage of current. Also name given ta coil which magnetises the "pot" of a dynamic speaker.

FIELD STRENGTH—The field strength of a transmitter at any given point is expressed in millivolts per metre. Should the field strength be 3 millivolts per metre an aerial four metres high would theoretically have twelve millivolts induced in it.

FILAMENT—Wire in a vacuum tube which when heated gives off electrons.

FILTER—Device used to eliminate or smooth out current pulses in a power supply or to exclude unwanted signals from a circuit.

FLUX DENSITY—The number of lines of force per square centimetre around a magnet or electro magnet.

FREQUENCY—The number of cycles per second.

FREQUENCIES, AUDIO—Those frequencies audible to the human ear ranging approximately from 15 cycles to 14,000 cycles per second, in certain persons this range may extend to 20,000 cycles per second or more. Certain animals have a hearing ronge far in excess of this.

FREQUENCIES, RADIO—Frequencies ranging from about 20,000 cycles per second to many millions of cycles per second.

FREQUENCY, INTERMEDIATE—Frequency to which the incoming signal is converted in a superheterodyne receiver.

FREQUENCY, FUNDAMENTAL—The basic frequency. The first harmanic.

FULL-WAVE RECTIFIER—A double element rectifier arranged so that current is allowed to pass in the same direction to the load circuit during each half cycle of the alternating-current supply, one element functioning during one-half cycle and the other during the next half cycle, and so on.

FUNDAMENTAL FREQUENCY—The lowest component frequency of a periodic wave or quantity.

FUNDAMENTAL OR NATURAL FREQUENCY (of an antenna). The lowest resonant frequency of an antenna, without added inductance or capacity.

FUSE—A wire of low melting point designed to melt and break a circuit should the current flowing became excessive.

GALENA—A type of crystal consisting of lead sulphide.

GALVANOMETER—Instrument for detecting and measuring minute electrical currents.

GANG—See Condenser ganged.

GAS PHOTOTUBE—A type of phototube in which a quantity of gas has been introduced, usually for the purpose of increasing its sensitivity.

GETTER—Magnesium used in valves which absorbs all traces of gas from a valve.

GRID—Open wire mesh placed between the plate and filament of a valve.

GRID BIAS—The direct component of the grid voltage.

GRID CONDENSER—A series condenser in the grid or control circuit of a vacuum tube.

GRID, CONTROL—Grid to which input signal is applied. A small amount of grid voltage being able to control a relatively large amount of plate current.

GRID LEAK—A resistor in a grid circuit, through which the grid current flows, to affect or determine a grid bias.

GRID-PLATE TRANSCONDUCTANCE — The name for the plate current to grid voltage transconductance. (This has also been called mutual conductance.)

GRID SCREEN—A second grid placed between the control grid of a valve which acts as an electrostatic shield between them.

GRID SUPPRESSOR—A grid placed between screen grid and plate of a valve which being kept at negative potential with respect to the plate tends to preven secondary emission.

GROUND SYSTEM (of an antenna)—That portion of the antenna system below the antenna loading device or generating apparatus most closely associated with the ground and including the ground itself.

GROUND WIRE—A conductive connection to the earth.

HALF-WAVE RECTIFIER—A rectifier which changes alternating current into pulsating current utilising only one-half of each cycle

HARMONIC—Frequency which is a multiple of the fundomental

HEATER—An electrical heating element for supplying heot to an indirectly heated cathode.

HEAVISIDE LAYER—A loyer of electrified otmosphere far above the earth's surface which is considered to have a decided effect on radio waves.

HENRY—Unit of self-induction. A circuit has an inductance of one henry when a rate of charge of 1 amp. per second produces a back electromotive force of 1 volt.

HERTZ—Unit of frequency, one hertz being one cycle per second.

HERTZITE—A type of crystal used as a detector.

HERTZIAN WAVES—Radio waves are often termed hertzian waves.

HETRODYNE RECEPTION—The production of beats by reaction between oscillations received and those locally generated for the purpose of reception is called hetrodyne reception.

HOMODYNE RECEPTION—A system of reception by the aid of a locally generated voltage of carrier frequency. Homodyne reception is sometimes called zero-beat reception.)

HOT-WIRE AMMETER, EXPANSION TYPE—An ammeter dependent for its indications on a change in dimensions of an element which is heated by the current to be measured.

HYDROMETER—Instrument used to measure the specific gravity of wet batteries.

HYSTERESIS—The lagging of an effect behind cause producing it. In transformers the magnetism produced in the core lags behind the force which produces it.

IMPEDANCE—The combined effect of resistance and reoctance. The total opposition offered by a circuit to alternating current.

INDIRECTLY HEATED CATHODE—A cathode of a thermionic tube, in which heat is supplied from a source other than the cathode itself.

INDUCTANCE—When an alternating current is passed through a coil a magnetic flux is set up, the lines of force cutting the turns of coil induces a voltage in the opposite direction thus retarding the flow of current.

INDUCTION—The property by which one circuit may induce energy into another circuit without elecrical contact.

INDUCTION LOUD SPEAKER is a moving coil loud speaker in which the current which reacts with the polarising field is induced in the moving member.

INDUCTIVE COUPLING—The association of one circuit with another by means of inductance common or mutual to both.

INPUT—The grid of a tube. That portion of a circuit to which the signal voltage is applied.

INSULATOR — Material of high resistance properties. The opposite to conductor.

INTERELECTRODE CAPACITANCE — The direct capacitance between two electrodes.

INTERFERENCE—Disturbance of reception due to strays, undesired signals, or other causes; also, that which produces the disturbance.

INTERMEDIATE FREQUENCY IN SUPERHETERODYNE RECEPTION—A frequency between that of the carrier and the signal, which results from the combination of the carrier frequency and the locally generated frequency.

INTERMODULATION—The production, in a non-linear circuit element, of frequencies corresponding to the sums and differences of the fundamentals and harmonics of two or more frequencies which are transmitted to that element.

INTERRUPTED CONTINUOUS WAVES—Interrupted continuous waves are waves obtained

by interruption at audio frequency in a substantially periodic manner of otherwise continuous waves.

INVERTER—Device for changing direct current into alternating current.

ION—An atom with an excess or a deficiency of electrons.

IONIZATION—The process by which a gas becomes a conductor through the production of ions to carry the current.

JACK—Appliance generally used to connect phones or a speaker into a circuit.

JOULE—Unit of energy. The amount of energy expended in a circuit when 1 amp flows at a pressure of 1 volt for 1 second.

KEEPER—Iron bar placed across Poles of a magnet which helps it to retain its magnetism.

KILOCYCLE—When used as a unit of frequency, is a thousand cycles per second.

KILOWATT—One thousand watts.

LAMINATIONS—Thin metal strips used for the cores of chokes and transformers.

LEAD-IN—That portion of an antenna system which completes the electrical connection between the elevated outdoor portion and the instruments or disconnecting switches inside the building.

LEAKAGE LOSS—Loss in condensers, etc., due to the fact that no insulating medium is perfect.

LEAK, GRID—A resistance of high value connected in parallel with the grid condenser. The audio voltages are developed across it.

LIGHTNING ARRESTER—Device usually fitted with two terminals one of which connects to the aerial wire and the other one to an earth connection. This device should always be fitted outside the house.

LINEAR DETECTION—That form of detection in which the audio output voltage under consideration is substantially proportional to the modulation envelope throughout the useful range of the detecting device.

LITZENDRAHT WIRE—This wire commonly called "Litz" wire consists of several fine strands of wire insulated from each other and then plaited together and then generally covered with silk .This wire is used where losses must be kept at a minimum. This is due to the fact that surface area is increased over a single wire, thus specifically reducing the "skin effect" (which see).

LOAD—Generally refers to the resistance or impedance placed in the plate circuit of a valve.

LOADING COIL—An inductor inserted in a circuit to increase its inductance but not to provide coupling with any other circuit.

LOUD SPEAKER, BALANCED ARMATURE — The balanced armature or magnetic speaker consists of an armature balance between two pole pieces. The signal current is fed through the coil of the armature causing it to be acted upon by the pole pieces. Here vibrations are then communicated to the cone of the speaker by means of a small rod connecting the two points.

LOUD SPEAKER, ELECTROSTATIC — The electrostatic or condenser speaker is made up of two fair-sized plates, the output from the receiver being connected to set up a varying electrostatic field. This causes the plates to be attracted and repelled, and as one of the plates is not fixed it vibrates quite freely in accordance with the signals fed to it.

LOUD SPEAKER, MOVING COIL—A light coil is placed in a stronge magnetic field. As the audio current flows through this coil the interaction causes the cone attached to the coil to vibrate and thus produce sound waves corresponding to the audio current variations through the coil.

LOUD SPEAKER, CRYSTAL — This type makes use of piezo electric crystals. The expansion and contraction of the crystal in accordance with the audio voltages impressed across it causes the cone attached to the crystal to vibrate in sympathy. These speakers are generally used to reproduce the higher frequencies.

MAGNETIC MICROPHONE—A microphone whose electrical output results from the motion of a coil or conductor in a magnetic field.

MAGNETISM—Property possessed by certain bodies whereby they naturally attract or repel one another.

MASTER OSCILLATOR — An oscillator of comparatively low power so arranged as to establish the carrier frequency of the output of an amplifier.

MEG.—Prefix meaning one million.

MEGACYCLE—When used as a unit of frequency, is a million cycles per second.

MERCURY-VAPOR RECTIFIER—A mercury-vapor rectifier is a two-electrode, vacuum-tube rectifier which contains a small amount of mercury. During operation, the mercury is vaporised. A characteristic of mercury-vapor rectifiers is the low-voltage drop in the tube.

METRE—39.371 ins.

METER—An instrument used for measuring As far as radio is concerned this generally refers to an instrument capable of measuring one or all of the following: volts, ohms or milliamps.

MHO—Unit of conductance, found by dividing unity by the resistance in ohms; e.g., a circuit with a resistance of 5 ohms will have a conductance of one-fifth or .2 mhos.

MICA—A mineral consisting of thin flexible scales used as an insulating material.

MICRO—One millionth.

MICRO AMPERE—One millionth of an ampere.

MICRO AMPERE—One millionth of an ampere.

MICRO FARAD—One millionth of a farad.

MICRO HENRY—One millionth of a henry.

MICROHM—One millionth of an ohm.

MICRON—One thousandth part of a millimetre.

MICROPHONE CARBON—A diaphragm is placed in contact with carbon granules and so the sound waves cause the pressure of the diaphragm on the granules to vary—the resistance of the circuit also varies. Should telephones and a battery be connected in the circuit the current variations due to the changing resistance will cause the telephones to vibrate in sympathy.

MICROPHONE CRYSTAL—A pair of Rochelle salts crystals are used in this type of microphone. Variations of sound pressure cause the crystals to vibrate giving rise to piezo electric voltages.

MICROPHONE VELOCITY — A Microphone which has a metal ribbon suspended between the poles of a magnet.

(Continued on next page)

RADIO DICTIONARY

(Continued)

MILLIAMETER—Instrument used for reading current in milliamps. A milliameter should always be connected in series with, not across the points to be measured.

MILLIAMP—One thousandth part of an ampere.

MIXER—The tube in a superheterodyne receiver which 'mixes' the received signal with that of the local oscillator producing the intermediate frequency. Also refers to controls used to mix or blend several sources of sound. such as combining music and sound from two different microphones.

MODULATED WAVE—A modulated wave is a wave of which either the amplitude frequency, or phase is varied in accordance with a signal.

MODULATION—The process by which the audio frequency wave is combined with the radio frequency carrier wave.

MODULATOR — A device which performs the process of modulation.

MONOCHROMATIC SENSITIVITY—The response of a photo-tube to light of a given colour, or narrow frequency range.

MU-FACTOR — A measure of the relative effect of the voltages on two electrades upon the current in the circuit of any specified electrode. It is the ratio of the change in one electrode voltage to a change in the other electrode voltage, under the condition that a specified current remains unchanged,

MUTUAL CONDUCTANCE—(See Grid-plate Transconductance.)

OHM—The unit of electric resistance. A circuit has a resistance of one ohm when a current of ane amp flows at a pressure of one valt.

OSCILLATOR — A non-rotating device far producing alternating current, the ouput frequency of which is determined by the characteristics of the device.

OSCILLATORY CIRCUIT — A circuit containing inductance and capacitance, such that a voltage impulse will produce a current which periodically reverses.

OSCILLOSCOPE — See cathade ray oscillascope.

PARALLEL—Where two or more resistars, etc., are connected across the same paints in a circuit they are said to be in parallel.

PEAK—The maximum value during a current voltage cycle, this being 1.414 af the effective value.

PENTODE—A type of thermionic tube containing a plate, a cathode, and three additianal electrades. (Ordinarily the three additianal electrades are of the nature af grids.)

PERCENTAGE MODULATION—The ratio of half the difference between the maximum and minimum amplitudes of a madulated wave ta the average amplitude expressed in per cent.

PERMEANCE—The ease with which lines of farce may pass through a given substance. The appasite ta reluctance.

PHONE—Unit of laudness.

PHONOGRAPH PICKUP — An electromechanical transducer actuated by a phonograph record and delivering power to an electrical system, the wave form in the electrical system corresponding to the wave form in the phonograph record.

PHOTOTUBE — A vacuum tube in which electron emission is produced by the illumination of on electrode. (This has olso been called phato-electric tube.)

PICK-UP—A device which transforms the vibrations imparted to the needle by a recording into corresponding audio frequency voltages.

PIEZO ELECTRICITY — Property possessed by Rochelle salts crystals and certain other substances whereby voltages are formed when mechanical pressure is applied.

PLATE—A common name for the principal anode in a vacuum tube.

POTENTIAL DIFFERENCE—The force which causes electricity to flow. This force is measured in volts.

POTENTIOMETER — Refers to resistance shunted across a circuit equipped with a sliding arm to enable voltage to be tapped off at any point.

POWER AMPLIFICATION (of an amplifier) The ratio of the alternating current power produced in the output circuit to the alternating-current power supplied to the input circuit.

POWER PACK—Device to enable all the receiver power requirements to be supplied from the mains. Generally includes a rectifier transformer and a combination of filter chokes and condensers.

PROTON—One of the units from which all matter is built up. A positive particle of electricity. Nucleus round which electrons revolve.

PULSATING CURRENT—A periodic current; that is, current passing through successive cycles, the algebraic average value of which is not zero. A pulsating current is equivalent to the sum of an alternating and a direct current.

RADIO CHANNEL—A band of frequencies or wavelengths of a width sufficient to permit of its use for radio communications. The width of a channel depends upon the type of transmission. (See Band of frequencies.)

RADIO COMPASS—A direction finder used for navigational purpases.

RADIO FREQUENCY — A frequency higher than those corresponding to normally audible sound waves. (See Audio Frequency.)

RADIO-FREQUENCY TRANSFORMER — A transformer for use with radio-frequency currents.

RADIO RECEIVER—A device far canverting radia waves into perceptible signals.

RADIO TRANSMISSION — The transmission of signals by means of radiated electromagnetic waves originating in a constructed circuit.

RADIO TRANSMITTER—A device far producing radio-frequency power, with means for producing a signal.

REACTANCE — The appasition offered to alternating current af an inductance ar a condenser.

REACTANCE, CAPACITIVE — This term is used to denote the appasition offered by a condenser to alternating currents, the reactance of a condenser being inversely proportional to its capacity and the frequency of the current. Thus the greater the capacity or the higher the frequency the less the reactance.

REACTANCE, INDUCTIVE—With an inductance its effect is in tatal appasitian to that of a condenser, its reactance being zero ta direct current and increasing directly as the frequency.

REACTION—Method of feeding back energy fram the plate circuit of a valve to the grid, it thus again being amplified thraugh the valve.

RECTIFIER—A device having an asymmetrical canduction characteristic which is used far the conversion af an alternating current into a pulsating current. Such devices include vacuum-tube rectifiers, gas rectifiers, oxide rectifiers, electrolytic rectifiers, etc.

REFLEX—A circuit whereby a valve may act bath as a radio frequency and audia frequency amplifier at the same time.

REGENERATION—The process by which a part of the autput power of an amplifying device reacts upon the input circuit in such a manner as ta reinforce the initial power, thereby increasing the amplification. (Sometimes called "feedback" ar "reactian.")

RESIDUAL MAGNETISM — Magnetism retained by a body after the magnetising force is removed.

RESISTANCE—The appasitian offered to a flow af current. The resistance of any material is inversely proportional to its cross sectional area and directly proportional to its length.

RESISTOR—Device used to drop voltage and oppose the flow of current in a circuit. It should be noted that an increase in operating temperature causes an increase in resistance with wire-wound resistors and a decrease in resistance with carbon resistors. All resistors therefore should be operated well within their maximum wattage ratings if the correct resistance is to be maintained.

RESONANCE—Resonance is said to be abtained when the capacitive reactance in a circuit)—The frequency at which the supply effect of these being in total opposition, they balance out leaving only pure resistance to oppose the flow of current.

RESONANCE FREQUENCY (of a reactive circut)—The frequency at which the supply current and supply voltage of the circuit are in phase.

RHEOSTAT — A variable resistance connected in a circuit to vary the amount of current flowing through it.

RIPPLE VOLTAGE—The A.C. voltage present at the output of a rectifier filter system is called the ripple voltage. Provided the ripple voltage does not exceed about 250 milliwatts this ripple voltage may be ignored as far as a receiver power supply is concerned.

ROTARY CONVERTER—A machine for converting direct current into alternating current.

ROTOR PLATES—The movable plates of a variable condensers.

SCREEN GRID — A screen grid is a grid placed between a control grid and an anode, and maintained at a fixed positive potential, for the purpose of reducing the electrostatic influence of the anode in the space between the screen grid and the cathode.

SECONDARY EMISSION—Electron emission under the influence of ,electron or ion bombardment.

SELECTIVITY—This may be defined as the ahility of a receiver to separate the wanted signal from the unwanted ones. This is determined mainly by the sharpness of the resonance curves of its tuned circuit. It should not be imagined, however, a very high degree of selectivity is desirable in the average receiver. All other things being equal the fidelity of a receiver is largely gaverned by the band of frequencies the receiver will pass. Therefare any excesive cutting aff of these frequencies ar side bands will have a bad effect on the quality of the reproduction.

SENSITIVITY — The degree to which a radia receiver responds ta signals of the frequency to which it is tuned.

SENSITIVITY OF A PHOTOTUBE—The electrical current respanse af a phatatube, with no impedance in its external circuit, to a specified amaunt and kind of light. It is usually expressed in terms of the current for a given radiant flux, ar for a given luminaus flux. In general the sensitivity depends upan the tube voltage, flux intensity, and spectral distribution af the flux.

SERIES—Method of connecting cells, resistors or other components in such a way that the current flows through each in turn.

SERVICE BAND—A band of frequencies allocated to a given class of radio communicatian service.

SIDE BANDS — The bands of frequencies, ane on either side of the carrier frequency, produced by the process of modulation.

SIGNAL—The intelligence message or effect conveyed in communication.

SINGLE SIDE-BAND TRANSMISSION — That method of operation in which one side band is transmitted, and the other side band is suppressed. The carrier wave may be either transmitted or suppressed.

SKIN EFFECT—This effect is due to the fact that radio frequency currents da not act in the same manner as direct or low frequency ones. The current tending to flow an the outside of the conductor only rather than through the centre, It is for this reason stranded wires or wire with a fairly large surface are used for short waves.

SOLENOID—Coil of wire wound in the form of a cylinder, acts like a magnet when a current is flowing through the winding.

SPACE CHARGE — Electrons emitted from the filament which due to several causes tend to crowd around the filament.

STABILITY—The ability of a receiver to remain on a given frequency once it is tuned on to it.

STATIC — Strays produced by atmospheric conditions.

STATIC SENSITIVITY OF A PHOTOTUBE—The direct current response of a phototube to a light flux of specified value.

STATOR PLATES—The fixed plates of a variable condenser.

STOPPING CONDENSER—A condenser used to introduce a comparatively high impedance in some branch of a circuit for the purpose of limiting the flow of low-frequency alternating current or direct current without materially affecting the flow of high frequency alternating current.

STRAYS — Electromagnetic disturbances in radio reception other than those produced by radio transmitting systems.

SULPHATION—The farming of a hard deposition of leod sulphide on the plates of an accumulatar. Unless immediate steps are taken to remove this the accumulator will soon become useless. This is due usually to allowing the accumulator to stand for lang periods in a dischorged condition. It is quite often possible to decompose this lead sulphate by giving the accumulator a long overcharge at a low rate.

SUPERHETRODYNE — Type of receiver in which the incoming signal is changed to a lower (intermediate) frequency. It is possible by this means to obtain greater selectivity and also a higher stability and gain.

SWINGING—The momentary variation in frequency of a received wave.

TELEPHONE RECEIVER—An electro-acoustic transducer actuated by power from an electrical system and supplying power to an acoustic system, the wave form in the acoustic system corresponding to the wave form in the electrical system.

TELEVISION—The electrical transmission of a succession of imoges, and their reception in such a way as to give a substantially continuous reproduction of the object or scene before the eye of o distant observer.

TETRODE—A tube having four elements. The additional elements consist of a grid (screen) between the control grid and plate of the valve.

THERMIONIC—Relating to electron emission under the influence of heat.

THERMIONIC EMISSION—Electron or iron emission under the influence of heat.

THERMIONIC TUBE—An electron tube in which the electron emission is produced by the heating of an electrode.

THERMOCOUPLE AMMETER—An ammeter dependent for its indications on the change in thermo-electromotive force set up in a thermo-electric couple which is heated by the current to be measured.

TOTAL EMISSION—The value of the current carried by the electrons emitted from a cathode under the influence of a voltage such as will draw away all the electrons emitted.

TRANSCEIVER — A unit which combines both the transmiiter and receiver. Used extensively in field work where size and portability are of major importance.

TRANSCONDUCTANCE—The ratio of the change in the current in the circuit of an electrode to the change in the voltage on another electrode, under the condition that all other voltages remain unchanged.

TRANSDUCER—A device actuated by power from one system and supplying power to another system. These systems may be electrical, mechanical, or acoustic.

TRANSFORMER—Device for converting alternating voltages fram one value to another. Should a transfarmer have 6 volts applied to its primary terminals the voltage at its secondary terminals will depend on the turns ratio of the two windings. For example, should the secondary have 3 times the number of turns as that af primary winding the voltage promoted at the secondary terminals will be 6 x 3 = 18 volts. Should the reverse be the case the voltage will be 6 x 1/3rd = 2 volts.

TRANSMISSION UNIT—A unit expressing the logarithmic ratios of powers, voltages, or currents in a transmission system. (See Decibel.)

TRICKLE CHARGER — A battery charger whhich charges at a low rate, generally about ½ an ampere.

TICKLER — The reaction winding on a former.

TRIMMER—A small condenser used to balance out small differences existing between sections of a gang condenser or coils.

TRIODE—A valve of three electrodes, consitsing of cathode or filament, grid and plate.

TUBE—Valve.

TUNED TRANSFORMER — A transformer whose associated circuit elements are adjusted as a whole to be resonant at the frequency af the alternating current supolied to the primary, thereby causing the secondary voltage to build up to higher values than would otherwise be obtained.

TUNING—The adjustment of a circuit or system to secure optimum performance in relation to a frequency; commanly, the adjustment of a circuit or circuits to resonance.

TWEETER—A loud speaker designed to reproduce the higher audio freauencies.

UNIDIRECTIONAL—In one direction.

VACUUM PHOTOTUBE—A type of phototube which is evacuated to such a degree that the residual gas plays a negligible part in its operation.

VACUUM TUBE—A device consisting of a number of electrodes contained within an evacuated enclosure.

VACUUM TUBE TRANSMITTER—A radio transmitter in which vacuum tube sare utilised for measuring alternating voltages.. radio-frequency power.

VACUUM TUBE VOLTMETER — A device utilising the characteristics of a vacuum tube for measurin galternating voltages.

VALVE—A tube containing two or more electrodes, usually exhausted of air or may be gas filled.

VARIO COUPLER—An arrangement of coils so arranged that the coupling between them may be varied.

VIDEO—Term meaning a picture or vision used in television,

VOLT—Unit of electrical pressure. The pressure required at the ends of a circuit of 1 ohm resistance to produce a current of 1 ampere.

VOLTAGE AMPLIFICATION—The ratio of the alternating voltage produced at the output terminals of an amplifier to the alternating voltage impressed at the input terminals.

VOLTAGE DIVIDER — A resistor provided with fixed or movable contacts and with two fixed terminal contacts; current is passed between the terminal contacts, and a desired voltage is obtained across a portion of the resistor. (The term potentiometer is often erroneously used for this device.)

WATT—The practical unit of power and is the product of volts and amps.

WAVE — (a) A propagated disturbance, usually periodic as an electric wave or sound wave; (b) a single cycle of such a disturbance; or, (c) a periodic variation as represented by a graph.

WAVELENGTH—The distance between the crests of a wave is called the wavelength and is measured in metres.

WAVEMETER — An instrument consisting fundamentally of a coil condenser and a calibrated dial used for checking the frequency or wavelength of the signal received.

WAVE TRAP—An inductive capacity combination used to prevent unwanted signals from interfering with the wanted signal.

WHEATSTONE BRIDGE — Device used for the measurement of resistance by means of balancing the unknown resistor against known ones.

WOOFER—A speaker designed for the reproduction of the bass or low frequency notes.

—From "Radiogram," N.Z.

LICENCE INCREASE

The return of broadcast listeners' licences made available to-day by the Postmaster-General (Senator Ashley), disclosed an increase of 4,377 for the month of November. The total number of licences in force is now 1,335,336.

Senator Ashley said that the increase for November followed an increase of 7,968 licences in October. The number of homes equipped with wireless receivers had increased in these two months more than in the previous eleven months. Since the passing of the Australian Broadcasting Act which became operative in July, 23,560 supplementary licences have been issued for receivers in excess of one. Only 1,367 licences have been issued for motor car radios.

Licences for additional receivers in homes, however, continue to increase and the Department had encountered cases where no fewer than six receivers had been licenced in the same home, Senator Ashley said.

Referring to the obligation to hold broadcasting listeners' licences, Senator Ashley explained that under the new Act all radio dealers were required to notify the Postmaster-General's Department of the names and addresses of purchasers of wireless sets. This information was proving a great help in the detection of unlicensed listeners.

Senator Ashley said that the recent increase in licences was caused by a drive to detect unlicensed receivers. The drive would continue in all States.

SIGNAL TRACERS

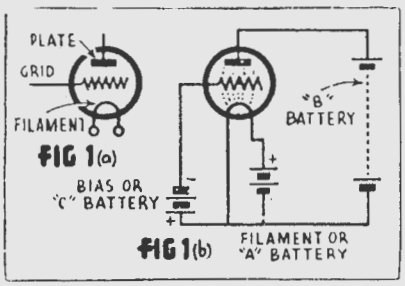
Another article on the subject of signal tracers for service work has been promised by Mr. John Bristoe and should be ready for publication in next month's issue.

MORE ABOUT THE VALVE

The action of the control grid in controlling the electron flow, and the reason why further grids are added in some types of valves, are explained below.

LAST month the working of the simple diode valve was explained, together with the effect of the space charge on current flow. Now, suppose a third element is added to the valve, which now becomes a triode or three-element valve.

This new element, called the grid (or more fully, the control grid), is in the form of a widely-spaced mesh-like structure. It generally consists of a spiral of wire, and is located between cathode (or filament) and plate. In circuit diagrams, a grid is



represented by the zig-zag line shown in fig. 1 (a), separating filament from plate.

The Action of the Grid

Now imagine a triode connected up in the circuit shown in fig. 1 (b). This is similar to the circuit used to illustrate the action of the diode, except that a third battery, known as a "C" or grid bias battery, is included, with its negative terminal connected to the grid and positive to the negative pole of the filament battery.

This arrangement obviously means that the potential applied to the grid is negative to that of the filament.

The effect of this negatively-charged electrode between filament and plate should now be obvious. The negatively-charged electrons leaving the filament for the plate under the influence of the positive voltage applied to the latter, come under the influence of the negative grid, which repels them. The number that manage to pass through the open spiral of wire constituting the grid, and reach the plate, depends on the repelling force exerted by the grid, which in turn depends on the negative potential applied to it.

Grid Potential Controls Electron Flow.

Thus with the grid at zero potential, there is no repelling force; with it negative to filament, there is, while when the grid is positive to filament it exerts an attracting force augmenting that of the plate. If the grid is positively charged, it actually captures a few electrons of its own, and these, in returning via the grid circuit to the negative side of the filament, constitute what is known as grid current.

Effect of the Grid Illustrated

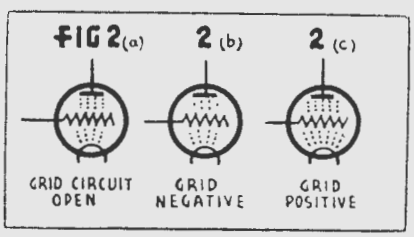
The steady plate current that flows with the zero grid potential decreases when the grid is negative and increases when it is positive. These effects are illustrated diagrammatically in figures 2 (a), (b), and (c).

Thus we have learnt that the action of the grid is that of a valve or trigger, in that by varying its potential in respect to that of the filament, the electron stream flowing from filament to plate, and constituting the plate current, can be varied from zero to maximum.

Adding a Second Grid

The triode valve was for some time regarded as perfect for the functions it had to perform, until there came a new development which made the valve far more useful in many ways.

Between the grid and plate of a triode valve there exists a tiny capacity which can cause serious trouble in some applications by providing undesirable coupling between the plate (or output circuit) and the grid (or input) circuit. This drawback can be



obviated by placing yet another element within the valve, making four in all.

This new element — generally known as the screen grid — is interposed between the control grid and

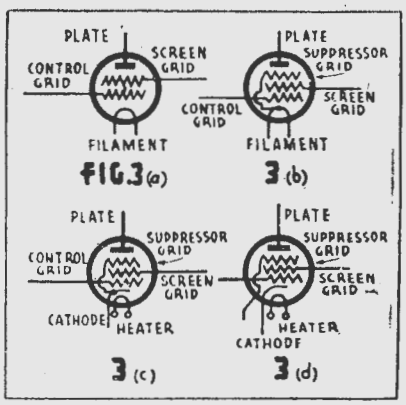


plate. In order that it will not have any detrimental effect on the electron flow from filament to plate, a positive potential is applied to it approximately equal in value to the potential of the electron stream at the point where screen grid is inserted.

Thus this grid does not obstruct the flow of electrons, but provides an effective electro-static shield between grid and plate that greatly reduces the capacity between these two elements. This type of valve is known as a tetrode, or four-element valve, the theoretical symbol for it being shown in fig. 3 (a).

Adding Still Another Grid

With the inclusion of the screen grid, a new effect arises. Some of the electrons flowing from filament to plate knock out other electrons from the latter, and as the screen grid nearby has a positive potential on it, some of these dislodged electrons are attracted to the screen. These electrons are called secondary electrons, and the effect is known as secondary emission.

To overcome it, the introduction of yet another grid, known as the suppressor grid, is required. This gives us the pentode, or five-element valve.

In some types of pentodes, notably those of the output variety, the suppressor grid is connected to the centre point of the filament in the case of battery valve (see fig. 3b), and to the cathode in the case of indirectly-heated valve (see fig. 3c). This "zero potential" grid interposed between plate and screen effectively eleminates secondary emission.

In r.f. pentodes the suppressor grid is not connected internally to filament or cathode, but the connection from it is taken out to a separate pin on the valve base (see fig. 3d).

Other Multi-Element Types

There is a tremendous variety of multi-element valves, used for dual and specialised purposes. However, these need not be considered for some time yet.

(Continued next month)

Shortwave Review

CONDUCTED BY
L. J. KEAST

NOTES FROM MY DIARY

Vacation Time

Even radio people, or some of those connected with the publication of this little magazine must have a spell, so these notes are being sent in much earlier than is customary. (Yours truly hopes to get his "fortnight off" a little later in the New Year.) It may mean that reports from several of our regulars will be omitted in this issue.

There does not seem to have been anything outstanding of late; as a matter of fact, reception has certainly been spasmodic. Our old friends, the Sun Spots, according to the BBC, are blamed again for the poor signals. But at this time of the year one becomes reminiscent, and, in looking back, marvels at the improvement in Short-wave reception. Whilst a good deal is due to the improved transmission, we must not overlook the fact that Australia radio engineers have improved our receiving sets, so much so that a modestly priced dual wave receiver will bring in most of the stations. These two great improvements have been brought about by you and I; yes, by our reports overseas. The various countries have been able to choose the best times and the correct wavelengths, and by the continued request of this magazine to the manufacturers to build the type of sets we knew to be mostly required. Several have told me they had no idea that there was such an interest in short-wave reception; but the terrific sales have not only proved our contention, but enabled them to be sold at a very low price. Latest official figures show there are 1,330,960 homes in the Commonwealth with licenced sets.

Anyhow, while the boss, and those connected with the publication of A.R.W. had gone as far as the transport authorities would let them, I decided, as my little spell of four days was to be at home, I would spend it (Xmas Day excepted) at the controls and try and hear some of those stations not available to me on ordinary days. But my luck was out. A worse day than Boxing Day I do not remember. At one stage I wondered if my aerial was alive, it seemed to me that my little Radio Centre had got the full force of the thunder and lightning, It was hours before overseas reception was possible.

Morning Stations

While summer time is really night reception time, there are, these days, plenty of stations to tune in around early breakfast time. Actually from say, 6 a.m. till 8 a.m., there are over a dozen different countries to be heard, and while Turkey, Algeria, Switzerland, Portugal, and Mozambique may only have one station each in operation at that time, England, America, Russia, Germany, Italy, Japan, and China leaves a choice of several transmitters. And looking at this list one is struck by Portugal. I suppose every Short-wave listener has tuned in the old reliable Lisbon signal on 27.17 metres. Always seems to me to be the same female announcer as we have heard for years.

Talking of women announcers reminds me of EAQ, Madrid, now putting in a nice signal from 5 to 6 a.m. with news in English a little after 5.15 a.m.

Picking up one of Dr. Gaden's many letters I find he spends most of his available time in the mornings listening to the Yanks. From 7 a.m. he says: "WLWO, 25.26m. splendid, WCDA, 25,36 metres good; WCBX, 19.65 fair; WCW, 18.93 and WCRC, 16.83 both need phones." Dr. Gaden's remarks, together with my own observations, have prompted me to give a list of stations on the air between 6 a.m. and 7 a.m.

It certainly makes a formidable list and while all stations will not be heard in all districts, it may serve as a useful guide to those listeners who are hearing a "weak sister", and not quite sure of same.

Re Verifications

Got some consolation by reading that Arthur Cushen states "Nobody in New Zealand has received any veries from WJQ, etc., and he hasn't got one from KWID yet."

Well, I think he will receive one from KWID, as most of us over here have.

My latest moan regarding American "efficiency" is the return to me of a letter I sent to my old friend E. J. Shields, Boulder City. Posted in Sydney on May 20, 1942, it arrived back at Carlingford just before Xmas, stamped by postmaster in U.S.A. reason checked "unclaimed and unknown." I can understand a letter being unclaimed particularly if this chap is away, but "unknown" seems hard to accept, as I figure Shields must have a tremendous mail as principal of the Quixote Radio Club. I have been a member of this Club ever since I saw Shields' report to the ABC., when the Department of In-

(Continued on next page)

ALL-WAVE ALL-WORLD DX CLUB

Application for Membership

The Secretary,
All-Wave All-World DX Club,
117 Reservoir Street, Sydney, N.S.W.
Dear Sir,

I am very interested in dxing, and am keen to join your Club.

Name .....

Address .....

(Please print both plainly) .....

.....

My set is a .....

I enclose herewith the Life Membership fee of 2/– (Postal Notes or Money Order), for which I will receive, post free, a Membership Certificate showing my Official Club Number. NOTE—Club Badges are not available.

(Signed) .....

(Readers who do not want to mutilate their copies can write out the details required.)

formation programmes first commenced. It was his stationery that first attracted my attention and we have been in constant communication since then.

Dr. Gaden Tells Me:

VLG-7, Melbourne, 15,160kc., 19.79 metres, in a.m. and at lunch-time puts VLR-8 in the shade. (I can understand our Quilpie friend thrilling at this, because he advocated for ages a 19 metre band transmitter was required for Queenslanders at these hours.—Ed.) Cannot understand omitting WBOS. It is about equal to WGEO, but not as good as WLWO. A great favourite of mine. I received a verie from WBOS as far back as 1934.

Recent veries are: WRUL, and WRUW, WRUS, KWU, KWV, KES-3,

NEW STATIONS

KEI, Bolinas, 9490kc., 31.61m.: This old-timer seems to have replaced KET, 9480kc., 31.65m. Takes programme from KGEI at 5 p.m.

XGAW, Shanghai, 6090kc., 49,25m.: This Eastern station is heard from midnight with fair signal. At 12.45 news is heard, This Jap controlled station employs an American to read the news. DXBC enthusiasts can also hear XGAW on 800 kc.
Dr. Gaden says XGAW announce as on 6100kc., which would make wavelength 49.12m.

VQ7LO, Nairobi, 10,730kc., 27.96m.: The popular Kenya Colony station is now using this transmitter carrying the same programme as its sister on 49.5 metres, and is coming through at much better strength. This frequency is not new, as a note in my records shows it as being heard on November 1, 1940 — the call sign then being VQGE.

all by letters from KWID, who stated that such good reports "deserved more than a card" (and I'll bet they were reports too.—Ed.).

Have two KWID cards, but cannot get a reply from KGEI.

New Identification Signal

Tokyo in the 31 metre band has been heard using a bird-call very similar to Radio Roma. I was listening to JZI, 31.46 m. at 9.27 p.m. birds were followed by Tokyo chimes, then, "This is Radio Tokyo in Spanish for America Latina."

"Here is the News"

Stephen Miller, one of the BBC announcers in the overseas service, is a man who has realised boyhood's ambition—he always wanted to be an announcer, and now he is one of the youngest in the BBC. He developed a craze for announcing at an early age and in reply to a request he made for an opportunity to "try his hand" was told that he seemed to be a little young at 13!

At 17 he became a reporter on the "Daily Mirror" and in 1938 achieved his ambition when he went to France to join Radio Lyons as announcer. When war broke out he returned to England and became a newspaper free-lance, touring London in every blitz in order to get the best up-to-the-minute stories. Two of his narrow escapes were when a bomb dropped 20 yards behind him, and when he came completely unscathed from the bombing of London's Cafe de Paris. When the bomb fell he was sitting in the balcony covering a story for the American periodical "Downbeat."

By the way, I heard another news reader from the BBC—Tom Chalmers.

Shades Of YDC

Probably mindful of how popular the musical programme of YDC became, Tokyo has apparently ordered Radio Batavia, 16.54 metres, to present well known dance bands from 9 to 9.30 p.m. (Victor Sylvester's orchestra is often featured, according to Mr. Hugh Perkins, of Malanda.)

Believe It Or Not

Next time you are listening to HI2G, Cuidad, Trujillo, 32.28m. remember that Columbus Street is the oldest street in the Americas — the buildings were erected 1502-1505, according to Ripley.

BBC Has New Service

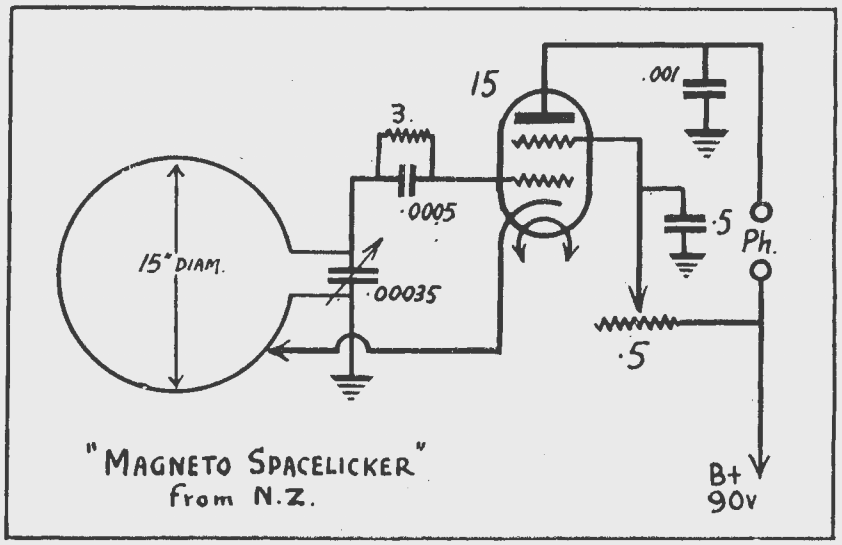
Miss Marjorie Anderson, after wishing us "A Happy New Year" on Saturday, January 2, at 9.45 p.m., announced: "Before I proceed with the programme announcements I must mention that Central America, the West Indies, South America and —— can now hear our programme in the African service at 16 hours (3 a.m. Sydney) on 16.64 metres, and 16.59 metres. The news in Spanish previously given at 16 hours will now be heard at 15.45 hours." We, of course, are familiar with GRQ 16.64 metres, but I have not heard the call sign on the new transmitter on 16.59 metres.

The "Magneto" Spacelicker

WHEN I designed this receiver it was in great haste in order to attempt to take a bearing on the ground wave component of a nearby S.W. station without a thought of D.X. or long-distance possibilities.

Heretofore it had been a dogmatic contention of mine that shortwave reception was impossible without a good outdoor antenna.

However, I had never previously conducted any experiments on reception utilising the magnetic component of the waves at high frequencies, and I was frankly amazed at the results obtained, for, in addition to the main S.W, stations of the world being audible, dozens of lesser low-powered transmitters, both phone and telegraph, were heard, while the loop tended to nullify static and improved selectivity to a marked degree.



Construction

Firstly, a frame about 19-in. in diameter, roughly circular, must be obtained or made and cup hook insulators screwed in round it every two or three inches.

These are to support the loop, which should preferably be of 18-16 gauge S.W.G. tinned copper. Their exact spacing will depend on the rigidity of the wire used. Then the frame is drilled through and mounted, by means of long screws and washers, on to a baseboard of sufficient size to make the frame freely rotatable without danger of overbalance.

For convenience the set is mounted inside the frame by means of a panel which overlaps the ends of the baseboard.

It is built first on to its baseboard and panel, leaving provision to tie in the two ends of the loop tuning coil and then mounted in the frame, while lastly the loop is threaded through the insulators and connected across the tuning condenser,

Reaction Control

The cathode connection has soldered to it about six inches of flexible wire with an alligator clip on the end for attaching to the loop. It should be first tried between 3-in. and 6-in. from the ground end of the coil, remembering that too much feedback stops oscillation as well as too little, the exact position being the place where the set slips into oscillation with the least click.

Operation

For most satisfactory operation a plate voltage of about 90 is required; also to ensure stability the batteries should be connected through a length of 5-wire battery cable, as loose battery connections moving about near the coil may make tuning difficult.

The actual tuning range of this receiver will vary with individual construction. However, with the .00035 mfd. tuning condenser it should cover from approximately 18 to 50 metres, The heavier the gauge of the loop wire, the lower the minimum wavelength will be that the set will tune.

ALL TIMES ARE AUSTRALIAN DAYLIGHT SAVING TIME

Further pressure on spoce only permits of unusual Loggings or alterations in schedules or frequencies.

Please have reports sent to L. J. Keast, 23 Honiton Avenue West, Carlingford, to arrive by 27th of month,

Please note alterations and additions to Australia.

Australia:

VLQ2, Sydney 11,870kc, 25.27m
From 9.40 to 10.15 p.m. for North East Asia.

VLG-3, Melbourne 11,710kc, 25.62m
Time for Western States of Nth America is now 3.25 p.m. to 4 p.m. Also used for Tahiti (in French) from 4.55 p.m. to 5.40 p.m. From 5.55 to 6.25 p.m. for British Isles. From 6.30 to 6.50 p.m. for New Guinea (in Japanese) Fram 7.25 to 8.25 p.m. for New Caledonia (in French).

VLQ-5, Sydney 9680kc, 30.99m
For Western States of Nth. America 3.25 to 4 p.m. and from 5.55 to 6.25 p.m. for British Isles.

VLW-6, Wanneroo 9680kc, 30.99m
From 11.40 p.m. to 1.55 a.m
For South East Asia (in Thai, Malay, Dutch, French and English).

VLG-2, Melbourne 9540kc, 31.45m
From 10.25 to 11.30 p.m. for Eastern States of North America. From 11.40 p.m. to 1.55 a.m. for South East Asia (in Thai, Malay, Dutch, French and English). From 2 to 2.45 a.m. for Western States of Nth. America.

Oceania:
New Caledonia:

FK, 8AA, Noumea 6160kc 48.7m
French programme around 6.15 p.m., but almost blotted out by atmospherics on most evenings.

Africa:

VQ7LO, Nairobi 10,730kc, 27.96m
Heard in same programme as VQ7LO on 6060kc., 49.5m. BBC news at 5 a.m.

VLQ-4, Sydney 7280kc, 41.21m
Note slight change in frequency. Used at 10.25 p.m. with VLG-2 for Eastern States of North America.

North America:

KWU, 'Frisco 15,355kc, 19.53m
Terrific signal at 10.45 a.m. when "Hi Neighbour" session was on. News given at 11 a.m. was as clear as a bell.
At 11.15 a.m. splendid talk directed to the Philippines warning them against the dangers of opium, which was being distributed by the Japanese at a price within the reach of all.

KWID, 'Frisco 15,290kc, 19.62m
Quite a fair signal at 10.45 a.m., but not 1-2-6 with KWU. Closed at 12.15 and announced would return at 12.30 p.m. on 9570kc., 31.35m.

KWV, Dixon 10,840kc, 27.67m
Best of the KWID reloys at 6 p.m. (Perkins).

WCDA, New York 11,893kc, 25.22m
Opens nicely at 7 p.m. — much better than at 7 a.m. (Gaden).

WGL, New York 9750kc, 30.76m
Heard at 9.16 a.m. giving their skeds and frequencies, mainly 15 m.c. band during our hours of darkness, and 7 m.c. during our hours of light.

KEI, Bolinas 9490kc, 31.61m
Heard from 5 p.m. in same programme as KGEI.

WLWO, Cincinnati 6080kc, 49.5m
Believe schedule is 1.30 p.m. to 3.30 p.m.

WRUS, Boston 6040kc, 49.67m
5 p.m. to 9 p.m.
Fair around 8 p.m. (Gillett). Heard Nov. 8 at 10.30 p.m. (Condon).

THE EAST

China:

KGOY, Chungking 11,900kc, 25.21m
Schedule: 8.15 a.m. to 9 a.m. News 8.30 a.m. 9 p.m. to 10.30 p.m. News 9 p.m.

KMHA, Shanghai 11,855kc, 25.3m
7.30 p.m. to 1.30 a.m. News 9.30 p.m. and 12.15 a.m.

XGRS, Shonghoi 11,680kc, 25.68m
7.30 p.m. to 2.30 a.m. News 9.15, 10.30 and 11.30 p.m.

XGOK, Canton 11,650kc, 25.75m
9 p.m. to 1 a.m. News 11 p.m. R4 at 10.30 p.m. (Perkins).

XGAP, Peiping 10,240kc, 29.24m
R6 at 9 p.m. (Perkins).

XGOA, Chungking 9720kc, 30.86m
6 a.m. to 8a.m. 11 p.m, to 2 a.m. News at 1 a.m.

XGOY, Chungking 9625kc, 31.17m
10.35 p.m. to 2.30 a.m. News 11.30 p.m., 1 a.m. 1.30 and 2 a.m.

JQHA, Hongkong 9470kc, 31.68m
R8 at 9 pm. (Perkins).

XLMA, — 9370kc, 32.02m
Heard around 11.30 p.m. (Perkins, Gillett).

XPSA, Kweiyang 8465kc, 35.44m
10 p.m. to 2 a.m.

XGOY, Chungking 6130kc, 48.94m
Opens at 10.30 p.m. closes 3 a.m. English 11.30 p.m., 12.30, 1, 1.30 and 3 a.m.

French Indo-China:

Radio Saigon, Saigon 11,780kc, 25.47m
10.45 a.m. to 11.15 a.m.; 9 p.m. to 3 a.m. News 10.30 p.m. and 2.45 p.m.

Malaya:

Singapore Radio 12,000kc, 25.00m
8 p.m. to 1.30 a.m. Another Jap controlled transmitter.

Dutch East Indies:

PMC, Batavia 18,135kc, 16.54m
8.30 a.m. to 10 a.m.; 1 p.m. to 2.30 p.m.; 8 p.m. to 2 a.m. (Japanese controlled).

India:

VUD-3, Delhi 15,290kc, 19.62m
R6 at 1.15 p.m. and 10 p.m. (Perkins).

VUD-4, Delhi 11,840kc, 25.34m
11 p.m. to midnight. News 11 p.m.

VUD-6, Delhi 11,790kc, 25.45m
R7 around 10.30 p.m. (Perkins).

Philippines:

KZRH, Manila 11,600kc, 25.86m
R6 at 9 p.m. and 10 a.m. (Perkins). (Not a sign of same at Carlingford in the mornings.—Ed.)

KZRH, Manila 6145kc, 48.82m
R6 at 10 p.m. (Perkins).

GREAT BRITAIN

With the exception of, say, 8 a.m. till 1 p.m., one or more London transmitters can be heard right round the clock.

GSF 15,140kc, 19.82m
Now used from 4.45 to 8.45 p.m. But probably not too good till near 6 p.m.

GRG, ...11,680kc, 25.68m
Now used from 4.45 p.m. to 8.45 p.m. in Pacific Service (Perkins).

GRY 9600kc, 31.25m
Now used from 4.45 to 5.45 p.m.

EUROPE

France:

Radio Vichy, Vichy 15,245kc, 19.69m
12.30 a.m. to 3.45 a.m.

Radio Vichy, Vichy 11,845kc, 25.33m
4 a.m. to 9.50 a.m.

Radio Vichy, Vichy 9520kc, 31.51m
5 p.m. to 6.30 p.m.

Germany:

DJH, Berlin 17,845kc, 16.81m
6.30 p.m. till 3 a.m. very good around 9.30 p.m. (Perkins).

DXV, Berlin 17,820kc, 16.83m
Heard at 9.30 p.m. in same programme as DJH (Perkins).

DJE, Berlin 17,760kc, 16.89m
5.30 p.m. till 3 a.m., News 6 p.m. and 11 p.m.

DJR, Berlin 15,340kc, 19.56m
4 p.m. to 3 a.m. News 6 and 11 p.m.
An unbelievably good signal at 11 p.m.

DZD, Berlin 10,543kc, 28.45m
3.30 a.m. to 8.45 a.m. News at half past the hour. Also at 6 a.m. and 7.45 a.m.

DXZ, Berlin 9570kc, 31.35m
3.30 a.m. to 8.45 a.m.

DXM, Berlin 7270kc, 41.27m
3.30 a.m. to 8.45 a.m.

DXJ, Berlin 7240kc, 41.44m
3.30 a.m. to 8.45 a.m.

DJC, Berlin 6020kc, 49.83m
4.40 a.m. to 8.25 a.m. News 5.15 a.m. and 7.15 a.m.

LOGGINGS
(Continued)

Holland:

PCJ-2, Huizen 15,220kc, 19.71m
This German-controlled station announces at 10.30 p.m., "Here is Holland calling." News 10.45, 11.45 p.m. and 1.30 and 2.30 a.m. Closes 2.45 a.m.

Italy:

2RO-3, Rome 9630kc, 31.15m
3.30 a.m. to 9.15 a.m., 3.30 p.m. to 4.30 p.m.

2RO-23, Rome 6300kc, 47.6m
3.30 a.m. to 9.15 a.m.

Vatican City:

HVJ 15,120kc, 19.84m
2 a.m. to 2.20 a.m. on Wednesdays.
8.30 p.m. to 9.05 p.m. Sundays.

HVJ, ... 5969kc, 50.26m
5 a.m. to 6.30 a.m. Talk 6.15 a.m. except Mondays.

Portugal:

CSW-6, Lisbon 11,040kc, 27.17m
8 a.m. to 9 a.m. One of the most consistent transmitters, but fades after 8 a.m.

Russia:

Schedules are liable to change daily.

——, Moscow 15,265kc, 19.65m
10.40 p.m. to 11.15 p.m. News and talks. 12.15 p.m. to 12.25 p.m news and talks.

——, Moscow 15,230kc, 19.7m
Same schedule as 19.85m. Heard in English at 10 a.m. Louder than 19.85 (Gaden).

——, Moscow 15,115kc,19.85m
8.15 a.m. to 8.40 a.m., News 8.25 a.m.; 9.48 a.m. to 10.25 a.m. News and talks 12.15 p.m. to 12.40 a.m. News and talks 2.15 p.m. to 2.40 p.m. News and talks. Good at 10 a.m. (Gaden).

——, Kuibyshev 13,010kc, 23.06m
Midnight to 12.15 a.m. News and talks: 12.45 a.m. to 1.15 a.m. News and talks.

——, Moscow 9545kc, 31.43m
10.40 p.m. to 11.15 p.m. Talks. 12.15 a.m. to 12.25 a.m. Talks.

——, Kuibyshev 8050kc, 37.27m
English from 6.30 to 7 a.m.

——, Kuibyshev 6130kc, 48.94m
English from 6.30 to 7 a.m.

Siberia:

——, Khabarovsk 9566kc, 31.36m
6.50 a.m. to 8.30 a.m. 8 p.m. to 1 a.m. Physical exercises at 7.15 a.m.

Spain:

EAQ, Madrid 9860kc, 30.43m
5 a.m. to 6 a.m. English at 5.15 a.m. Woman announcer.

Switzerland:

HER-5, Schwarzenburg 11,865kc, 25.28m
Saturdays, 5.45 p.m. to 7.15 p.m. in national languages and on Tuesdays in English.

HER-3, Schwarzenburg 6165kc, 48.66m
5 a.m. to 9.05 a.m.; 4.20 p.m. to 5.40 p.m. Talk in English at 7.10 a.m. on Saturdays.

Yugoslavia:

YUB, Belgrade 6100kc, 49.18m
4 a.m. to 8 a.m.

(Continued on page 26)

SPEEDY QUERY SERVICE

Conducted under the personal supervision of A. G. HULL

M.R. (Ballarat, Vic.) states that his set has stopped working and that the rectifier plates glow red when it is switched on.

A.—It sounds very much as if the first electrolytic condenser hos broken down. This may be either on aluminium can bolted to the chassis, or a cylindrico! cardboard covered cylinder under the chassis. At any rote, one part or end of it will be connected to a prong of the rectifier valve socket. The foulty condenser should be removed and reploced by another, either one of the some type or on 8 microfarad 525 volt condenser. Be sure that it is the red, or positive end of the condenser that is connected to the rectifier (the centre terminol is the positive in the case of a con type electrolytic).

* * *

A.D.K. (Annuello, Vic.) finds that his 6 volt "battery-less" wireless will work off 4 volts and wants to know if it will harm it.

A.—Yes, it may harm it. Some valves suffer from whot is termed "cathode poisoning' if the voltage is too low, because the cothode surfoce does not become hot enough to evaporote vorious materials harmful to its action. In extreme cases, valve life hos been reduced to less than 20 hours by operating 6.3 volt filament on 4.8 volts. Besides, the reduction of the supply to 4 volts means that the battery becomes unevenly discharged. Again, the tone ond volume suffer and the vibrator is likely to stop, so we advise most strongly to use the whole 6 volts.

* * *

J.D.K. (Queensland) says: "I have output valves in push-pull and two speakers. Can I use two separate transformers, one between each valve and speaker "

A.—The answer is definitely **no** if you wish to retain push-pull operation. The onodes of the output valves **must** be coupled together by some antiphase device such as a centre-topped transformer or centre-tapped choke coil. Without this coupling, it would only be equivolent to porallel operation, thereby losing tone, volume and efficiency. For a poir of speakers, the simplest plan is to connect their voice coils in parallel and use o transformer of twice the required impedance, e.g., for 6V6 valves in push-pull, and two voice coils in parallel, use a transformer labelled 16,000 to 20,000 ohms.

* * *

R.D.S. (Footscray, Vic.) asks: "Why does an R.F. stage reduce noise in a superhet? Woudn't the R.F. stage amplify noise and signal to the same extent and thus keep their ratio the same "

A.—That is certainly true of noise coming in via the aerial, except that the increased selectivity reduces the band width and hence the amount of noise received. However, a good part of the noise comes from the converter, especially if of the pentagrid type, so if the signal is amplified first, then the signal-to-noise ratio is considerably improved.

* * *

H.T. (Bell, Vic.) is worried about the new broadcasting listeners' regulations.

A.—Yes, it is correct that you will have to pay an odditional 10/— licence fee for every extra set in the house. If you have two sets in operation the fee is 30/—. These new regulotions have been in force for some months now, but only apply to renewols. Licences taken out before the new regulations were introduced will serve to cover any number of sets until they expire.

LOGGINGS

(Continued from page 25)

SCANDANAVIA

Sweden:

SBT, Stockholm 15,155kc, 19.8m
2 a.m. to 3 a.m. News at 2 a.m.

SBP, Stockholm 11,705kc, 25.63m
4.56 a.m. to 5.15 a.m.; 5.40 p.m. to 6.30 p.m. Also (on Sundays only) can be heard in religious service from 9 p.m.

SBU, Motala 9530kc, 31.46m
8.15 a.m. to 9 a.m. News 8.20 a.m.

MISCELLANEOUS

Canada:

CFRX, Toronto 6070kc, 49.42m
Heard at 11 p.m., but badly QRM'D by other stations (Perkins)

Iran:

EQB, Teheran 6155kc, 48.74m
3 a.m. to 6 a.m.; News 5.15 a.m.

TAQ, Ankara 15,195kc, 19.74m
Heard from 8.30 to 9 p.m. in Turkish.

Turkey:

TAP, Ankara 9465kc, 31.70m
1.15 a.m. to 6.50 a.m. News 5.15 a.m. Was missing for a while, due to crystal trouble, I believe, but now as good as ever.

STATIONS ON AIR 6 a.m. to 7 a.m.

Here is a list of stations which, according to my records, are on the air between 6 a.m. and 7 a.m.

I have heard most of them, and some not audible at my address will most likely come in at quite good strength in Queensland.

It must be understood it does not follow stations are on for the whole period—they may open at ten minutes to the haur, or close just a few minutes past.

Will welcomc reports as to correctness of this list.

Between 6 and 7 a.m.

Call Sign	City	Kilo-cycles	Wave Length
WRUW	Boston	15,350	19.54
WGEA	New York	15,330	19.57
2RO-6	Rome	15,300	19.61
GSI	London	15,260	19.66
VLG-7	Melbourne	15,160	19.79
WNBI	New York	15,150	19.81
DJL	Berlin	15,110	19.85

It will be noted in several instances two stations on the same frequencies are shown as being on the air at the same time. It is quite likely in a good many locations one station will get "through", whereas in others it will be a hopeless blur.

However, the list is intended to be as complete as possible. Some of the doubles are:—

DJL, Berlin, 19.85.
——, Moscow, 19.85.
WGEO, New York, 25.33.
——, Paris, 25.33.
VLW-3, Perth, 25.36.
WCDA, New York, 25.36.
VLR-8, Melbourne, 25.51.
DXR, Berlin, 25.51.
KWID, 'Frisco, 41.49.
GSW, London, 41.49.
GSL, London, 49.18.
YUB, Belgrade, 49.18.

WDO	New York	14,470	20.73
TPZ	Algiers	12,120	24.75
2RO—	Rome	11,950	25.1
WRCA	New York	11,893	25.22
WBOS	Boston	11,807	25.27
GSE	London	11,860	25.29
WGEO	New York	11,847	25,33
——	Paris	11,845	25.33
WCDA	New York	11,830	25.36
GSN	London	11,820	25.38
2RO-4	Rome	11,810	25.4
WRUL	Boston	11,790	25.45
OIX-3	Helsinki	11,785	25.46
DXR	Berlin	11,760	25.51
VLR-8	Melbourne	11,760	25.51
GSD	London	11,750	25.53
2RO—	Rome	11,740	25.55
WLWO	Cincinnati	11,710	25.62
GRG	London	11,680	25.68
CSW-6	Lisbon	11,040	27.17
DXD	Berlin	10,543	28.45
2RO—	Rome	10,330	29.04
CR7BE	Lourenco Marques	9845	30.47
2RO—	Rome	9790	30.64
XGOA	Chungking	9720	30.56
GRX	London	9690	30.96
DJX	Berlin	9675	31.01
2RO-3	Rome	9630	31.15
GRY	London	9600	31.25
GSC	London	9580	31.32
DXZ	Berlin	9570	31.35
RW-15	Khabarousk	9566	31.36
JZI	Tokyo	9535	31.46
GSB	London	9510	31.55
OIX-2	Helsinki	9500	31.58
KET	'Frisco	9480	31.65
TAP	Ankara	9465	31.7
Bucharesti	Bucharest	9255	32.41
TPZ-2	Algiers	8960	33.48
KES-2	'Frisco	8930	33.59
——	Kuibyshev	8050	37.27
——	Beirut	8030	37.34
GRJ	London	7320	40.98
DXM	Berlin	7250	41.27
KGEI	'Frisco	7250	41.38
DXJ	Berlin	7240	41.44
KWID	'Frisco	7230	41.49
GSW	London	7230	41.49
2RO-11	Rome	7220	41.55
——	Kuibyshev	6945	43.2
2RO-23	Rome	6300	47.6
JLT	Tokyo	6190	48.47
HER-3	Geneva	6165	48.66
GSL	London	6110	49.1
YUB	Belgrade	6100	49.18
GRR	London	6080	49.34
GSA	London	6050	49.59
DJC	Berlin	6020	49.83
HVJ	Vatican City	5969	50.26

*Note the clean-cut appearance of the new Eimac 450T tube...see the streamlined cap over the plate and the husky single tungsten-bar plate lead. Notice the new shape of the bulb near plate terminal. These and other improvements have increased its already superior performance capabilities.

EIMAC 450T sets the pace in modern radio

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