THE AUSTRALASIAN

Radio World

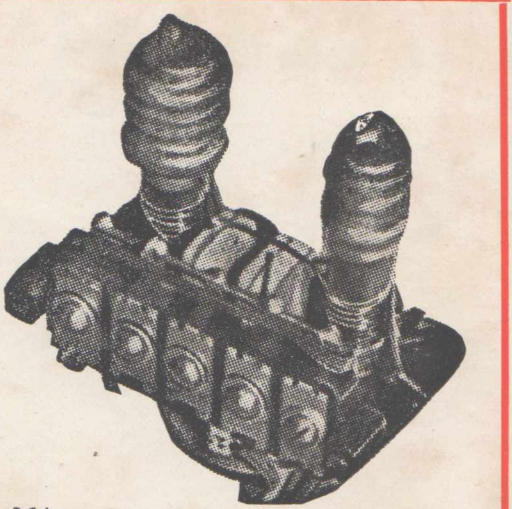
Registered at the G.P.O., Sydney, for transmission by post as a periodical.

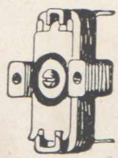
1/-

Special Data and Handbook Issue

VOL. 13 ..... NO. 4   SEPTEMBER 18, 1948

CROWN COMPONENTS





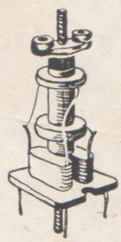
P.12. STANDARD 5-PLATE PADDER CONDENSER

455 Kc. using Polystyrene base. For use in conjunction with H. gang condenser. Price 2/6.

D.C. 2A TUNING UNIT

(13 to 42 metres) 1600 to 550 Kc/s. for use with H gang condenser. Suitable for compact chassis construction. Price, 36/–.

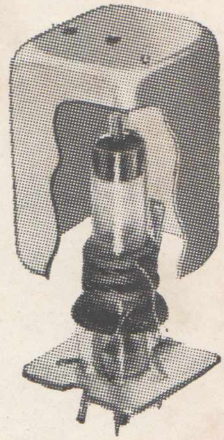
455 Kc. STANDARD "PERMA-TUNED" I.F. TRANS-FORMER



In aluminium Can. First Stage P.T.31, Second Stage P.T.32. Price, 13/9.

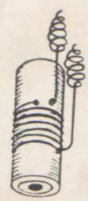
STANDARD "PERMATUNE" COILS IN ALUMINIUM CANS

Aerial PC53, R.F. PC54, Osc. PC55. Iron-cored. For use with H gang condenser. Wound on Polystyrene formers. Price 8/9.



AIR CORE S/W COILS

13 to 42 metres, Z.C.59 aerial, ZC.60 R.F., ZC61 oscillator, for use with H gang. Price, 2/10 Each.



IRON CORED SHORT WAVE COILS

I.C. 62 aerial,
I.C. 63 R.F.,
I.C. 64 oscillator,
13 to 42 metres, for use on standard H. gang. Price 4/9.

M.E.B. TRIMMER CONDENSERS

2 to 35 mmfd. on Polystyrene base. Price, 1/1.

R.F. CHOKE

Standard general purpose honey comb winding, will carry up to 50 M/a. Price, 1/10.

D.P. 3A Tuning Unit: 3 Stage, range 13 to 42 metres, 1,600 to 550 Kc/s. Price, £4/17/–.

B.F.O. 455 Kc/s. Oscillator Coils. Price, 12/–.

R.F. Coil with reaction in aluminium can. Price, 9/10.

Reinartz Coil in aluminium can. Price, 7/6.

Crown
RADIO PRODUCTS PTY. LTD.
51-53 MURRAY ST.
PYRMONT, SYDNEY. TELEPHONE: MW 2628

THE AUSTRALASIAN RADIO WORLD

Devoted entirely to Technical Radio

and incorporating

ALL-WAVE ALL-WORLD DX NEWS

Vol. 13 **SEPTEMBER, 1948** **No. 4**

CONTENTS

EDITORIAL

As you will have noticed already, this issue is a special one, with more pages than usual and a number of new ideas embodied in it.

The main purpose of the issue is to help us catch up with our publication date, as the strain of the war and its after-effects brought us into a position where our issues were not actually on sale until a week or more after the date on the cover. By bringing out three issues in two months we hope to catch up again. In fact future issues should be on sale all over the Commonwealth by the 15th day of each month.

We have taken the opportunity of making this issue somewhat different in structure, mainly with the idea of giving you an issue which will be a handy source of reference for many months to come. Data charts have been prepared with a view to having them essentially practical; the sort of data which I myself will pin up over my work bench to save time when I am in doubt about the colour code for an odd resistance value or the socket connections for an unfamiliar valve.

In some ways the arrangement is experimental, and I would like expressions of opinions about it. If it appears to meet with a favourable reception it is quite possible that we will make a regular feature of the catalogue section, for example. The lists in this issue are far from complete, and I feel sure that there will be ample material available to keep this feature going for many months, especially with additions and amendments.

—A. G. HULL.

PUBLISHED BY THE PROPRIETOR—
A. G. HULL,
Balcombe St., Mornington, Vic.
Phone M'ton 344.

Technical Editor—
PAUL STEVENS
21 Fletcher's Av., Bondi, N.S.W.
Phone FW 6157.

Short-wave Editor—
L. J. KEAST
7 Fitzgerald Rd., Ermington, N.S.W.
Phone WL 1101.

Ham Notes by—
DON B. KNOCK (VK2NO)
43 Yanko Av., Waverley, N.S.W.

ADVERTISING REPRESENTATIVES—
In N.S.W.: Amalgamated Publications Pty. Ltd., 83 Pitt St., Sydney. Phone B 1077.

In **Victoria: R. I. McKillop,** Regency Advertising Contractors, 60 Market St., Melbourne. Phone M 1279.

REPRESENTATIVES
In Queensland: John Bristoe, Box 82, Maryborough, Q.

In New Zealand: H. Barnes & Co., 4 Boulcott Terrace, Wellington.

In England: Anglo Overseas Press Ltd., 168 Regent St., London, W1.

Distributed throughout the World by Gordon & Gotch (A/asia) Ltd.

SUBSCRIPTION RATES—

12 issues	10/6
24 issues	£1
To N.Z. and Overseas:	
12 issues	12/-

POST FREE

Address for all correspondence—
AUSTRALASIAN RADIO WORLD
Box 13, Mornington, Vic.

The 5 BAND KIT *FOR YOUR LATEST RIG*

TYPE K120 - - - PRICE £3.10.6

consisting of 5 coils:—Aerial, R.F. and Oscillator in the following band.

10 metres	30 MC	to	11 MC.
15 metres	8.25 MC	to	23 MC.
20 metres	16 MC	to	5.5 MC.
40 metres	8 MC	to	3.0 MC.
80 metres	4 MC	to	1.5 MC.
Broadcast	1600 KC.	to	550 KC.

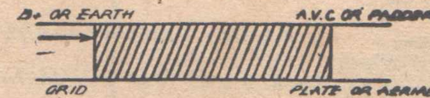
This coil kit is suitable for use with a stromberg H. Type condenser and will give a band spread as above. A smaller gang will give less overlap at each end and amateurs may use our type CV49 double spaced condensers for band spreading in conjunction with the H gang.

A six bank double sided switch with shorting plate, the 2nd side being used to short circuit all unused coils. IT IS NECESSARY to shield between the Aerial, R.F. and Oscillator sections of switch.
The following padding condensers will be needed.

SEPARATE COILS

COLOR		METRES	FREQUENCY M/C	PADDERS	PRICE
	Nil	B/C Band	.55 to 1.6 MC	R.C.S. Type P21, 5-Plate Adj.	5/6 each
Color dot	Green	80	1.5 to 4 MC	R.C.S. Type P21, 5-Plate Adj.	4/6 each
on END	Red	40	3.0 to 8 MC	0015 fixed condenser	4/6 each
of	Yellow	20	5.5 to 16 MC	004 fixed condenser	4/6 each
FORMER	White	15	8.25 to 23 MC	004 fixed condenser	4/6 each
	Blue	10	11 to 30 MC	004 fixed condenser	4/6 each

COLOUR DOT DENOTES GRID LUG



STAND OFF INSULATORS

Mounting screw Type—fitted with 5/32" Brass nut and bolt with solder lug attached. Mounting hole centre 1" x 1-8" moulded from black Polystyrene.

1" Type No. A.F. 18 1/9 ea.
1½" Type No. A.F. 19 2/- ea.
2" Type No. A.F. 20 2/3 ea.

Pin Jack Type—fitted with Pin Jack to fit standard banana plugs. Mounting hole centres 1" x 1-8" moulded from black Polystyrene.

1" Type No. A.F. 15 2/- ea.
1½" Type No. A.F. 16 2/3 ea.
2" Type No. A.F. 17 2/6 ea.

Iron Cored

B.F.O. COILS

The B.F.O. coil with sealed - in 100 mmf. Shunt Coil Condenser.

175 K.C. Type H143
100 K.C. Type H144
455 K.C. Type H140
1600 K.C. Type H141
1900 K.C. Type H142

New Round Can High Impedance Permability Tuned.

SUPERHET COILS

7/41 Litz Secondary
Extra High Permability Primary

Aerial ...... Type No. E356)
R.F. ...... Type No. E357)
Oscillator ...... Type No. E358)

7/6 retail

INTERMEDIATE TRANSFORMERS

Type IF 170
Frequency 455 K.C.

Position 170-1st, 171-2nd. Selectivity Standard 28 K.C. 103. Capacity 70 mmfd.

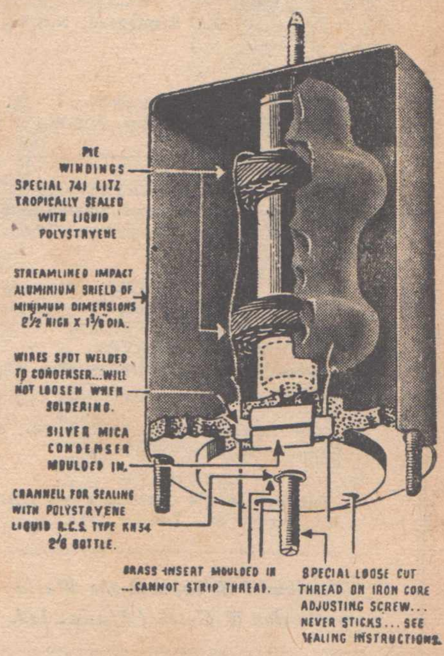
Each 13/-.

Type IF171 Frequency 455 K.C. Position 170-1st 171-2nd. Selectivity Standard 28 K.C. 103. Capacity 100 mmfd.

Each 13/-

Type IF174
Low Gain

Each 13/-



IF YOUR LOCAL RETAILER CANNOT SUPPLY

If you have been unable to purchase R.C.S. components from your local retailer, write us, and whilst we cannot supply you direct, we will arrange for your retailer to receive supplies immediately or advise you where supplies can be obtained.

R.C.S. RADIO PTY. LTD.

174 Canterbury Rd., Canterbury, N.S.W., Australia.

F.M. — MINUS BOLONEY

Frequency modulation is in the news and a great deal of silly rot is being published about it in the papers, gassed about it at Canberra and generally tangled up. Here are the clear facts about frequency modulation transmission so that you can readily form your own conclusions.

By

PAUL STEVENS

ASK the ordinary mortal-in-the-know, what frequency modulation is and he will quickly tell you, that it is the most modern, latest, wonderful invention, giving you unheard of fidelity, freedom from noise, etc., etc. After his real or commercially inspired enthusiasm has spent itself a little and you get a word in and ask him, what the principle of the thing is, he will scratch his head and say: "Well, it's a wave modulated with frequencies . . . " and that is as far as you get. If you then go and try to get the required information from technical books, you will soon find yourself smothered, choked and bashed to the ground by a mass of formulae and diagrams and when you get up by the count of ten, you decide to give up and despair.

It is a fact, that amongst all the articles on FM I have ever read, there was not a single one, which explained the matter in simple, easily understandable language, and this is what prompted me to write this.

Frequency Modulation (FM) differs from our present Amplitude Modulation (AM) by the fact, that in the first case the frequency, in the second case the amplitude of the carrier varies with modulation.

Fig. I shows the well known diagram of an amplitude modulated wave. A,b,c and d depict a soft tone, a loud tone, a deep note and a high note respectively. The louder the note, the bigger the difference between peak and trough of the modulation wave, the higher the note, the narrower and closer together will the modulation waves be. All this is nothing new and is easy to understand from Fig. I.

The Difference

The story with FM is an entirely different one. Have a look at fig. 2: again we have soft, loud, deep and high audio notes modulating the carrier. C is the nominal station frequency, we call it centre frequency, because, with modulation, the carrier frequency changes symetrically to this C frequency up and down. (A lot of "frequencies" in this sentence, not nice, but it makes things clearer that way). In the unmodulated state, only C is being transmitted. With modulation, the carrier amplitude stays completely constant, but its frequency will increase and decrease in rhythm with the modulating audio signal. The louder the signal, the larger will be the deviation from C. Fig. 2, a, shows a soft tone, which causes the carrier to swing plus-minus 1KC from C; fig. 2b is a loud tone with a deviation of 10 K.C. up and down from C. (1 and 10 K.C. are merely figures picked at random for explanatory purposes.).

The frequency of the modulating tone determines the speed, with which the carrier frequency changes take place. A bass note will cause a slow swing of carrier frequency up and down from C, with a high note the frequency deviations will occur at a fast pace; in any case the carrier frequency changes per second will be determined by the modulating audio frequencies.

This fact also makes it clear, why FM transmitters are such a comparatively simple affair. The secret is, that modulation is so much easier. AM requires considerable energies to change the amplitudes of a powerful transmitter, which means large and complicated modulators. With FM, only the capacity of the tuning condenser has to be changed with modulating frequencies, which can be achieved by a valve wired as capacity or inductance, as shown in Fig. 3. The explanation of this pheno-

(Continued on next page)

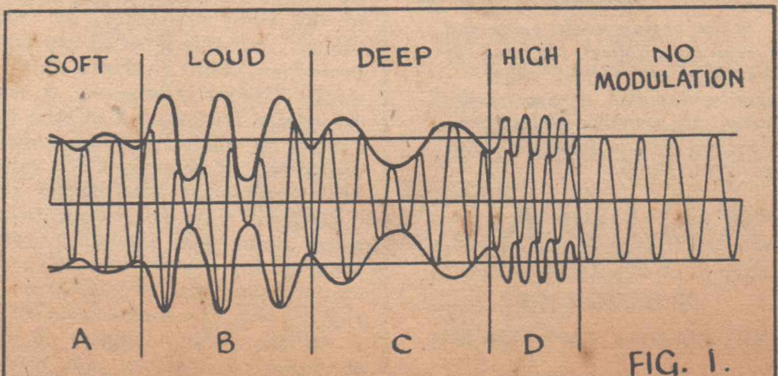


FIG. 1.

(Continued)

menon is beyond the scope of this article, but briefly, it is based on the fact, that a valve can be made to imitate capacity or inductance by giving similar phase angles between voltage and current. The modulator, independent of size and energy of the transmitter, thus becomes a rather simple and cheap affair.

Although the loudness of a FM transmitted tone is depending on the carrier frequency deviations from the centre frequency C, this does not necessarily mean, that we have to provide for great band width to transmit loud notes. There are FM stations, working on frequencies around 100 M.C., with a maximum band width for "100% modulation" fixed at 75 K.C. in America; but there is also Narrow Band or NBFM, often used by amateurs on their short wave bands, with only a channel of about 15 K.C. What counts in both cases for the volume of a certain note is its deviation in relation to the full permissable frequency deviation of the station, 75 K.C. in the first case, 15 in the latter. A 10 K.C. change will represent a soft tone on a system using a band width of 75 K.C., but a loud tone on the 15 K.C. channel. The band widths are determined by the authorities.

Static

The static eliminating qualities of FM are based on the fact, that static is a completely irregular AM wave, and if we make our receiver non-responsive to AM, we eliminate the noise. Practically FM can be received by any AM set tunable to the right frequency, by "side tuning," but this is a far cry from perfection. Fig. 4 shows how it works. The set is tuned in, so that the centre frequency C of the FM station is about half way down either side of the resonance curve. With modulation, the carrier frequency will shift closer and further away from the resonance peak, thus causing our set to receive the station stronger and weaker in rhythm with the modulation, which is exactly what happens in the reception of ordinary AM broadcasts. We thus transformed FM

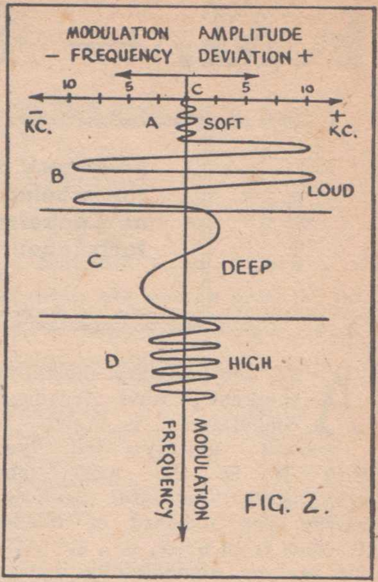


FIG. 2.

into AM and receive it with all the static and noises peculiar to our present form of broadcasting. This certainly is not the idea.

A proper FM receiver differs from an AM receiver for similar frequencies only in two things: the limiter and the detector.

Limiter

The limiter is the device, which makes the FM set insensitive to AM, cutting out static, and thus becomes the heart of the whole FM principle. It simply consists of a purposely overloaded sharp cut-off RF pentode, which follows the IF amplifier (Fig. 6.). With plate voltage limited to about 75 volts, this valve cannot handle the powerful IF signals, which get their heads and feet cut off in the process, as Fig. 5 shows. Any amplitude modulation present will thereby be effectively eliminated, provided of course, that the modulation depth is not too great. What is left is an FM modulated wave without superimposed AM, which is then fed into the detector.

The detector itself is either a "slope filter," which is an ordinary diode detector fed by a "side tuned" IF circuit, or a "frequency discriminator" as shown in Fig. 6. The theory of this circuit again is rather complicated and full of phase shifts, so I will not go too far into it. Two diodes are coupled to a special centre tapped IF transformer, with a coupling condenser between plate and centre tap. The load resistors R and R' of the diodes oppose each other, so that under normal circumstances, when the circuit is balanced, no energy is delivered on the audio end. As soon as, due to frequency modulation, the fed in frequency becomes different to the one the circuit is tuned to, one or the other diode will gain the upper hand and so a voltage will be developed in the audio circuit, which corresponds to the deviations from the centre frequency caused by modulation. The peculiar behaviour of two tuned, inductively coupled circuits, with an extra capacity from the hot end of the primary to the centre tap of the secondary, makes this circuit work. As long as the frequency fed into these circuits is identical with their resonance frequency, the potentials at the two outer ends of the secondary, which are connected to the diode plates are identically-opposed. If the frequency fed into the circuits varies from their resonance frequency, phase shifts will take place, which unbalance the secondary and the voltages developed across the diodes differ.

Apart from limiter and detector circuit the FM receiver differs from its AM counterpart only by the absence of AVC. While AVC or a manual gain control is absolutely necessary in the AM tuner to prevent overload, causing distortion, this sort of overload is desired and even purposely brought about (in the limiter stage) in the FM tuner. The limiter actually takes the place of AVC, as it chops all amplitudes down to the same level. If the FM signal becomes too weak, the limiter will not be properly overloaded and some AM noises will get through. This will also happen, if the FM signal-AM noise ratio becomes too small. Increased amplification here will not help much, as both signals and noise are amplified together. It is therefore necessary for good FM reception to have a strong input signal, which means a good aerial system. Note this for later on.

I am now practically finished with the technical explanation of FM, yet I have not said a word about high fidelity, wide audio range, large number of new stations etc., claimed in favour of FM; expensive receivers and aerial systems, short operational range, reception "shadows" thrown by hills and masses of buildings claimed against it. The reason is, that many of these facts have nothing whatsoever to do with FM itself, but rather with the very high frequencies commercial FM is going to be used on. Short waves of about 100 M.C., which are going to be used for FM, propagate, like light, in a straight line and it is therefore necessary for the receiver to be visible (or very near so), from the transmitter for proper communication. Aerials too have to be elaborate dipole outdoor affairs, not just a wire round the picture rail. Wide audio range and high fidelity could also be provided by an AM system working on the same frequency, if the permitted channel width was 20 or 30 K.C. instead of the usual 10. As for the number of new stations on this wave band, they could have been just as well AMs.

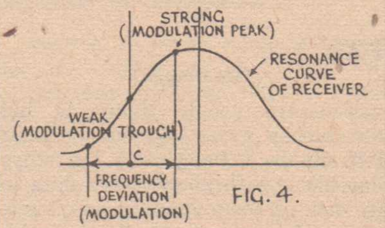


FIG. 4.

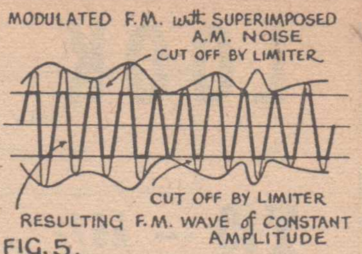


FIG. 5.

The only real advantage the FM system has over AM is its freedom from interference. This only advantage is being taken away from it by many low cost FM adaptors for existing receivers, which do not carry a limiter stage and thus allow all the noise to pass, just like an ordinary AM set. One of these, and probably the cheapest of the lot, is the Fremodyne adaptor, developed by the American Hazeltine laboratory, (Fig. 7) which is a super-regenerative-superhet combination with a double triode as only valve, a very ingenious circuit indeed.

One problem the promoters of high frequency FM do not like to talk about is how they are going to give listeners in a hill and dale city like Sydney and suburbs proper service. How will people living in low lying parts of Sydney or those screened by masses of buildings from FM transmitters get their radio programme? And

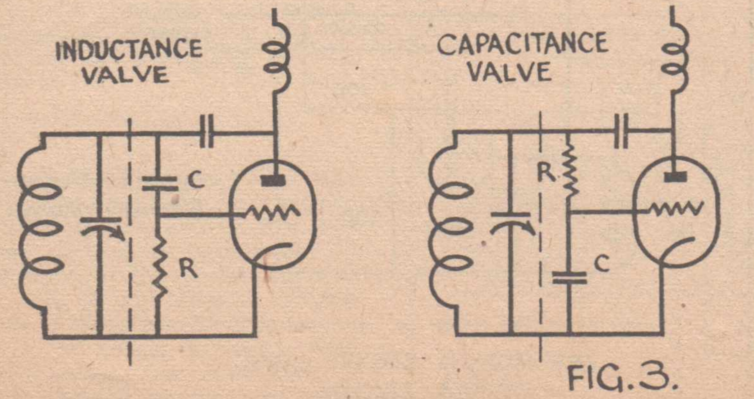


FIG. 3.

(Continued on next page)

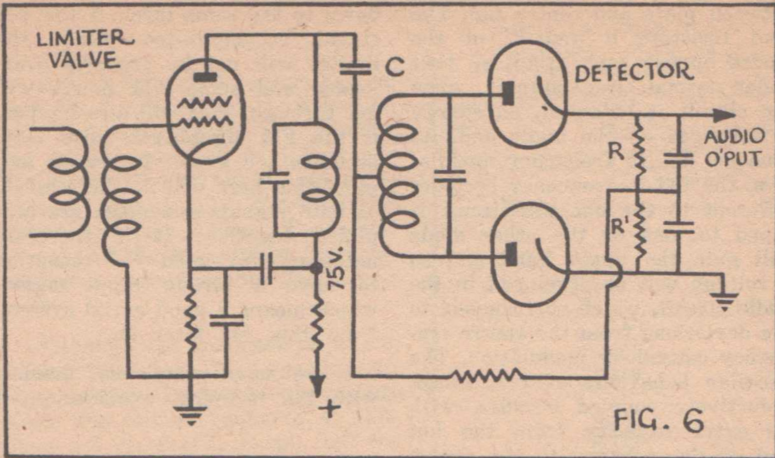


FIG. 6

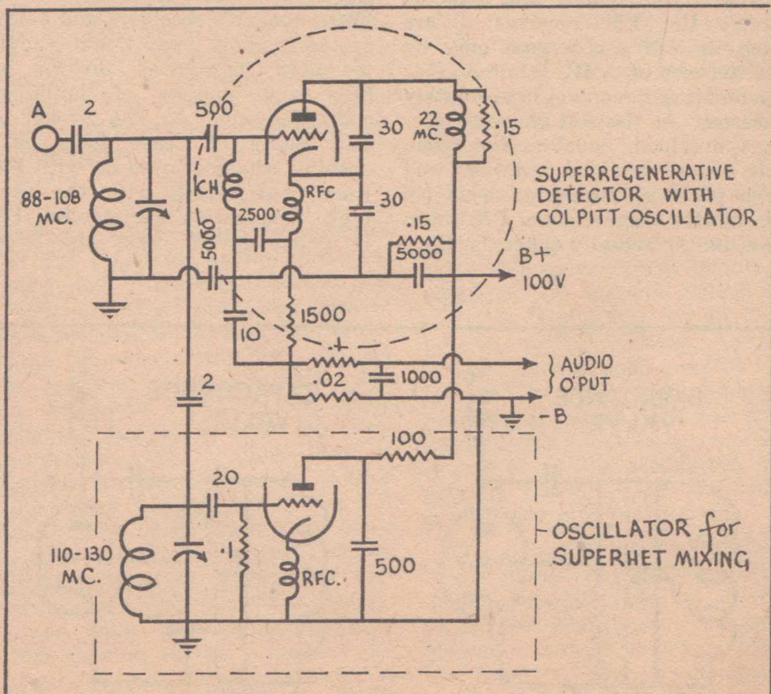
F.M.

(Continued)

where are people living in big flat blocks going to put up their FM dipoles? Imagine a ten story flat block with about forty flats in it, each of them running an elaborate aerial system up to the roof. If it would be for the sake of Television, all these efforts would be worth while. But just to get a few crackles less on local stations the buying of an expensive receiver and the erection of a relatively equally expensive aerial seems crazy to me.

To sum up: FM, stripped of nonsense and boloney, is an excellent means to get static free reception on all wave lengths, as long as the signal strength is sufficient. The addition of a limiter stage, changes in detector and AVC cir-

(Continued on page 58



FRE MODYNE CIRCUIT USING DOUBLE TRIODE

FIG. 7.

STARTING OFF IN RADIO

An introduction to radio theory and practice, written especially for the newcomer by Paul Stevens.

RADIO is a fascinating hobby and, for many people, an interesting, if not always very lucrative, profession. The rather abstract secrets of radio science have always tickled modern man's imagination and in comic strips as well as certain types of literature this finds ample if not very realistic expression in form of death and other rays, pocket television sets, wrist radios and other devices, which nearly in every case have been developed secretly by some more or less evil brain.

In real life radio is a far cooler and more methodical affair, which develops slowly along the results of hard laboratory work. If ever there will be a wrist radio or pocket television set it will be the result of millions spent on research by big firms all over the world and not the creation of some mad scientist behind the secret entrance of an underground laboratory.

So if we proceed learning about radio in a cool detached way, accepting its miracles as scientific fact, we will get much further than the also-radio man, who once told me that the reception of a certain type of short wave will burn out valves, or another one who, with some weird contraption, claimed to have solved the old problem of static-free reception without FM.

Outlines

In teaching people about radio, I have found it a far more successful and quicker way to first give them a general outline on the principles of its functioning, than to start off with detailed explanations of capacities and inductances, as it is almost generally done. Then, after the framework is built, there is always time to fill in the details, which are then accepted with far more understanding by the pupil.

So let us boldly start building a three-valve TRF receiver without knowing the first thing about it. Fig. 1 shows the circuit, but at this stage you are, of course, not expected to understand it.

Section A shows what is known as the input circuit, which receives the incoming signals from the aerial and picks out the one we want to listen to. It consists of two coils of wire, wound closely together around the same former, and a contraption called tuning condenser, which is connected across one of the coils.

Radio Waves

A radio wave or signal can be imagined as an alternating current, just as our AC power, only of much higher frequency (changes per second) which is not tied to a wire, but flies through the air with the greatest of ease. It is one of the peculiarities of high frequency currents to take to the air when led into a dead-end alley, such as a transmitting aerial. The air is therefore full of these travelling radio waves and if we stick our aerial up and connect it to our set, it will bring in all available signals to choose from.

The signal travels from our aerial, through the aerial coil, to earth. But in doing so it creates a similar signal in the secondary coil nearby. It is another trick of alternating current of any frequency to do this sort of thing, which is called induction. A theoretical explanation of this phenomenon at this stage is unnecessary. Briefly, it is based on the fact that current flowing through a coil creates a magnetic field, which in turn causes AC in the secondary coil to flow.

In parallel to the secondary coil is the tuning condenser, which is of variable capacity. This capacity is another device extensively used in radio in various forms as condensers. In its very simple form it consists of two metal plates, placed face together, but insulated from each other by air or insulating material. Its outstanding feature is that it allows AC to pass between the plates, in spite of space or insulation between them, but completely blocks direct current. The bigger the surface of the plates, the less resistance it offers to alternating current. As the shape of the opposing plates is irrelevant to their function, much space can be saved by rolling two

(Continued on next page)

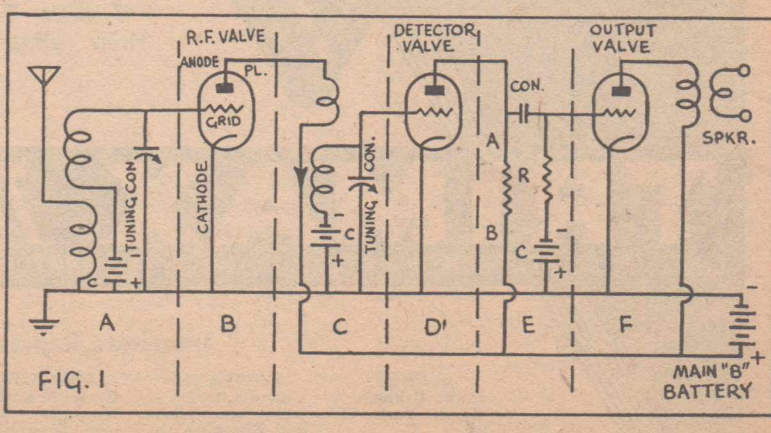


FIG. 1

STARTING

(Continued)

strips of tin foil (the plates) with insulation in between, together, and we thus get the little cylindrical condensers we find in our radio sets.

As for our variable tuning condenser, it consists of a number of fixed plates (stator) on a frame, with another lot of movable plates on an axle swinging in and out of mesh in between them (rotor). Fig. 2 shows the principle. The function of this tuning condenser is based on the "tuned circuit," another phenomenon of radio theory, which we have to take for granted for the time being. If a coil and condenser are wired together as shown in Fig. 1, Section A, this "tuned circuit" will respond to one particular frequency far more than to any other, depending on the size of the capacity (condenser) and inductance (coil). By varying one or the other, the "resonance" frequency can be varied. As it is easier to alter the capacity (by means of the said tuning condenser of comparatively simple construction), this method has been generally adopted here.

We have now a means in hand to lift out any desired station far above the level of others. But before it is strong enough to drive our loud-speaker, we have to amplify it several hundred or thousand times. This is achieved by the soul of the radio, the valves.

Section B, Fig. 1, shows the symbol for the first or radio frequency amplifier valve, together with the necessary circuit elements.

Complicated as the science of electronics may be, the function of a valve is fundamentally simple. It is just as the action of a

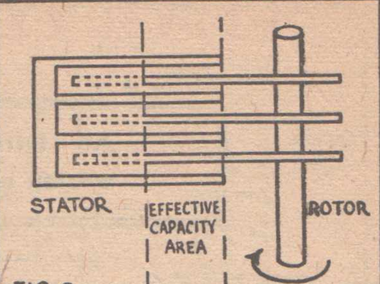


FIG. 2

mechanical valve, with which it is possible to control a powerful flow of liquid or gas with an easy twist of your wrist. A valve, as shown in our picture, consists of three elements within an evacuated glass bulb and is therefore called "triode." The elements are arranged as concentric cylinders, the innermost called cathode, the middle one grid, the outermost anode or plate. (Fig. 3.)

Inside the slim cathode cylinder is an insulated heater element, which keeps the cathode red hot. Under these conditions certain chemicals covering the surface "sweat out" electrons, of which electric current consists. The outside cylinder, the anode, is now supplied with a positive voltage, which, through the vacuum of the valve, attracts the negative electrons. As the grid cylinder between them only consists of loose wire mesh, the electrons fly right through to the anode, thus forming the "plate current" of the valve. As electrons are only emitted from the hot cathode, there can only be one-way traffic from cathode to plate, and this current will only flow if the anode is made positive to the cathode. No current will flow if the anode is negative. A valve can thus act as rectifier for alternating current, by letting only one half-cycle pass. This is very important. Now to the very essential third electrode within the valve, the "grid." Through it every electron has to pass on its flight between cathode and plate. But as it is much closer to the cathode, any voltage variation on the grid will have a far more profound influence on the electron stream than the plate voltage. The result will be that slight voltage variations on the grid will cause large variations of plate current, whereby amplification is achieved. To prevent the grid from attracting electrons to itself, thus forming a grid current apart from the plate current, we give it a slight negative "bias" and see to it that the variations in grid voltage just make the grid more or less negative, but never swing over to positive against cathode. Fig. 4 shows how the grid voltage on a valve influences the plate current.

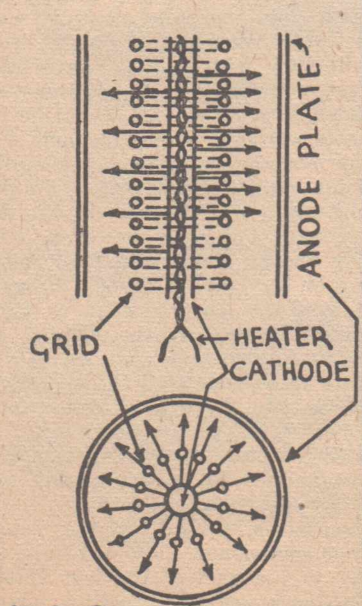


FIG. 3

As can be seen in Fig. 1, the input circuit of our receiver is connected to the grid of the first valve. The tuned-in radio signal will thus control the plate current of the valve, while a small battery C provides the necessary negative grid bias. If the grid is kept negative, no current will flow in the grid circuit and no energy is therefore consumed.

Detector

Fig. 1C shows the second tuned circuit of the receiver, which connects the first to the second valve. It is principally the same as the aerial circuit, only, instead of the aerial, the plate circuit of the RF valve is feeding it. Its anode current, varying in the same rhythm as the input signal, generates an amplified signal voltage in this circuit. It is tuned again to increase the selectivity of the receiver, which, with only one tuned circuit, is usually not sufficient to separate the stations from each other. In modern receivers the tuning condensers of both circuits can be ganged, which simplifies the handling.

The second valve, apart from amplification, has a special function, that of a "detector." The radio signal consists of two parts: The carrier and the modulation. RF energy, as transmitted by the station, has a frequency far too high to be audible. This carrier wave fluctuates now with the transmitted audio frequencies (Fig. 5), its amplitudes getting bigger and smaller in rhythm of speech or music, whatever is on the programme. The task of the detector is now to separate the now-useless carrier wave from its modulation, which is simply done by rectifying it, as Fig. 5, b and c, show. The negative half of the carrier wave is being cut off, which leaves a pulsating direct

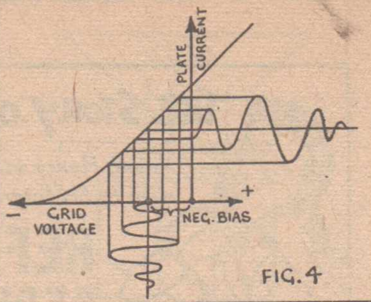


FIG. 4

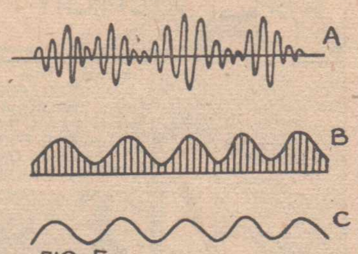


FIG. 5

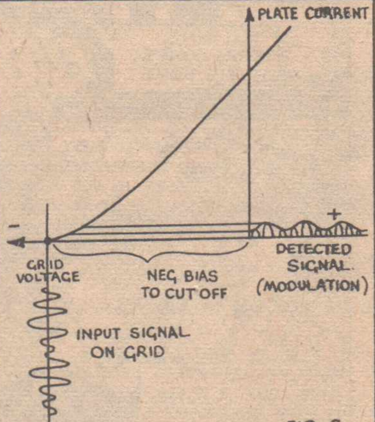


FIG. 6

current, the amplitude of which changes both in rhythm with the carrier as well as with the modulation. However, as the carrier frequency is far too high to be heard, we only hear the modulation and that is all we want.

The particular type of detector used in our set is the bias detector: We know that the voltage on the grid of a valve controls the plate current. The more negative the grid voltage will get, the smaller will the anode current become, until, with a certain negative grid voltage, it will be cut off altogether. At this point, further negative grid voltage cannot have any effect, as the plate current is

(Continued on next page)

already blocked. But making the grid less negative will start off plate current again which, in this region, will be subject to fluctuations corresponding to alterations in grid current. Fig. 6 again shows a grid voltage-plate current characteristic of a valve, but this time when used as bias detector. The valve is biassed to about cut-off point by means of a battery or other methods. The modulated carrier wave then applied to the grid will only be effective during its positive half cycle, the negative being almost entirely suppressed. This brings out the modulation in the before described way, which will from now on be called "audio frequency," as against radio frequency (RF).

Fig. 1E shows the coupling section between the detector and the output valve, which drives the speaker. There are no more tuned circuits, as we are now dealing with audio frequencies. The type of coupling between the valves employed here is known as resistance coupling. It is based on the principle that the voltage drop caused by a resistor is depending on the current flowing through it; that twice the current flowing, for instance, will cause twice the voltage drop. If we insert such a resistor into the plate circuit of our detector valve, the voltage drop will vary with fluctuations of the plate current. With no current flowing, point A and B will be of equal voltage, no matter how big the resistor is. If current flows, point B, being connected to the plate battery, will remain at this voltage. Point A, however, will now show a lesser voltage, depending on the current flowing through it. As this current changes with audio frequencies, the voltage at point A also will, and so all we have to do is to feed these voltage changes to the grid of the output tube. Again we are not interested in the fluctuating DC as presented by the second valve's plate current, but only in the fluctuations themselves, which are the audio frequencies, and these we have to get to the grid of the last valve. To block off the positive plate voltage, but let the audio voltage pass, we use a condenser C, which

TO—

keep up-to-date in radio matters you should read Australasian Radio World every month. Place an order with your newsagent NOW.

is of the rolled paper dielectric type mentioned before.

The output valve, to which the loud-speaker is connected, has to be able to handle the now much-amplified audio voltage on the grid, which has to be kept rather negative to prevent grid current flowing at high amplitudes. At the same time it has to be a type with large plate current to supply the energy for the speaker. These valves are therefore usually designed along entirely different principles as those primarily used for voltage amplification.

The final link in the chain is the reproducer or loud-speaker, which turns the electrical vibrations into mechanical vibrations of the air, which we can then perceive by means of our ears. Such a loudspeaker (Fig. 7) is based on the principle that an electrical conductor in a magnetic field will be pushed out of this field, as soon as current begins to flow through it. The direction in which it is pushed out depends on the direction of the electric current through the conductor. If we imagine now a ring-shaped magnetic field, with a coil instead of a single conductor suspended in it and a cone attached to this "voice coil," we have our modern loud-speaker. If the coil is fed with audio frequencies, the cone will vibrate in the same rhythm and we hear the music just as it was created in the broadcasting studio—we hope.

I have now given you a rough outline on the functioning of a simple broadcast receiver. All you had to know for its understanding

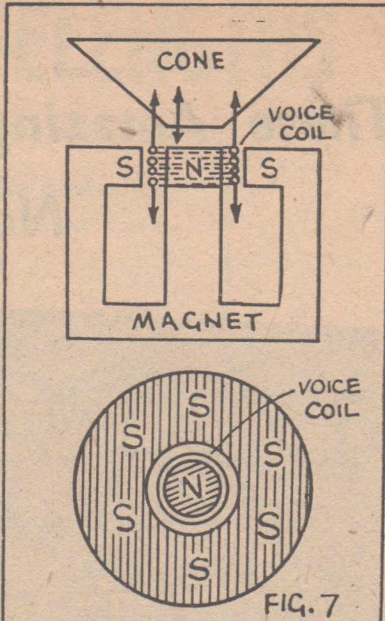


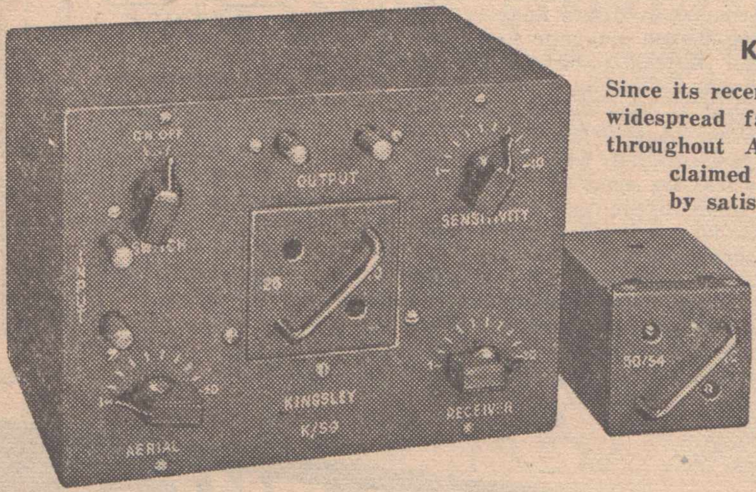
FIG. 7

(Continued on page 48.)

☆ ☆ ☆ ☆ ☆

These Amazing KINGSLEY UNITS

Now Available . . .

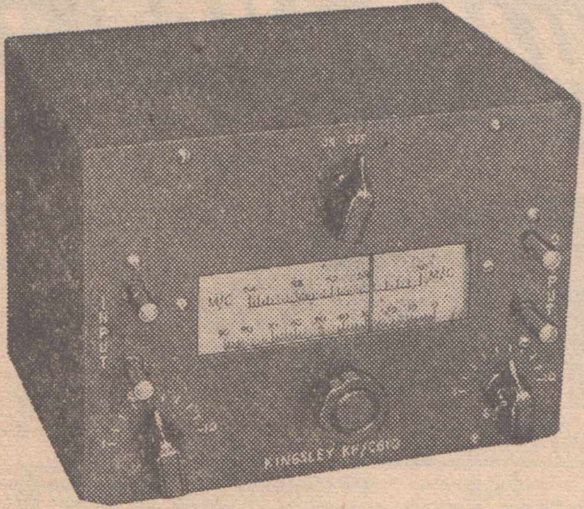


KINGSLEY
K/S9'er SIGNAL BOOSTER

Since its recent introduction the K/S9'er has met with widespread favour, many hundreds now being used throughout Australia. The K/S9'er does everything claimed for it, and is being acclaimed everywhere by satisfied users. It operates on 10 metres, and additional plug-in coil boxes to operate on the 6 and 20 metre bands are now available at little extra cost.

Completely assembled, less valve.
£5/5/- plus Tax.

Plug-in Coil Boxes, 6-20 metres, each 15/- plus Tax.



KINGSLEY
SHORT WAVE CONVERTER

Ready for immediate use on 50/54 megacycles (6 metres) band, the KF/C6 is completely assembled, aligned, and adjusted.

No amateur operator can afford to be without this amazing unit. Acclaimed throughout the Commonwealth as an outstanding success.

Completely assembled, less valves £6/18/6 plus Tax.

Available all authorised Kingsley radio distributors.

— — — —

Complete installation and circuit details of both units are obtainable on application.

If your regular supplier is unable to supply your requirements of Kingsley products, drop us a line mentioning his name and address.

Ask for—Insist on DEMAND Genuine Kingsley Parts from your supplier

KINGSLEY QUALITY RADIO PRODUCTS

KINGSLEY RADIO

KINGSLEY RADIO PTY. LTD.

380 St. Kilda Road, Melbourne, Victoria . Phones: MX 1159, MX 3653

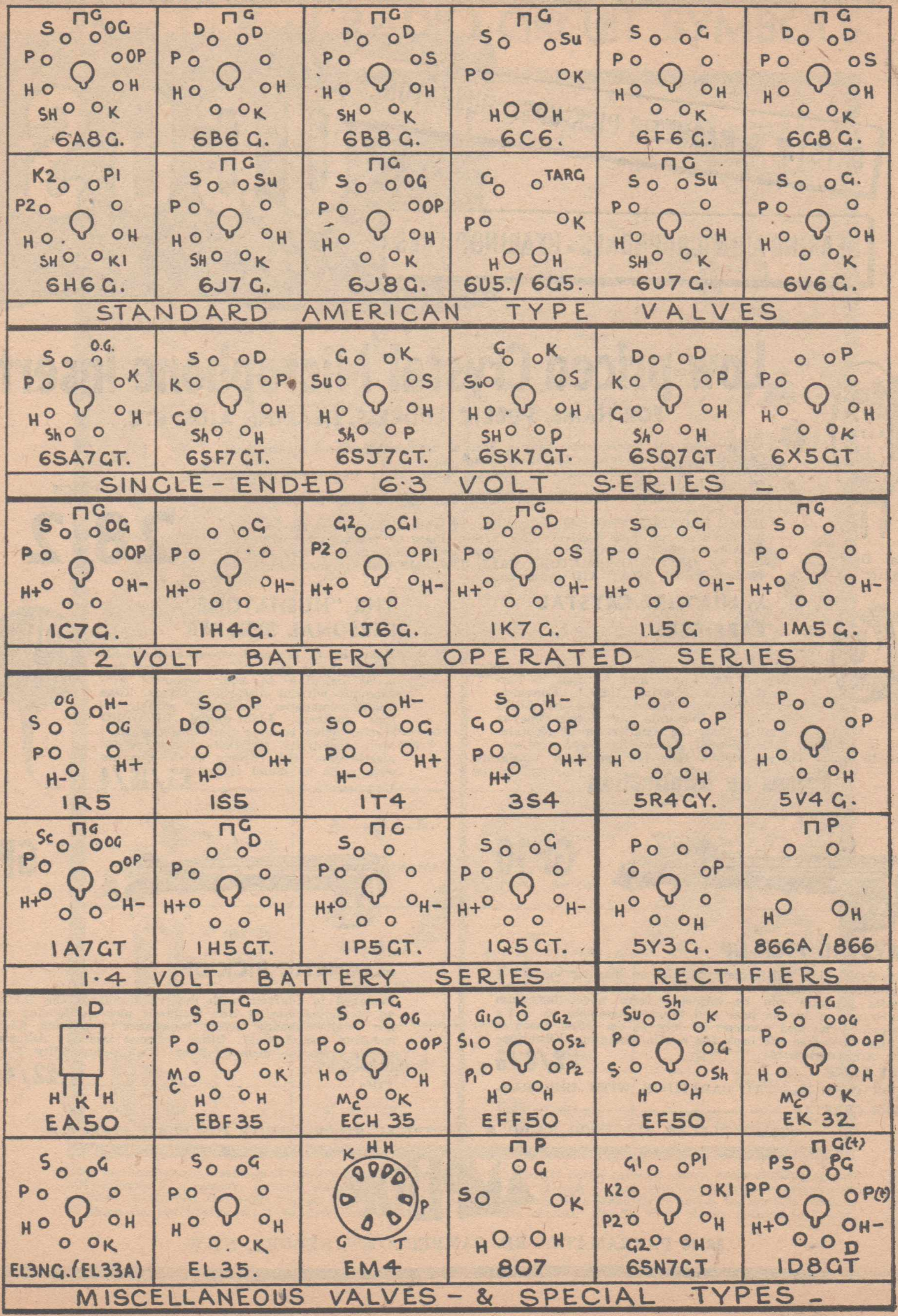
NEW BROADCAST WAVELENGTHS

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

Freq. kC/s	W/L m.	Station
540	556	4QL, Longreach
550	545	2CR, Cumnock
560	536	3GI, Sale
560	536	6WA, Wagin
580	517	3WV, Dooen
590	508	4QR, Brisbane
600	500	7ZL, Hobart
610	492	2FC, Sydney
620	484	3AR, Melbourne
630	476	4QN, Cleveden
640	469	5CK, Crystal Brook
650	462	2BH, Broken Hill
660	455	2NU, Manilla*
670	448	2CO, Corowa
680	441	2HR, Lochinvar
680	441	4AT, Atherton
680	441	7QT, Queenstown
690	435	4KQ, Brisbane
690	435	6WF, Perth
700	429	2NR, Lawrence
710	423	7NT, Kelso
720	417	2—, Taree*
720	417	6GF, Kalgoorlie
730	411	5CL, Adelaide
740	405	2BL, Sydney
750	400	2NB, Broken Hill
750	400	6—, Moora*
760	395	4QS, Dalby
770	390	3LO, Melbourne
780	385	2KA, Katoomba
780	385	4TO, Townsville
790	380	4QG, Brisbane
800	375	2—, Bega*
800	375	6WN, Perth
810	370	2—, Glen Innes*
820	366	2—, Kiama*
820	366	6GN, Geraldton
830	361	5RM, Renmark
840	357	2—, Kempsey*
850	353	2CY, Canberra
860	349	4GR, Toowoomba
860	349	7HO, Hobart
870	345	2GB, Sydney
880	341	3UL, Warragul
880	341	4WK, Warwick
880	341	6PR, Perth
890	337	4QY, Cairns*
890	337	5AN, Adelaide
900	333	2LM, Lismore
900	333	7AD, Devonport
910	330	4QB, Pialba
920	326	2XL, Cooma
920	326	4VL, Charleville
920	326	6—, Northam*
930	323	3UZ, Melbourne
940	319	4RK, Rockhampton
940	319	7ZR, Hobart
950	316	2UE, Sydney
960	313	3BO, Bendigo
960	313	4AY, Ayr
970	309	5DN, Adelaide
980	306	2KM, Kempsey
980	306	6AM, Northam
990	303	2GZ, Orange
1000	300	3HA, Hamilton
1010	297	4CA, Cairns
1010	297	4MB, Maryborough
1010	297	7EX, Launceston
1020	294	2KY, Sydney
1030	291	3DB, Melbourne
1040	288	5PI, Crystal Brook
1050	286	2CA, Canberra
1060	283	4SB, Kingaroy
1070	280	2RG, Griffith
1070	280	6WB, Katanning
1080	278	2LT, Lithgow
1080	278	4RO, Rockhampton
1080	278	7HT, Hobart
1090	275	3LK, Lubeck
1100	273	4LG, Longreach
1100	273	6MD, Merredin
1100	273	7LA, Launceston
1110	270	2UW, Sydney
1120	268	4BC, Brisbane
1130	265	2AD, Armidale
1130	265	3CS, Colac
1130	265	6PM, Perth
1140	263	2HD, Newcastle
1150	261	2WG, Wagga
1160	259	4QA, Mackay*
1160	259	5—, Mt. Gambier*
1170	256	2NZ, Inverell
1180	254	3KZ, Melbourne
1190	252	2CH, Sydney
1200	250	5KA, Adelaide
1210	248	2GF, Grafton
1210	248	3YB, Warrnambool
1210	248	6KG, Kalgoorlie
1220	246	4AK, Oakey
1230	244	2NC, Newcastle
1240	242	3TR, Sale
1240	242	6IX, Perth
1250	240	2DU, Dubbo
1250	240	9PA, Port Moresby
1250	240	7BU, Burnie
1260	238	3SR, Shepparton
1270	236	2SM, Sydney
1280	234	3AW, Melbourne
1290	233	4BK, Brisbane
1300	231	2TM, Tamworth
1310	229	5AD, Adelaide
1320	227	3BA, Ballarat
1320	227	6KY, Perth
1330	226	3SH, Swan Hill
1330	226	4BU, Bundaberg
1340	224	2LF, Young
1340	224	6TZ, Dardanup
1350	222	3GL, Geelong
1350	222	4GY, Gympie
1360	221	3MA, Mildura
1370	219	2MO, Gunnedah
1370	219	5SE, Mt. Gambier
1370	219	6GE, Geraldton
1380	217	2GN, Goulburn
1380	217	4MK, Mackay
1390	216	4BH, Brisbane
1400	214	2PK, Parkes
1400	214	5AU, Port Augusta
1410	213	2KO, Newcastle
1420	211	3XY, Melbourne
1430	210	2WL, Wollongong
1430	210	6CI, Collie
1440	208	2QN, Deniliquin
1440	208	4IP, Ipswich
1450	207	2MG, Mudgee
1450	207	7DY, Derby
1460	205	2CK, Cessnock
1460	205	5MU, Murray Bridge
1470	204	2MW, Murwillumbah
1470	204	3CV, Maryborough
1480	203	2AY, Albury
1490	201	2BE, Bega
1490	201	4ZR, Roma
1500	200	2BS, Bathurst
1500	200	3AK, Melbourne
1500	200	5DR, Darwin
1510	199	2NA, Newcastle
1520	197	2—, Narooma*
1530	196	2—, Tenterfield*
1530	196	3—, Bendigo*
1530	196	5—, Pt. Lincoln*
1540	195	2—, Lithgow*
1540	195	4—, Gympie*
1540	195	7—, Queenstown*
1550	194	2—, Armidale*
1560	192	2—, Canberra*

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

VALVE SOCKET CONNECTIONS -



CRYSTAL & MAGNETIC PICK-UPS. "HUSHATONE"

HEARING AID MICROPHONES - HEARING PIECES

The acos Range!

Low-priced Crystal Microphone Inserts

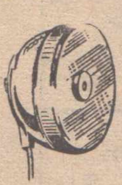
FOR HAMS, PUBLIC ADDRESS, HEARING AIDS, ETC.

Size: Only 1 11/16" x 5/16"

Crisp, clear cut reproduction plus a host of technical features makes Acos Crystal Microphone Inserts the ideal choice for:
HAMS: "DX" reproduction cuts through QRM. High frequencies peaked. Built-in load resistor.
PUBLIC ADDRESS: High output. Light and rugged. May be adapted as lapel mike.
HOME BROADCASTING: Exceptionally high gain allows direct use on pick-up terminals of good receivers. No preamplifiers or transformers required. Because of their accentuated speech range and sensitivity they may also be used for OFFICE and FACTORY CALL SYSTEMS and are incorporated in leading British DEAF AID equipment.

LIST PRICE

28/2



MINIATURE CRYSTAL EARPIECES

Ultra sensitive, light, and rugged! Acos Crystal Ear Pieces may be used in Personal Radios, Hearing Aids, by Convalescent Hospital Patients, and in Silent Radios for Hospitals and Hotels. They're smaller than the smallest speaker-obtainable in moulded, flesh coloured plastic—light and comfortable to wear. There's perfect tone for speech or music.

Prices on Application

THE "HUSHATONE" PERSONAL SPEAKER

Here is a personal speaker that fits snugly under your pillow; provides personal listening to your favourite programme—without disturbing others. Tone quality compares favourably with cone-type speakers. Light-weight BIMORPH crystal drive ensures uniform response—high sensitivity. Attractively styled in plastic case with chrome finish. For use with radio or sound system.

List price **£3/16/4**

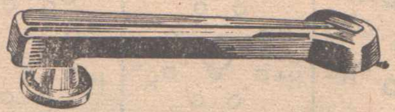
GP10

CRYSTAL PICK-UP

A modern, high fidelity, crystal pick-up housing the G.P.9 unbreakable cartridge in a smart, moulded bakelite arm. Needle pressure can be adjusted from novel beryllium copper spring in the base and bracket assembly to user's preference. Normal pressure is only 1¼ oz. Other features include 95 degree lift back for needle changing. Vibration-free arm movement.

LIST PRICE **£2/8/6**

ACOS G.P.9 CRYSTAL CARTRIDGE WITH UNBREAKABLE CRYSTAL 22/1



GP6

MAGNETIC PICK-UP

Designed to conform with modern standards the G.P.6 is an attractive moving iron magnetic pick-up. Moving parts are small—reducing needle impedance, improving fidelity, reducing record wear. Other features include: Adjustable needle pressure—normally 2 oz. High permeability Ticonal magnet.

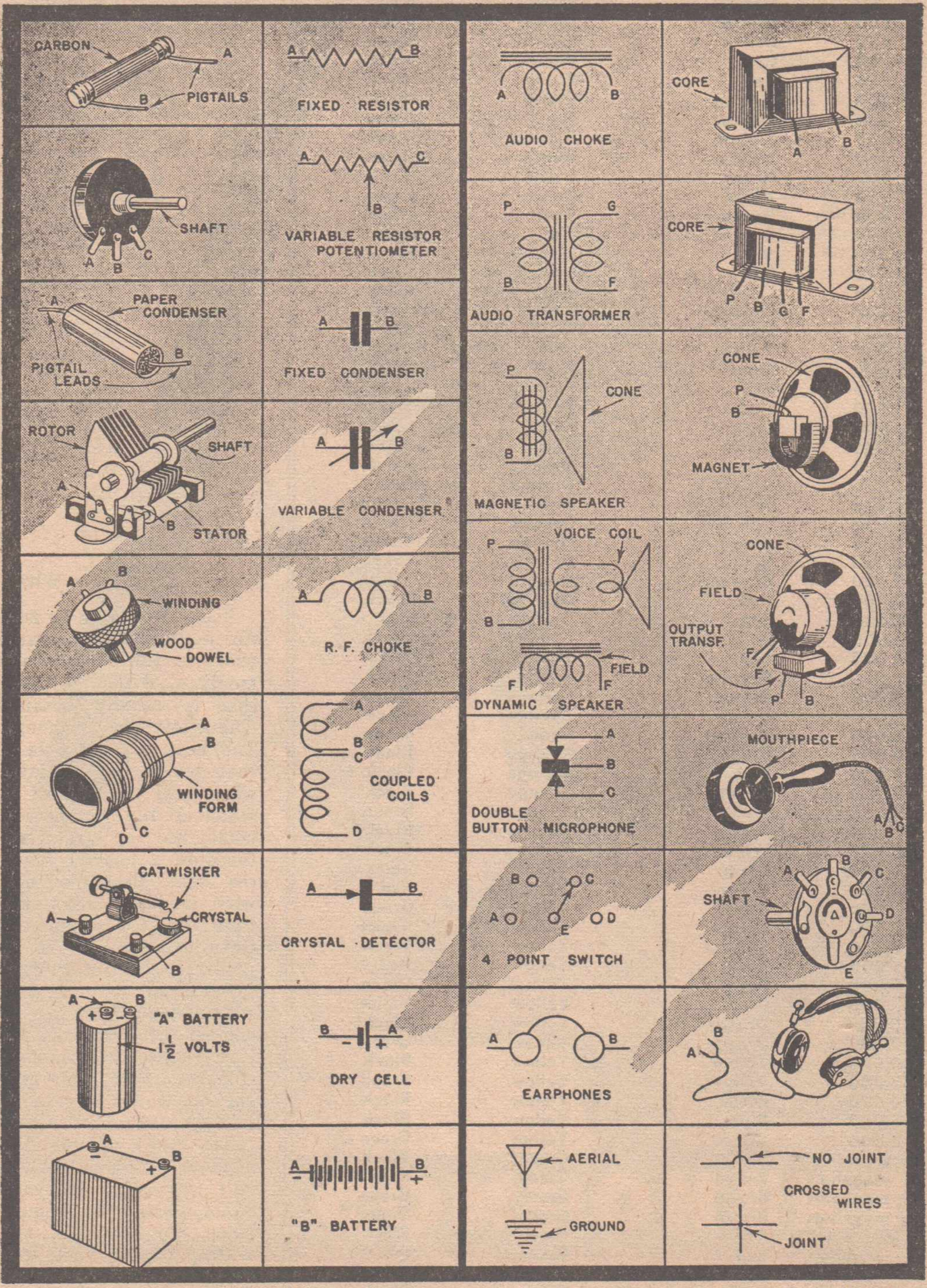
Price **£2/4/1**

OBTAINABLE AT ALL GOOD RADIO & ELECTRICAL STORES—WRITE FOR PUBLICATION C.1.

AMPLION

36-40 PARRAMATTA RD., CAMPERDOWN, SYDNEY, N.S.W.

How To Read RADIO CIRCUIT SYMBOLS



Once you understand meanings of schematic symbols pictured in two vertical center columns above, radio circuit diagrams will no longer be a mystery. Pictorial sketches are shown at right or left of each symbol, with letters to show proper connections. Remember that short bar on battery symbol is always negative. Use terminals A and B for variable resistor; all three for potentiometer. B on potentiometer is always movable contact. Parallel lines always indicate iron core.

RESISTOR COLOUR CODE

Resistance in Ohms	Body Colour	Dot Colour	End Colour
50	Green	Black	Black
100	Brown	Brown	Black
150	Brown	Brown	Green
200	Red	Brown	Black
250	Red	Brown	Green
300	Orange	Brown	Black
350	Orange	Brown	Green
400	Yellow	Brown	Black
450	Yellow	Brown	Green
500	Green	Brown	Black
750	Violet	Brown	Green
1,000	Brown	Red	Black
1,500	Brown	Red	Green
2,000	Red	Red	Black
2,500	Red	Red	Green
3,000	Orange	Red	Black
3,500	Orange	Red	Green
4,000	Yellow	Red	Black
4,500	Yellow	Red	Green
5,000	Green	Red	Black
6,000	Blue	Red	Black
7,000	Violet	Red	Black
8,000	Grey	Red	Black
9,000	White	Red	Black
10,000	Brown	Orange	Black
12,000	Brown	Orange	Red
13,000	Brown	Orange	Orange
15,000	Brown	Orange	Green
17,000	Brown	Orange	Violet
18,000	Brown	Orange	Grey
19,000	Brown	Orange	White
20,000	Red	Orange	Black
22,000	Red	Orange	Red
25,000	Red	Orange	Green
27,000	Red	Orange	Violet
30,000	Orange	Orange	Black
35,000	Orange	Orange	Green
40,000	Yellow	Orange	Black
45,000	Yellow	Orange	Green
50,000	Green	Orange	Black
60,000	Blue	Orange	Black
70,000	Violet	Orange	Black
75,000	Violet	Orange	Green
80,000	Grey	Orange	Black
90,000	White	Orange	Black
100,000	Brown	Yellow	Black
125,000	Brown	Yellow	Red
150,000	Brown	Yellow	Green
175,000	Brown	Yellow	Violet
200,000	Red	Yellow	Black
225,000	Red	Yellow	Red
250,000	Red	Yellow	Green
275,000	Red	Yellow	Violet
300,000	Orange	Yellow	Black
350,000	Orange	Yellow	Green
400,000	Yellow	Yellow	Black
450,000	Yellow	Yellow	Green
500,000	Green	Yellow	Black
600,000	Blue	Yellow	Black
750,000	Violet	Yellow	Green
1 megohm	Brown	Green	Black
1¼ megohms	Brown	Green	Red
1½ megohms	Brown	Green	Green
1¾ megohms	Brown	Green	Violet
2 megohms	Red	Green	Black
2¼ megohms	Red	Green	Red
2½ megohms	Red	Green	Green
3 megohms	Orange	Green	Black
4 megohms	Yellow	Green	Black
5 megohms	Green	Green	Black
10 megohms	Brown	Blue	Black

RESISTANCE TABLES

Table I. Eureka Wire

S.W.G.	Safe current (amps) D.S.C.	Safe current (amps) Enamelled	Resistance (ohms per yard)
20	2.2	3.0	0.66
22	1.6	2.2	1.09
24	1.1	1.5	1.77
26	0.73	1.0	2.65
28	0.55	0.76	3.91
30	0.43	0.59	5.58
32	0.34	0.47	7.35
34	0.27	0.37	10.13
36	0.20	0.28	14.84
38	0.14	0.19	23.81
40	0.11	0.15	37.18

Table II. Nichrome Wire

S.W.G.	Current for 200°C.	Resistance (ohms per yard)
22	2.2	2.36
24	1.6	3.83
26	1.1	5.72
28	0.93	8.46
30	0.68	12.04
32	0.55	15.88
34	0.43	21.88
36	0.32	32.20
38	0.21	51.40
40	0.16	80.20

Suitable Wire

Some details as to suitable wire for making up resistances should prove useful. Eureka wire is commonly used for the purpose, since this is usually obtainable with double-silk or enamel covering. The heat generated is limited by that which the insulation of the wire (and the former itself) can stand. If the heat is too much, we must use a larger number of turns of a heavier gauge so that the heat dissipated **per turn** of wire is less, although the total heat radiated remains the same. Generally speaking, a rise in temperature of about 70 degrees centigrade is all that can be permitted with a double-silk insulation. With enamel insulation the rise may be rather more than this, and the two columns in the table give the safe current which may be handled by various gauges of Eureka wire.

The third column gives the resistance in ohms per yard, which will be useful in evaluating the exact resistance required. Consider, for example, the case of a drop of 220 volts with half an amp. for a D.C. receiver to operate filaments from the initial 240 volts. 20 volts is the required value for the valve filaments (or

(Continued on page 58)

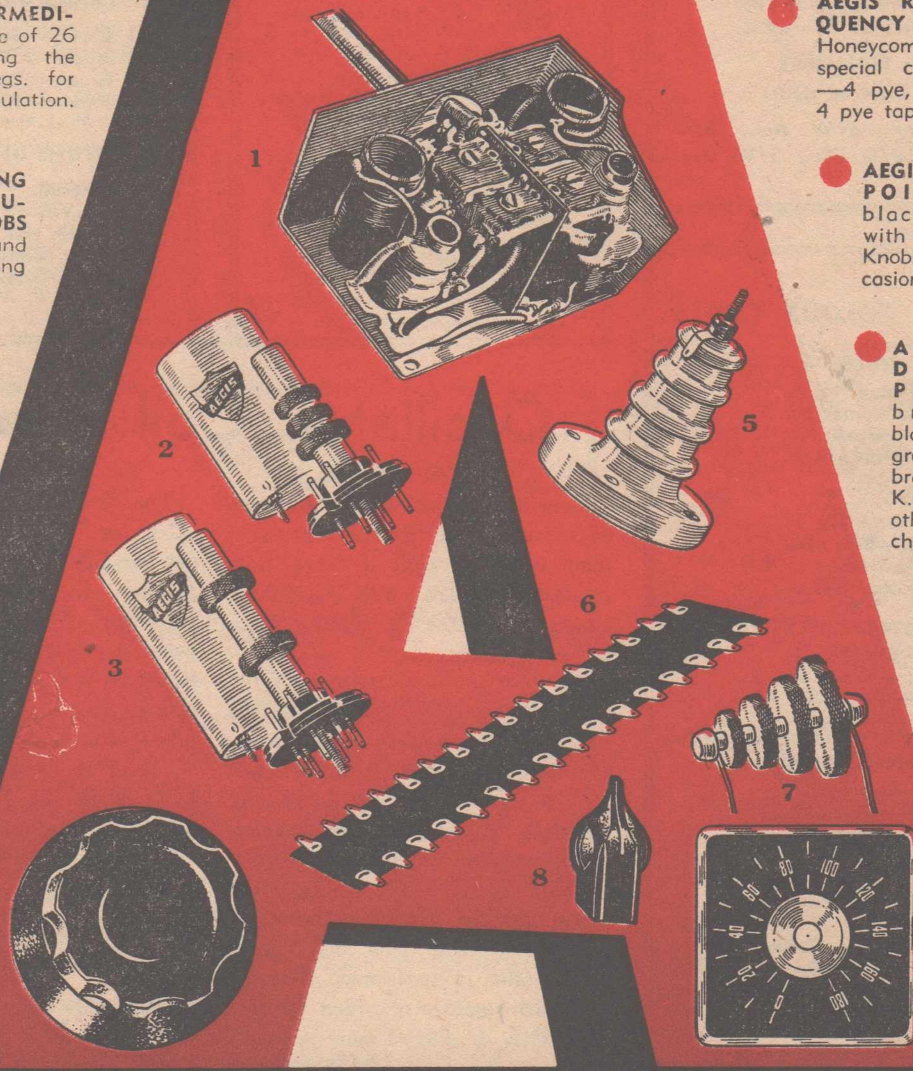
AEGIS 2-STAGE D/W COIL ASSEMBLY featuring Permeability iron-cored B/C and SW coils.

AEGIS BROADCAST COILS cover the full range of standard types, plus special windings as required.

AEGIS INTERMEDIATES — range of 26 types including the new 10.7 megs. for Frequency Modulation.

AEGIS TUNING AND INSTRUMENT KNOBS all sizes and types including Vernier drive.

Capital "A" is appropriate for Aegis components—for their quality is second to none! Here are some typical examples from the comprehensive Aegis range, each one designed and made to exacting standards from first-grade materials.



AEGIS CERAMIC INSULATORS. Full range of stand-off and feed-through types for all needs.

AEGIS RESISTOR STRIPS 48 lug, 24 lug and 6 lug (with upright mounting lugs).

AEGIS RADIO FREQUENCY CHOKES. Honeycomb wound on special ceramic rods —4 pye, 1 pye and 4 pye tapered.

AEGIS TUNING POINTER in black bakelite with metal insert. Knobs for all occasions.

AEGIS INDICATOR PLATE — bright on black background, calibrated 0-180 K.C. — many other types to choose from.

AEGIS COMPONENTS

AEGIS MANUFACTURING CO. PTY. LTD., 208 LT. LONSDALE ST., MELBOURNE, VIC.

Distributors:

MELBOURNE: Lawrence & Hanson Electrical Pty. Ltd.; Replacement Parts Pty. Ltd.; Vealls Electrical & Radio Pty. Ltd.; Homecrafts Pty. Ltd.; J. H. Magrath & Co.; John Martin Electrical and Radio Co. **TASMANIA:** Lawrence & Hanson Electrical Pty. Ltd. (Hobart); Lawrence & Hanson Electrical Pty. Ltd. (Launceston). **ADELAIDE:** George Procter (Factory Rep.); Newton, McLaren Ltd.; A. G. Healing Ltd.; Harris Scarfe Ltd.; Oliver J. Nilsen & Co. Ltd.; Gerard & Goodman Ltd.; Unbehaun & Johnstone Ltd. **PERTH:** Nicholsons Ltd. **SYDNEY:** John Martin Pty. Ltd.; George Brown & Co. Pty. Ltd.; Fox & Macgillycuddy Ltd.; Australian General Electric Pty. Ltd.; Cook Bros. Pty. Ltd. **BRISBANE:** Chandlers Pty. Ltd.; A. E. Harrold Pty. Ltd.; B. Martin Pty. Ltd.

CROWN COLOUR CODES

THE DC2A BRACKET

Aerial—Green
Grid—Brown
Osc. Grid—Blue
Osc. Plate—Yellow
Braid—Earth
Terminal 1—B Plus
Terminal 4—A.V.C.

TRIMMERS

(Left to right)

B/C Aer., S/W Aer., B/C Padder, B/C Osc., S/W Osc.

"Q-PLUS"

AERIAL

Aerial—Blue.
Earth—Red.
Grid—Green.
A.V.C.—Black.

R.F. COIL

Grid—Green.
A.V.C.—Black.
Plate—Blue.
B Plus—Red.

OSC. COIL

Osc. Plate—Blue.
Osc. Grid—Green.
Padder—Black.
B Plus—Red.

I.F. TRANSFORMERS

B Plus—1
Grid—2.
A.V.C.—3.
Plate—4.

KINGSLEY

D.W. BRACKET

Yellow—Osc. Plate.
Green—Aerial.
Black—A.V.C.
Brown—Grid.
Blue—Osc. Grid.
Red—B Plus.
Braid—Earth.

I.F. TRANSFORMERS

1 Brown—Grid.
3 Black—A.V.C.
4 Green—Plate.
6 Red—B Plus.

FERROTUNE UNITS

1—Aerial.
2—A.V.C.
3—Grid.
4—Osc. Plate.
5—Osc. Grid.

AEGIS COLOUR CODES

AERIAL COILS

Grid—Blue No. 1.
A.V.C.—Black No. 3.
Aerial—Green No. 4.
Earth—Red No. 6.

R.F. COILS

Grid—Blue No. 1.
A.V.C.—Black No. 3.
Plate—Green No. 4.
H.T.—Red No. 6.

OSCILLATOR COILS

Grid—Blue No. 1.
Padder—Black No. 3.
Plate—Green No. 4.
H.T.—Red No. 6.

I.F. TRANSFORMERS

Grid—Blue No. 1.
A.V.C.—Black No. 3.
Plate—Green No. 4.
H.T.—Red No. 6.

REINARTZ COIL

Grid—Blue.
Short aerial—Yellow.
Long aerial—Brown.
Earth—Black.
Plate—Green.
Reaction—White.

FOR THE D.W. BRACKET TYPE K1

Aerial—White
Earth—Braid
Grid—Blue
Osc. P.—Green
Osc. G.—Yellow
B Plus—Red
A.V.C.—Black

Oscillator Coil Tracking

Considerable difficulty is often experienced in getting replacement oscillator coils to track, particularly where the oscillator tuning capacitor is smaller than the r-f section.

The problem is caused by the exacting design of the original oscillator coil. This involves such factors as the distributed capacity inherent in the coil. In the replacement coil it is usually quite difficult to duplicate the original characteristics exactly. Therefore, when replacing this coil, some compromise is necessary. Best results are usually obtained when a coil with a slug tuner is used. This type has very low distributed capacitance, and may be compensated more easily.

Three points on the dial are usually used for alignment. These are a low, middle and high frequency. Suggested frequencies are 550, 1,000 and 1,500 kC/s.

The dial is first tuned to 1,500 kC/s, and the oscillator slug is set for this frequency without adjusting the oscillator trimmer capacitor. The r-f trimmer, however, is adjusted. The dial is then tuned to 550 kC/s, and the deviation in frequency is noted. If the actual frequency at this point on the dial is found to be, say, 530 kC/s, then the inductance of the coil is too high. The inductance of the coil should then be reduced and the oscillator trimmer capacitance increased so that the receiver is still tuned correctly at 1,500 kC/s.

The process is then repeated until both 550 and 1,500 kC/s are both received correctly. A check should then be taken at 1,000 kC/s to check the accuracy of the tracking. A 3-kC/s error is not considered high.

—From Kingsley Radio.

Codes for R.C.S. Trolitul Coils and I.Fs.

Aerial Coils

No. 1 or G—Grid. No. 3 or F—A.V.C. No. 4 or A—Aerial. No. 6 or E—Earth.

4 Pin B/C & S/W

No. 1—B/C Aerial. No. 2—S/W Aerial. No. 3—S/W Grid. No. 4—B/C Grid. No. 5—A.V.C. No. 6—Earth.

Type K80 Coils.

No. 1 or G or Yellow—Grid and Aer. No. 3 or F or Blue—Earth. No. 4 or P or Pink—Plate No. 6 or BX or Black—B. Plus.

R.F. Coils and Intermediates
4 Pin B/C and S/W

No. 1 or G—Grid. No. 3 or F—Earth. No. 4 or P—Plate. No. 6 or BX—H.T. If primary tapped No. 5. If secondary tapped No. 2.

R.F. Coils
6 Pin D/W

No. 1—B/C Plate. No. 2—S/W Plate. No. 3—S/W Grid. No. 4—B/C Grid. No. 5—A.V.C. No. 6—B. Pos. Spare lead to earth.

Oscillator Coils
4 Pin B/C & S/W

No. 1 or G—Grid. No. 3 or F—Padder. No. 4 or P—Plate. No. 6 or BX—H.T.

6 Pin D/W

No. 1—B/C Plate. No. 2—S/W Plate. No. 3—S/W Grid. No. 4—B/C Grid. No. 5—B/C Padder. No. 6—B. Pos. Spare lead to earth.

Beat Frequency Osc. Coil

No. 6 or BX—Grid. No. 1 or G—Earth. No. 4 or P—3 Plate Midget. No. 3 or F—Cathode. 3 plate midget condenser from No. 4 to earth.

Reinartz Coil

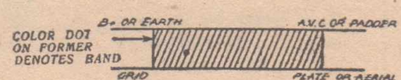
No. 1—Plate. No. 2—Short Aerial. No. 3—Long Aerial. No. 4—Grid. No. 5—Earth. No. 6—Reaction Condenser (14 plate 100 Mmf).

R.F. With Reaction

No. 1—R.F. Plate. No. 2—Detector Plate. No. 3—Reaction Condenser. No. 4—Grid. No. 5—Earth. No. 6—B. Pos.

R.C.S. 5-BAND COIL KIT

Colour Dots Denote Grid Lug



Aerial Grid .... Black
R.F. Grid .... Green
Oscillator Grid .... Red
Type K120 .... Price, £3/10/6.
Consisting of 15 coils—Aerial, R.F. and Oscillator in the bands as shown hereunder.

This coil kit is suitable for use with a Stromberg H Type condenser and will give a band spread as below. A small gang will give less overlap at each end, and amateurs may use our type CV49 double-spaced condensers for band spreading in conjunction with the H. Gang. A six-bank, double-sided switch with shorting plate, the second side being used to short circuit all unused coils. IT IS NECESSARY to shield between the Aerial, R.F., and Oscillator sections of switch.

MOUNTING METHOD

The coils are arranged around the switch from left to right—10 to B/C—the Grid Lugs of the coils being soldered direct to the switch contacts on switch banks 2, 4, and 6, while the Aerial and Plate Lugs are soldered direct to switch contacts in banks 1, 3 and 5.

Five heavy tinned copper wires are formed in a half circle and soldered direct to all the coil lugs AVC and B+, except the Oscillator Padders, which will connect direct to their associate Padders with the Padder earthed on opposite ends.

	Color	Metres	Frequency M/C	Padders
Color dot	Nil	B/C Band	.55 to 1.6 MC	R.C.S. Type P21, 5-Plate Adj.
On END	Green	80	1.5 to 4 MC	R.C.S. Type P21, 5-Plate Adj.
of	Red	40	3.0 to 8 MC	0015 fixed condenser
FORMER.	Yellow	20	5.5 to 16 MC	004 fixed condenser
	Blue	10	11 to 30 MC	004 fixed condenser

For Plug-in Coils use R.C.S. 6-Pin Polystyrene Coil Formers—1¼-in. dia., Type 124; 1½-in. dia., Type 125.

Use R.C.S. 5-Bank Coil Trimmer No. CG27. Type R.C.S. Intermediate Transformers 1F162 and 1F163, and Type 1F168, 1F169, 1F170, 1F171, 1F172, 1F173, 1F174.

5/6 DUAL WAVE UNIT
L/Hand

Green .... Osc. B. Pos.
Red .... Osc. Plate
Yellow .... Osc. Grid.
Green .... R.F. B. Pos.
Red .... R.F. Plate
Black .... D/Light B/C
Pink .... D/Light S/W
Blue .... D/Light Common
Green .... Aerial

R/Hand

Yellow .... Osc. Grid
Black .... Earth
Blue .... A.V.C.
Yellow .... Grid
Black .... Earth
Blue .... R.F. A.V.C.
Yellow .... R.F. Grid
Black .... Earth

4/5 DUAL WAVE UNIT

Blue .... Aerial Grid
Yellow .... Osc. Grid
Red .... Osc. Plate
Green .... Osc. BX
Black .... Aerial
Braids .... Earth

This unit is suitable for use with 6A7, 6J8, 6A8 or 6K8 Valves, R.C.S. Dials and Stromberg-Carlson "H" Type Gang.

Short Wave 13/42 Metres
Broadcast 1600/550 K.C.
To use A.V.C. remove shorting busbar on Terminal Strip.

TRIMMERS

Looking from front of Unit—
Left to right: S/W Osc., B/C Osc., B/C Padder, S/W Aerial, S/W Osc.
Spare contacts will be found at top of Switch Bank, near Trimmers.

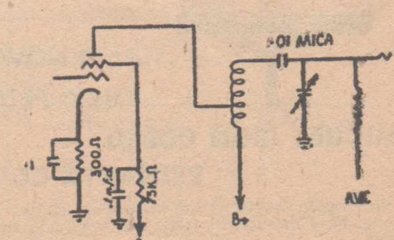
MAGNASONIC MINIATURE

Type E353.

Connections G or 1 — Grid
F or 3 — B+
P or 4 — P or Plate

Use a .01 mica condenser only.

This R.F. coil is used with slightly unusual circuit as per above, the reason being that by this method a reversal characteristic to that of the Aerial Coil or loop is obtained, thereby allowing for a more even sensitivity over the entire band.



BUYERS' GUIDE

and

CATALOGUE SECTION

As a feature of this Special Issue we present in the following pages a review of some of the radio components which are on the market at present. Needless to say, the list is by no means complete, but it should prove a handy reference for those who want a better knowledge of what is available. If the co-operation of manufacturers can be obtained it is intended to make this section a regular feature in future issues.

TRIMAX TRANSFORMERS

TYPE	CASE	APPLICATION	IMPEDANCE-OHMS (See Notes 1, 2, 3, 4.) Primary	Secondary	TURNS RATIO	MAXIMUM LEVEL dbm. (See Note 5)	FREQUENCY VARIATION db/cycles	Unbalanced D.C. in Primary M.A.	NET WEIGHT
MIXING (LINE TO LINE) TRANSFORMERS									
TA636	M8-M66	Line, Microphone or Pick-up Matching Balanced or Unbalanced.	50	200	1-2	+18	± 0.5/30—40,000	0	1 lb. 14 ozs.
TA406A	,, ,,		50	600	1-3.46	,,	,, ,,	0	,,
TA101	,, ,,		200	200	1-1	,,	,, ,,	0	,,
TA168A	,, ,,		200	600	1-1.73	,,	,, ,,	0	,,
TA37A	,, ,,		600	600	1-1	,,	,, ,,	0	,,
TA793	M17	See Note 7.	600	600	1-1	+36	± 0.5/30—15,000	0	4 lb.
MIXING (LINE TO LINE) TRANSFORMERS—MULTI SHIELDED									
MS944	M66	Line, Microphone or Pick-up Matching Balanced or Unbalanced.	50	200	1-2	+10	± 0.5/30—40,000	0	1 lb. 14 ozs.
MS866	,,		50	600	1-3.46	,,	,, ,,	0	,,
MS945	,,		200	200	1-1	,,	,, ,,	0	,,
MS946	,,		200	600	1-1.73	,,	,, ,,	0	,,
MS896	,,		600	600	1-1	,,	,, ,,	0	,,
INPUT (BRIDGING) TRANSFORMERS									
TA17	M8-M66	Input from 50-600 ohm Line to Single or Push-Pull Grids.	10,000	100,000	1-3.16	+18	± 0.5/30—12,000	0	1 lb. 14 ozs.
INPUT (LINE TO GRID) TRANSFORMERS									
TA61	M8-M66	Line, Microphone or Pick-up to Single or Push-Pull Grids.	50	100,000	1-44.7	+18	± 0.5/30—12,000	0	1 lb. 14 ozs.
TA47	,, ,,		200	100,000	1-22.4	,,	,, ,,	0	,,
TA82	,, ,,		600	100,000	1-12.9	,,	,, ,,	0	,,
INPUT (LINE TO GRID) TRANSFORMERS—MULTI SHIELDED									
MS860	M66	Line, Microphone or Pick-up to Single or Push-Pull Grids.	50	100,000	1-447	+10	± 1.0/30—10,000	0	1 lb. 14 ozs.
MS837	,,		200	100,000	1-22.4	,,	,, ,,	0	,,
MS878	,,		600	100,000	1-12.9	,,	,, ,,	0	,,
INTERSTAGE TRANSFORMERS									
TA3	M8-M66	Single or Push-Pull 10,000 ohm Plates to Push-Pull Grids.	40,000	160,000	1-2	Whole Sec. 120 v.p.	± 1.0/30—10,000	0	1 lb. 14 ozs.
OUTPUT (PLATE TO LINE) TRANSFORMERS									
TA835	M8-M66	Single 7,000-10,000 ohm Plate to Line.	20,000	50	20-1	+24	± 1.0/30—12,000	6.5	1 lb. 14 ozs.
TA833	,, ,,		20,000	200	10-1	,,	,, ,,	6.5	,,
TA733B	,, ,,		20,000	600	5.8-1	,,	,, ,,	6.5	,,
TA947	,, ,,	Push-Pull 7,000-10,000 ohm Plates to Line	30,000	50	24.5-1	+27	,, ,,	1.0	,,
TA948	,, ,,		30,000	200	12.3-1	,,	,, ,,	1.0	,,
TA710A	,, ,,		30,000	600	7.1-1	,,	,, ,,	1.0	,,

Table showing the various types of high fidelity transformers listed by Trimax.

REPAIR GUIDE

ROLA SPEAKERS

Manufactured by

ROLA COMPANY (AUST.) PTY. LTD.

The Boulevard, Richmond, Vic.

ROLA SPEAKER REPAIR SERVICE

Because of their design and the quality of the materials used in their construction most of the 2,000,000 Rola loudspeakers sold in Australia during the past twenty years are still giving trouble-free service.

However, some of them—due to mishandling, faults which develop in use, or to windings burnouts caused by breakdowns in radio receivers with which they have been associated—may need attention. Rola Service Depots which provide prompt and efficient loudspeaker service are established in Sydney and Melbourne.

Though at these depots repairs to Rola loudspeakers are carried out by highly trained staffs, it is not always economic to attempt the reconditioning of very old model loudspeakers.

To help the radio dealer and the general public to decide on the advisability of having a loudspeaker repaired these tables have been prepared.

Where the cost of repairing a loudspeaker will approximate the purchase price of a new model, replacement of the old unit is suggested.

Provided that they are not damaged, Rola Speakers listed below with the word "Yes" are worth repairing. Speakers listed with the word "No" are regarded as so obsolete as to be not worth repairing and should be replaced.

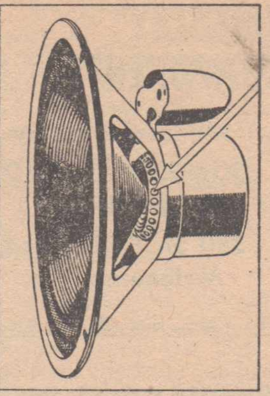
MODEL	Worth Repairing	Voice Coil Impedance at 400 Cycles	Replacement Transformer Type
3½" Permanent Magnet Types			
3C	Yes	3.7	D,E,F,G,
5" Electro Dynamic Types			
F4	No	3.7	—
K5	Yes	3.7	E
5" Permanent Magnet Types			
5–4	Yes	3.7	D & E
5–7	Yes	3.7	D
5–8	No	3.7	—
5–9	Yes	3.7	D & E
5–11	No	3.7	—
5–15	No	3.7	D
5C	Yes	3.7	D,E,&G.
		(G in battery sets only)	
T5 (Bakelite external spider)	No	12*	—
T5 (Permaflex spider)	Yes	12*	Special
5–6	No	3.7	—
F4 PM	No	3.7	—
6" Electro Dynamic Types			
F5B (Permaflex spider)	Yes	3.7	D
F5B (Internal spider)	No	3.7	—
DP5B (Bakelite external spider with felt)	No	3.7	—
6" Permanent Magnet Types			
F5B PM	No	3.7	—
6–6 (Bakelite external spider with felt)	No	3.7	—
6–6 (Permaflex spider)	Yes	3.7	D
6–8	Yes	3.7	D
6–11	Yes	3.7	D
6–12	Yes	3.7	D
6–15	Yes	3.7	D
6H	Yes	3.7	D
DM6 (Special Car Radio)	No	—	—
8" Electro Dynamic Types			
F6 (Internal spider)	Yes	2	C
K8 (Internal spider)	Yes	2	C
K8 (Permaflex spider)	Yes	2	C
K8 (Bakelite external spider)	No	2	—
K8 (Bakelite external spider)	No	2	—
K8 (Bakelite external spider with felt)	No	3.7	—
F8 (Bakelite external spider with felt)	Yes	3.7	D
F8 (Permaflex spider)			
GM8 (Special Car Radio)	No	1.8	—
8" Permanent Magnet Types			
8–8 (External bakelite spider with felt)	No	2	—
8–8 (Permaflex spider)	Yes	2	C
FR6 PM	No	2	—
8–11 (Permaflex spider)	Yes	3.7	D
8–11 (External bakelite spider with felt)	No	3.7	—
8–14 (External bakelite spider with felt)	No	2	—
8–14 (Permaflex spider)	Yes	2	C
8–15 (Permaflex spider)	Yes	3.7	D
8–15 (External bakelite spider with felt)	No	3.7	—

*At 5,000 Cycles

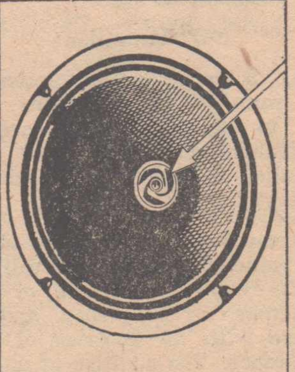
FOR ROLA SPEAKERS

MODEL	Worth Repairing	Voice Coil Impedance at 400 Cycles	Replacement Transformer Type
8" Permanent Magnet Types			
8–20 (External bakelite spider with felt)	No	2	—
8–21 (External bakelite spider with felt)	No	2	—
8–42 (External bakelite spider with felt)	No	2	—
8–20 (Permaflex spider)	Yes	2	C
8–21 (Permaflex spider)	Yes	2	C
8–42 (Permaflex spider)	Yes	2	C
8–0	Yes	2	C
8–M	Yes	2	C
8K	Yes	2	C
10" Electro Dynamic Types			
K7	No	2	—
F10 (External bakelite spider)	No	2	—
F10 (External bakelite spider with felt)	No	2	—
F10 (Permaflex spider)	Yes	2	C
F10 (Internal spider)	Yes	2	C
K10 (Permaflex spider)	Yes	2	C
K10 (External bakelite spider with felt)	No	2	—
10-20 (Permaflex spider)	Yes	2	C
10-21 (Permaflex spider)	Yes	2	C
10-42 (Permaflex spider)	Yes	2	C
10" Permanent Magnet Types			
10-20 (External bakelite spider with felt)	No	2	—
10-21 (External bakelite spider with felt)	No	2	—
10-42 (External bakelite spider with felt)	No	2	—
12" Electro Dynamic Types			
K12 (Permaflex spider)	Yes	2	C
F12 (Permaflex spider)	Yes	2	C
K12 (External bakelite spider)	No	2	—
F12 (External bakelite spider)	No	2	—
K12 (External bakelite spider with felt)	No	2	—
12" Permanent Magnet Types			
12-20 (Permaflex spider)	Yes	2	C
12-21 (Permaflex spider)	Yes	2	C
12-42 (Permaflex spider)	Yes	2	C
12-20 (External bakelite spider with felt)	No	2	—
12-21 (External bakelite spider with felt)	No	2	—
12-42 External bakelite spider with felt)	No	2	—
12-0 (Permaflex spider)	Yes	2	C
G12 Speakers			
All types	Yes	8.4	B

Explanatory Notes:



PERMAFLEX SPIDER—is a non-adjustable diaphragm suspension attached externally to the apex of the cone which provides a means of permanently retaining the moving coil concentrically in the magnetic gap. Comprising a concentrically corrugated disc of paper or impregnated fabric, it is cemented at its outer periphery to an annular support. No screws or other means of adjusting the position of the spider or its support are provided. (An early type is illustrated.)



INTERNAL SPIDER—is a diaphragm suspension attached inside the cone near the apex.

ROLA CATALOGUE

Full technical details of the complete range of Rola loudspeakers, including two new 12" models which are to be released shortly, are contained in the newly-issued Rola Loudspeaker Catalogue. The loudspeaker data includes power ratings, diaphragm resonance, voice coil impedance and mounting details. Also included in this attractively-printed booklet are details of output and line transformers, their impedance ratings and their type codes, information on Rola filter chokes, and a monograph setting out power, voltage and impedance relationships. Articles on loudspeaker performance ratings and the development of modern magnet alloys will also interest all loudspeaker users. Copies can be obtained free from all Rola distributors or direct from Rola Company (Aust.) Pty. Ltd., The Boulevard, Richmond, Victoria.

KINGSLEY COMPONENTS

Manufactured by
KINGSLEY RADIO PTY. LTD.
380 St. Kilda Road, Melbourne, Vic.

KINGSLEY COIL DESIGN

Generally, there is much more to winding a coil than simply using a number of turns on something that will mount them.

A number of factors must be taken into consideration when a coil is designed for an application . . . in simple language, it is possible to have too much wire, or too small gauge of wire on a coil for a given inductance. It will be understood that wire that is too coarse or too fine will increase the resistance of the coil, and so kill its "goodness" or "Q."

"Q" Definition

"Q" is the usual designation for the ratio of the reactance of a coil to its series resistance, or equivalent series resistance. "Q" is called the "figure of merit" or "energy factor."

It can be seen from the above, the value of "Q" will generally increase with an increase of coil-inductance or frequency, and decrease with an increase of coil-resistance. The addition of an iron core will increase the inductance, but also, introduce eddy current and hysteresis losses. These losses can be represented by an increase of coil-reistance. The correct iron core in a properly-designed coil can be made to increase the "Q" value appreciably within a certain frequency range. This is due to two factors, namely:

(a) A higher inductance L is obtainable with the same number of turns of wire if the core is present; thereby it is a means of reducing the coil

(Continued on next page)

"PERMACLAD" AND "PERMACORE" BROADCAST COILS

KC 1	Standard B/C Aerial Coil "H" Gang—use with Permaclad 455kc. I.E.
" 1a	B/C Aerial Coil for Car Radio—use with Permaclad 175kc. I.E.
" 2	Standard R.F. Coil "H" Gang—use with Permaclad 455kc. I.E.
" 2a	R.F. Coil Car Radio—use with Permaclad 175kc. I.E.
" 3	Standard Osc. Coil "H" Gang Valves—use with Permaclad 455kc. I.E. ECH35, 6A8, 6J8, EK2, etc. Padder 430 mmf.
" 4, " 5, " 6	Standard "F" Gang—all other particulars as for KC 1, 2 & 3; Padder 430 mmf.
" 7	B/C Autodyne—use with "Permaclad" 455kc. Padder 430 mmf.
" 8	B/C Osc. "H" Gang—use with "Permaclad" 175kc. IF Padder 840 mmf. Valves 6A8, 6J8, etc. Autodyne or Octode Converter.
" 9	B/C "Reinartz" with Hi-"Z" Primary and tappings for long and short aerial.
" 10	B/C R.F. Coil with reaction and Hi-"Z" Primary.
" 11	B.F.O. Coil, 455kc. (Hartley circuit).
" 12	Wave Trap, 455kc.
" 13	B/C Osc.—use with "Permaclad" 455kc. IF Valve 6SA7 Padder 430 mmf.
" 14	Miniature B/C Aerial "Permacore" unshielded (Replacement type).
" 15	Miniature B/C Osc. 455kc. unshielded (Replacement type) Padder 430 mmf.
" 16	B/C Aerial "H" Gang "Permacore" 3-section Secondary (manufacturer's type).
" 17	B.F.O. Coil, 1.9 mc.—use with 6J8, 6C8, etc. (Hartley circuit).
" 18	B/C Osc., 1.9 mc.—use with 6J8, 6C8, etc. (Hartley circuit). Padder 115 mmf.
" 19	Standard Mini. B/C Aerial (Can size 7/8" x 7/8" x 7/8").
" 20	Standard Mini. B/C R.F. (Can size 7/8" x 7/8" x 7/8").
" 21	Standard Mini. B/C Osc. (Can size 7/8" x 7/8" x 7/8"). Padder 430 mmf.

"PERMACORE" SHORT WAVE COILS

KCH 1	S/W Aerial Coil "H" Gang 13-42 Metres.
" 2	S/W R.F. Coil "H" Gang 13-42 Metres.
" 3	S/W Osc. Coil "H" Gang 13-42 Metres. 6J8 Converter Padder .004 mfd.
" 4	S/W Aerial Coil "H" Gang 16-50 Metres.
" 5	S/W R.F. Coil "H" Gang 16-50 Metres.
" 6	S/W Osc. Coil "H" Gang 16-50 Metres. 6J8 Converter Padder .004 mfd.
" 7	S/W Osc. Coil "H" Gang 16-50 Metres. EK2 Converter-Padder .004 mfd.

"PERMACLAD" & "PERMACORE" INTERMEDIATE FREQUENCY TRANSFORMERS

KIF 1	No. 1, 455kc. Autodyne "Permaclad" (Shield Can 3" x 1$\frac{3}{8}$").	
" 2	No. 1, 175kc. Autodyne "Permaclad" (Shield Can 3" x 1$\frac{3}{8}$").	
" 3	No. 2, 175kc. Standard replacement type (Shield Can 3" x 1$\frac{3}{8}$").	
" 4	No. 2, 175kc. "Permacore" (similar KIF 3) (Shield Can 3" x 1$\frac{3}{8}$").	
" 5	Standard No. 1, 455kc. Hi-gain and selectivity (Shield Can 3" x 1$\frac{3}{8}$").	
" 6	Standard No. 2, 455kc. Hi-gain and selectivity (Shield Can 3" x 1$\frac{3}{8}$").	
" 7	No. 1, 455kc. (alternative KIF5)	Manufacturer's type "Permacore" Hi-gain but with an extended band width.
" 8	No. 2, 455kc. (alternative KIF6)	
" 8a	No. 2, 455kc. (alternative KIF6)	
" 9	No. 1, 1.9 mc. 2 pye "Permacore"	for 2 stage I.F. channel use 2 x KIF9 with 1 x KIF10.
" 10	No. 2, 1.9 mc. 2 pye "Permacore"	
" 11	No. 1, 455kc. Low gain	for 2 stage IF channel use 2 x KIF11 with 1 x KIF12.
" 12	No. 2, 455kc. Low gain	
" 13	No. 1, or 2 175kc. "Permacore" type.	
" 14	Standard No. 1 Miniature 455kc. "Permaclad" (Can 1-7/8" x 7/8" sq.).	
" 15	Standard No. 2 Miniature 455kc. "Permaclad" (Can 1-7/8" x 7/8" sq.).	
" 16	Standard No. 2 Miniature 455kc. Tuned pri. untuned Sec. (Special).	

KINGSLEY COMPONENTS (Cont'd)

,, 17	Manufacturer's No. 1 "Permaclad" solid wire type.
,, 18	Manufacturer's No. 2 "Permaclad" solid wire type.
,, 19	No. 1 Hi-gain special manufacturer's type "Permaclad."
,, 20	No. 2 Hi-gain special manufacturer's type "Permaclad."
,, 21	Hi frequency No. 1 (F.M.) 10.7 mc } for 2 stage I.F. Channel use 2 x KIF21 & 1 x KIF22.
,, 22	Hi frequency No. 2 (F.M.) 10.7 mc }
,, 23	Crystal Filter 455kc. Input Transformer.
,, 24	Crystal Filter 455kc. Output Transformer.
,, 25	Crystal Filter 1.9 m.c. Input Transformer.
,, 26	Crystal Filter 1.9 m.c. Output Transformer.

"FERROTUNE" FOUNDATION KIT SETS INCLUDING DIAL, CHASSIS & I.F.T.'s

KFT 1	B/C "Ferrotune" Kit Set, 4/5 Valve Table Model.
,, 2	B/C "Ferrotune" 2/3 Valve "Reinartz" Kit Set—Mantel model.
,, 3	B/C "Ferrotune" Kit Set, 3/4 Valve Mantel Model.
KF/HB	B/C "Ferrotune" Hi-fidelity type using 1.9 mc. I.F.T.'s.

"FERROTUNE" CONVERTERS

KF/C610	Hi-frequency Converter covering 6 or 10 metres with I.F. injection at 10.7 mc.

"FERROTUNE" VARIABLE FREQUENCY OSCILLATOR (E.C.O.)

KF/VFO	A stable VFO for "Ham" use covering 80-40-20-10-6 Metres.

"FERROTUNE" PRE-SELECTOR

K/S9'er	Specially developed for Aerial to Receiver matching, plus high gain and high signal-to-noise ratio. Covers the 6 or 10 metre bands. A MUST for ecvery "Ham" or S.W.L.

DUAL WAVE UNITS—CONDENSER TUNED

KU 1	Dual Wave Unit (without R.F.) 13-42 metres.
,, 2	Dual Wave Unit (without R.F.) 16-50 metres.

DIALS—"FERROTUNE" TYPES

KDU 1	B/C Dial edgelit—table model type 6" x 4½".
,, 2	"Reinartz" 2⅞" square—no station call signs.
,, 3	B/C Dial 2⅞" square—N.S.W. and Q'land (Capital Stations shown).
,, 4	B/C Dial 2⅞" square—S.A. & W.A. (Capital Stations shown).
,, 5	B/C Dial 2⅞" square—Vic. & Tas. (Capital Stations shown).
,, 6	B/C Dial 2⅞"—Console Model.
,, 7	B/C Dial 2⅞"—Miniature floodlit slide rule 4⅛" x 2⅞" window.

LOOP AERIALS

K/L 2	Mini. loop aerial for portables Hi-"Q" with Primary winding built in for external aerial and earth connections if required.

SPEAKERS

K/R 3	3" Permag. Dynamic Speaker } each available with input transformer of requisite impedance.
K/R 5	5" Permag. Dynamic Speaker }
K/R 6	6" Permag. Dynamic Speaker }

COIL DESIGN

(Continued)

resistance by the reduction of the length of wire used to attain a given inductance value.

(b) The chemical and physical structure of the correct grade of core is such that the hysteresis and eddy current loss is kept at a very low figure for a given frequency range. It is important to note that a specified grade of powder is necessary for a specified frequency range of operation, and by the suitable selection of the grade, the coil losses are kept at a minimum, practical figure for that range.

Practical Application of Iron Cores in Coil Design

For some years radio engineers have followed the technique of using a Ferro-Magnetic Iron Core for the adjustment of an inductance to a given frequency. Experience has shown that with this system, frequency stability is of a reasonably high order and is an improvement over the conventional tuned circuit resonated by a compression - type adjustable capacitor.

The practical use of permeability-tuned inductors, particularly those applying to such components as I.F. transformers and tuning coils, used in domestic radio receivers and communication equipment is well known to the radio engineer and needs no further comment. It is our intention to discuss here the technique of modern practice in the use of iron cores of the slug and pot types and the improvements which may be derived therefrom.

The application of the correct iron core, or in the case of the "Permaclad" types, the iron dust pot, has been carefully studied for years by our engineers. The "Permaclad" type of coil, for example, employs an encasing pot, which, in combination with the adjustable core, employs just the correct amount of wire to provide a given "L" at the frequency of operation. The result is a very high "Q" coil or I.F. employing the minimum amount of wire, which, of course, means lower resistance, hence higher "Q."

TRANSFORMER RANGE *by* FERGUSON

This list of FERGUSON TRANSFORMERS represents our standard range which we are at present supplying the Radio trade.

This is by no means our complete range when taking into account those Transformers being supplied to manufacturers' special requirements.

Transformers of this type cannot possibly be listed in the space available and manufacturers are requested to contact us direct regarding their special Transformer requirements.

STANDARD RANGE TYPES

OUTPUT TRANSFORMERS

TYPE	PRIMARY	SECONDARY	RATING
OP1	5000 and 2500 ohms S.E.	12.5, 8.0 & 2.3 ohms Voice Coil	10W
OP1A	5000 and 2500 ohms S.E.	500 ohm Line	10W
OP2	5000 ohms P-P	12.5, 8.0 & 2.3 ohms Voice Coil	15W
OP3	6600 ohms P-P	12.5, 8.0 & 2.3 ohms Voice Coil	15W
OP4	10,000 ohms P-P	12.5, 8.0 & 2.3 ohms Voice Coil	15W
OP5	5000, 6600, 10,000 ohms P-P	12.5, 8.0 & 2.3 ohms Voice Coil	15W
OP6	5000 ohms P-P	500, 250 and 125 ohms	15W
OP7	6600 ohms P-P	500, 250 and 125 ohms	15W
OP8	10,000 ohms P-P	500, 250 and 125 ohms	15W
OP9	5000, 6600, 10,000 ohms P-P	500, 250 and 125 ohms	15W
OP10	5000 ohms P-P	500, 250 and 125 ohms	25W
OP11	6600 ohms P-P	500, 250 and 125 ohms	25W
OP12	10,000 ohms P-P	500, 250 and 125 ohms	25W
OP13	5000, 6600, 10,000 ohms P-P	500, 250 and 125 ohms	25W
OP14	5000 ohms P-P	500, 250 and 125 ohms	32W
OP15	6600 ohms P-P	500, 250 and 125 ohms	32W
OP16	10,000 ohms P-P	500, 250 and 125 ohms	32W
OP17	5000, 6600, 10,000 ohms P-P	500, 250 and 125 ohms	32W

TYPE	PRIMARY	SECONDARY	RATING
OP18	3800 ohms P-P	500, 250 and 125 ohms	60W
OP19A	5000 ohms P-P (30-10,000 C/s)	12.5, 8.0, 2.3 ohms Voice Coil	15W
OP19B	5000 ohms P-P (30-10,000 C/s)	500, 250 and 125 ohms	15W
OP20	11,600, 8400 ohms P-P (P.A. Range)	500, 250, 166 & 125 ohms	150W
OP21	8000 ohms P-P (30-15,000 C/s)	500/125 ohms	15W
OP22	3250 ohms S.E. 85 M.A. (30-15,000 C/s)	2.3 or 500/125 ohms	10W
OP23	3250 ohms S.E. 85 M.A. (30-15,000 C/s)	12.5 or 8.4/2.1 ohms	10W
OP25	10,000 ohms P-P (20-30,000 C/s)	Any Two Impedances in 4 to 1 ratio e.g. OP25 500/125. OP25 8.4/2.1 OP25 10/2.5	15W
OP8M	10,000 ohms P-P	500 ohm Line 10 Tappings	15W
OP15M	6600 ohms P-P	500 ohm Line 10 Tappings	15W
L1	500 ohms	12.5, 8.0, 2.3 ohms	10W
U1	30,000, 20,000, 14,000 10,000, 7000, 5000, 2500 ohms P-P-R S.E.	2.3 ohms Voice Coil Universal Speakers.	10W

CLASS B DRIVER AND INTERSTAGE TRANSFORMERS

			Prim to ½ Sec. RATIO
1P1	Single 6J7G Triode 5 M.A. D.C. Unbalance	Class A1, AB1, P-P Grids	1
IP2	Single 6V66 Triode 40 M.A. D.C. Unbalance	807, etc. Class AB2 P.P. Grids	2.5
IP3	P.P. Class A, A1 Triodes 45's, 2A3's, etc.	Class B P.P. Grids 809, 830B, etc.	2.3 or 4
IP4	S.E. or P.P. Triodes	Class B P.P. Grids 809, 830B, etc.	2.8 or 2.15

MODULATION TRANSFORMERS

M25	**6000 & 8000 ohms P-P**	10,000, 7000, 5000 ohms, 100 M.H.	25W
M50	**3800, 6600, 8000 ohms P-P**	10,000, 7500, 6500, 5500, 4500, 3500 ohms 150 M.A.	50W
M50M	**Multi Primary**	**Multi Secondary**	50W
M125M	**Multi Primary**	**Multi Secondary**	125W

VIBRATOR TRANSFORMERS

6V/150	6V at 0.9A D.C.	150V at 25 M.A.
6V/200	6V at 2.9A D.C.	200V at 50 M.A.
6V/250	6V at 3.4A D.C.	250V at 60 M.A.
6V/240/U	6V at 3.9A D.C. or 240V A.C.	250V at 60 M.A. 6.3V at 2A (A.C.), using 6X5GT Non Sync. Operation.

POWER TRANSFORMERS

P30	240V A.C.	150V/150V at 30 M.A. 6.3V at 2A.

FILTER CHOKES

C30/25	30 Henries at 10V A.C. 100 C/s plus 25 M.A. D.C.
C12/200	12 Henries at 10V A.C. 100 C/s plus 200 M.A. D.C.

LABORATORY SERVICE TO MANUFACTURERS

The Ferguson Laboratory is continually engaged in research for the improvement and advancement in the transformer and electronic field. This Laboratory together with its technical staff is available to assist manufacturers with their transformer problems.

FERGUSONS RADIO Pty. Ltd.

12 McMAHON STREET, WILLOUGHBY

Procurable from any wholesale house in all States including Tasmania. If you have any trouble obtaining supplies, write to us direct and we will forward a list of suppliers.

Factory Representative:

N.S.W.: ELECTRONIC INDUSTRIES IMPORTS
VIC.: ELECTRONIC INDUSTRIES IMPORTS
QLD.: ELECTRONIC INDUSTRIES IMPORTS
STH. AUS.: APEX AGENCIES

When writing to advertisers be sure to mention that you read "Australasian Radio World." It may help us to get greater advertising support, which in turn will allow us to give you bigger, better and brighter issues.

Item No.		Type No.	Price
72	500 ohms 8 & 4 ohms	VW84	58/11
73	500 ohms 2 & .5ohms	VW205	58/11
MODULATION TRANSFORMERS.			
74	25 Watts Universal Modulator	UM25	75/-
75	50 Watts Universal Modulator	UM50	98/-
76	125 Watts Universal Modulator	UM125	162/-
STEPDOWN VOLTAGE TRANS.			
77	230/115v 75 W	1107	41/11
78	230/115v 150 W	1115	68/5
79	230/115v 350 W	1135	102/-
80	230/115v 600 W	1160	175/8
81	230/115v 1000 W	1100	248/5
LINE INPUT TRANS. (L.L.)			
82	600 Line to Grid	AM1	79/8
83	200 Line to Grid	AM4	79/8
84	50 Line to Grid	AM5	79/8
LINE OUTPUT TRANS. (L.L.)			
85	L.L. Plate to Line	AR5	79/8
86	L.L. Plate to Line	AR7	79/8
INTERVALVE TRANSFORMERS.			
87	3:1 Intervalve	AM3	79/8
88	3:1 Intervalve	AM2	79/8
89	3:1 Intervalve	AR3	79/8
90	3:1 Replacement	RA3	19/5
DRIVER TRANS. (A-AB-B).			
91	pp Plates to pp 2A3's (A)	AR1	79/8
92	pp Plates to pp 807's (AB)	AR2	96/8
93	Single Plate pp 807's (AB)	AS2	60/6
94	2A3's pp to 805's pp (B)	D805	60/6
95	2A3's pp to 809's pp (B)	D809	60/6
96	Battery Class B Replacement	D19	14/5

IF IN DOUBT—

remember the Speedy Query Service. Reply by mail—fee 1/-. Address: Box 13, Mornington, Vic.

SET REPAIR HINTS

I RECENTLY had a long yarn with a radio repairman who works at his job about twelve hours a day for six days a week. This man can pop through about thirty sets a day in the ordinary run of troubles. When he found out who I was, and what I did, he poured a lot of pent-up emotion about the way in which amateur set repairers go about their work. He did not complain about the general way in which they tracked down the troubles and rectified them, but rather that they failed to exercise sufficient imagination to foresee weaknesses which would surely lead to trouble again in a few weeks time. As a typical example he showed me a set which he said had been in the hands of an amateur set repairer only a few weeks previously. The power cord was about ten years old. The rubber in it had decomposed to such an extent that it was just powder and lumps. As soon as it was twisted the two wires short-circuited. The set had blown the power fuses, and that is why my man had been called in. A couple of weeks before the set had been in other hands in order to have a rectifier valve replaced.

This was just a typical example, so here is a rough outline of things you should check on every set that passes through your hands. No matter whether the owner suggests it or not, you should check the power cord and its connections. The power cord is a vital thing, because faulty insulation can cause sudden death. Make sure that the power plug is connected properly, with the screws tight. Look along the cord for wear and tear on the insulation, inspect the ends of the wires to see that the rubber is still pliable and not perished. Take a good look at the grommet which protects the insulation at the place where the cord goes through the steel base. Make certain that there is a knot or some other method of taking the strain in case a sudden pull comes on the power line, such as happens when someone trips over it. Look at the soldering of the power cord to the terminal strip of the power transformer, watching for loose strands. Remember that it takes only one strand to cause a dangerous short circuit. So much for the power cord, which is an important point to watch. Of course there are other things as well, and my repairman suggests that the following precautions should be taken: (1) clean and dust the chassis all over; (2) tighten all screws and nuts; (3) seal all trimmers and adjusting screws after they are set; (4) make sure that all valves are firmly fitted in their sockets and that all valve cans are making effective contact to earth; (5) tighten the grub screws of all knobs after the set is re-installed in the cabinet. According to my informant, the above five rules would save about half his service calls if they were carried out properly.

Not so technical, but quite practical, was his final suggestion. It was that all set repairers should make a point of returning faulty components to the owner of the set from which they are taken. If you have to replace a valve, a condenser or any other component, it is best to return it with the repaired set. It is no use cluttering up your workshop with dud parts. Much better to give them back to their owner so that he can see at a glance that you have really given him something for his money. It is bound to lead to a better feeling with the client or customer.

—A.G.H.

* * *

"RED LINE" IN N.S.W.

Mr. Swales, director of Red Line Equipment Pty. Ltd., announces that Messrs. United Radio Distributors Pty. Ltd., of 183 Pitt Street, Sydney, have been appointed a distributor for "Red Line" equipment in New South Wales.

United Radio intends to carry a full range of "Red Line" transformers and equipment, so our readers in Sydney can look to them for immediate delivery of their requirements.

AEGIS COMPONENTS

Manufactured by
AEGIS MANUFACTURING CO.
208 Little Lonsdale St., Melbourne, Vic.

POWER AND DISTORTION

THERE is no easy way of measuring power and distortion. Even with the most expensive and elaborate laboratory equipment it is quite a problem. For the kitchen-table type of enthusiast the best way of obtaining a rough and ready idea of power output is to put an a.c. meter across the voice coil terminals of the speaker and then use the chart shown here.

When reproducing music or speech it will be found that the needle will flicker and wave up and down according to the modulation, but you can get a very fair idea of the peak power which is actually going into the speaker. Power factor, phase displacement and many other finer points will make this reading anything but a true reading of power, but as a basis of comparison it has its uses.

To detect distortion it is best to put a millimeter in the plate circuit of the output valve. So long as the needle remains steady there is not much distortion. When the needle starts to flicker and jump about it is a sure sign of distortion. By watching the needle of the milliammeter with the eyes and keeping the ears cocked to listen to the output from the speaker you will soon find how easy it is to tell distortion by ear. After all is said and done, it is distortion which the ear can detect which is the important thing

BROADCAST COILS

Where shielding is specified, extruded aluminium can measures 2¼" high x 1⅜" dia. Base is of moulded bakelite; pins, which are numbered, and protrude 5/16" from base, are silver plated. Permeability iron core is locked with retaining spring. Eyebolts (⅛") complete with nuts, are fitted to can with 1⅜" mounting centres; 1" (minimum) chassis hole required. All windings impregnated with high frequency lacquer.

Types M5-M6-M7 are unshielded. Former measures 7/16" dia. x 1¾" long. Windings terminated on punched bakelite plate (1-1/8" x 1-1/8") fitted with eyelet lugs. Iron core carried by brass insert with internal locking spring. Mounting is by one ¼" hole—nut supplied. These coils primarily designed for use in portable receivers.

Types M19-M20-M21 are unshielded, aircore coils wound on former 1⅞" long x ¾" dia. Secondary winding is progressive wound to ensure low distributed capacity. Terminating lugs fitted at top of former—2 similar lugs provided at base, which may be soldered to chassis, for mounting.

Type		Retail
	AERIAL B/C	
M1	Aircore, Shielded	7/3
M5	Perm. Tuned, Unshielded	6/9
M9	Perm. Tuned, Shielded	8/9
M12	Aircore, Shielded, Reinartz	8/9
M19	Aircore, Unshielded, Prog. wound	5/–
	R.F. B/C	
M2	Aircore, Shielded	7/3
M6	Perm. Tuned, Unshielded	6/9
M10	Perm. Tuned, Shielded	8/9
M15	Perm. Tuned, Shielded, WITH Reaction Winding	8/9
M20	Aircore, Unshielded, Prog. wound	5/–
	OSCILLATOR B/C	
M3	Aircore, Shielded, 455 Kc. Converter as specified	7/3
M7	Perm. Tuned, Unshielded, 455 Kc. Converters ECH35, 6J8, 6A8, EK2, 1R5	6/9
M11	Perm. Tuned, Shielded, 455 Kc. Suitable for same converters as Type M7	8/9
M11A.	Perm. Tuned, Shielded, 455 Kc. For 1A7 Conv.	8/9
M11B.	Perm. Tuned, Shielded, 455 Kc. For 6SA7 Conv.	8/9
M11C.	Perm. Tuned, Shielded, 175 Kc. Same converters as Type M7.	8/9
M21	Aircore, Unshielded, Prog. wound (Converters as specified)	4/9

* * *

Padder Values:

455 Kc. Iron Core Coils—450 mmf. fixed.
175 Kc. Iron Core Coils—.001 mfd. fixed or 175 Kc. variable.
Aircore Coils: 175 Kc. or 455 Kc. Variable, as necessary.

* * *

Type		Retail
	MISCELLANEOUS	
M16	B.F.O. 455 Kc. & 1600 Kc. (or as specified)	9/9
M22	Crystal Filter Input 455 Kc. (Circuit)	10/9
M17	Crystal Filter Output 455 Kc. (Available)	10/9
M22A.	Loop Aerial, wound on canvas bakelite former, oval in shape, measuring approx. 7¼" x 5". Windings terminated at centre with eyelet lugs. Coupling turn for external aerial provided. Matches AWA and "H" Gangs	5/9
M17A.	Loop Aerial, similar M17, but with loading coil for peak performance over entire band. Permeability tuned.	7/6

* * *

SHORT-WAVE COILS

All coils are unshielded and wound on bakelite former 1⅞" long, ¾" dia. Eyelet lug termination at top of coils. Iron cores carried by brass insert with internal locking spring—one hole mounting (¼"). Nut and washer supplied. Aircored types mounted by means of eyelet lugs on chassis, or tinned wire, direct to switch.

Type		Retail
	AERIAL 13-42 Metres	
H1	Aircore	4/3
H4	Permeability Tuned	4/9
	R.F. 13-42 Metres	
H2	Aircore	4/3
H5	Permeability Tuned	4/9

(Continued on next page)

OSCILLATOR 13-42 Metres

H3	Aircore 455 Kc.	4/3
H6	Permeability Tuned, 455 Kc. Converters ECH35, 6J8, 6A8, EK2	4/9
H6S.	Permeability Tuned, 455 Kc. for 6SA7 Converter	4/9

Note: S/W Coils are available for all frequencies up to and including 10 metres (30 Mc). As these types are not mass produced, cost is slightly higher than standard coils. Special data form available from Aegis distributors to ensure that all relevent information is supplied when ordering (Form NSF1).

TRANSFORMERS I.F.

Unless otherwise specified, I.F. transformers are fitted in extruded aluminium can measuring 3" high x 1⅜" dia. Base specifications are standard, with silver plated pins moulded into a unit of bakelite. Pins are numbered for wiring code purposes. Iron core in base is locked by means of a retaining spring. Eyebolts (⅛") at 1⅜" centres provide mounting facility—1" minimum) chassis hole required. The upper iron-core assembly comprises a turned brass insert to carry the iron core, which is locked by an internal spring—fibre spacing disc centres winding in can. All windings are impregnated with high frequency lacquer. Fixed mica condensers across wndings are impregnated to ensure stability.

Types J1-J2 are small aircore I.F.'s fitted in can measuring 2⅝" high x 1⅛" square. Heavy gauge tinned pins protrude ½" from punched bakelite base, which is color coded for wiring. Moulded trimmer condenser base is fitted at top of units, adjustment of which is primarily designed for use in portable receivers. The ideal replacement I.F. for old type receivers, being aircored, and of small physical size.

Type		Retail
	455 Kc	
J1	Aircore No. 1	10/6
J2	Aircore No. 2	10/6
J3	Perm. Tuned, Primary & Secondary Centre Tapped, No. 1	13/9
J4	Perm. Tuned, Primary & Secondary Centre Tapped, No. 2	13/9
J9	Perm. Tuned No. 1	13/9
J10	Perm. Tuned No. 2	13/9
J13	(General purpose I.F. providing high gain, with correct channel band width. Litz wire. 7 Kc. band width at 6DB.)	
	Perm. Tuned No. 1	16/6
	(Incorporates Tertiary Winding which may be switched in or out, thus providing variable selectivity. Circuit supplied in carton. Band width varied from 7 Kc. to 12 Kc. at 6DB, when tertiary winding is switched in.)	
J18	Perm. Tuned No. 1	13/9
J19	Perm. Tuned No. 2	13/9
	(A lower priced combination for general purpose use, incorporating solid wire. Ample gain for local receivers.)	
J20	Perm. Tuned No. 1 & No. 2	13/9
J21	Perm. Tuned No. 3	13/9
	(A medium selectivity group designed for the general purpose D/W Receiver employing two stages of I.F. amplification. As gain is slightly reduced to ensure stability, it is essential that these units be used in sets of three. Band width is 4.5 Kc. at 6DB. and 20 Kc. at 60 DB. "Miller Effect" de-tuning is eliminated.)	
J22	Perm. Tuned No. 1 & No. 2	15/–
J23	Perm. Tuned No. 3	15/–
	(In the design of this group maximum selectivity was achieved with gain adjusted for stability under all conditions. Most suitable for communications receivers. Aluminium Can measures 4" high x 1½" square. Windings terminated at eyelet lugs in punched bakelite base of best quality. It is essential that these units be used in sets of three (i.e. 2 I.F. stages) for maximum efficiency. Band width is 3.6 Kc. at 6 DB and 15 Kc. at 60 DB.	
	175 Kc.	
J11	Perm. Tuned No. 1	13/9
J12	Perm. Tuned No. 2	13/9
	(General Purpose Types)	

(Continued on next page)

about reproduction. By listening and watching, as mentioned above, you will soon develop a good ear for distortion.

Voice Coil Impedances

In order to obtain the maximum power output for a reasonable amount of distortion it is necessary to match the impedances of the output valve's plate to the input of voice coil of the speaker. This is usually done by using a step-down transformer. The ratio of step-down is varied, according to the square root of the impedance ratios.

Those few words just about cover the main facts of the position, but let us ramble about a bit and see what it all means in practice. The plate load rating for various types of output valves will be found by consulting the valve charts. It will be found to vary from about 2,500 ohms for some triodes up to about 15,000 ohms for a few battery-operated pentodes where power output efficiency is more important than the percentages of distortion. The plate load ratings have been selected by the valve manufacturers as optimum; they are the best compromise between power output and distortion. If you want the best all-round results you should make a point of following the recommendations as closely as possible.

In practice the loading is not quite as critical as you might imagine, but we will go into that later.

Whilst the plate loading is rated in thousands of ohms, on the other hand we find the impedance of the speaker rated at something between 1.5 and 15 ohms. Correct voice coil impedance rating for a speaker can be found from the chart which we show, or sometimes it is actually printed on the speaker.

There is no easy way of measuring the voice coil impedance of a speaker, as it is a rating of the motional impedance to a signal of a certain frequency, such as 400 cycles per second.

But once you know the plate load and the v.c. impedance at least you can calculate the correct turns ratio for the input transformer. It is simply a matter of

AEGIS COMPONENTS

(Continued)

dividing the plate load by the voice coil impedance and then taking the square root of this number. For a practical example, say the required plate load is 4,000 ohms and the voice coil impedance is 10 ohms. By dividing, we find that the required impedance ratio is 400 to 1. In order to find the turns ratio we take the square root. The square root of 400 being 20, this is the required turns ratio, viz., 20 to 1. The quickest way to find the turns ratio of any input transformer is to feed a small a.c. voltage into one side, such as 2½ volts from an old power transformer. By putting an a.c. meter across both sides it is then possible to determine the turns ratio quite easily.

There are, however, many side-issues to be considered in selecting input transformers. The turns ratio is not the only factor to be considered. Even in ordinary commercial applications it is desirable to specify a certain type of input transformer to suit a certain output valve when feeding into a certain type of speaker. For example, the correct input transformer for use with a small battery valve can be of quite different weight, size of core and gauge of windings to one which is required to operate with a big power valve drawing a heavy plate current. Then when you get out into the high-quality field many further factors become involved. High power and high fidelity call for special requirements.

In all cases it is safest to ask for a transformer to suit the particular application you require, but the above knowledge may be helpful to you in an emergency.

Further data on matching, the use of multiple speakers and so on, was given in the April, 1948, issue.

Tolerances

As with most things, in radio there are certain tolerances which

I.F. TRANSFORMERS (Cont'd.)

	1600 Kc	
J14	Perm. Tuned No. 1	13/9
J15	Perm. Tuned No. 2	13/9
	(General Purpose Types)	
	2000 Kc	
J16	Perm. Tuned No. 1	13/9
J17	Perm. Tuned No. 2	13/9
	(General Purpose Types)	
	10.7 Megacycles	
J24	Perm. Tuned No. 1 & No. 2	19/6
J25	Perm. Tuned No. 3 Ratio Detector	19/6
	(Designed for broad band F.M. Receivers. The physical specifications are similar to J1-J2 with the exception that iron-core screws protrude at each end. Suitable for use with Radiotronics No. 127 circuit. Resonating condensers and damping resistors fitted.)	

KITSETS

The term "Kitset" when coupled with the name "Aegis" is intended to indicate that every part required, and every detail of design necessary is embodied in the receiver concerned. When unpacked, all components, nuts, screws, solder, etc., will be found, together with a comprehensive booklet covering assembly and wiring instructions. A.R.T.S. & P. Transfers are attached to the chassis to enable full legal use of the superheterodyne circuit. Where necessary, all parts for the dial assembly are enclosed in a separate pack with the remaining hardware, thus simplifying the sorting of parts. The kitset is supplied in a compact corrugated carton.

Type		**Retail**
KS4/B	"METROPOLIS"—A four-valve B/C Mantel Receiver. Bakelite Cabinet. Edgelit straight line dial. Rola 5C Speaker. Cadmium plated chassis. Approx. size: 10" high, 9" wide, 6" deep. Valves: 6A8G, 6G8G, 5Y3G, 6V6G (not supplied)	£10/-/-
KS5/D	"LITTLE COMPANION DE LUXE"—A 5-valve D/W A/C Table Model. Attractive Walnut Veneer Cabinet. Rola 6H Speaker, Edgelit Dial. Instruction sheet includes the new Connoisseur Circuit with tone compensation network—superlative single ended output. Valves: 6J8G, 6G8G, 6J7G, 6V6G, 5Y3G (not supplied). Approx. sizes 14" wide, 9" high, 7½" deep.	£17/2/6
KSR/4	"RURAL FOUR"—The ideal country receiver, housed in attractive bakelite mantel cabinet. Rola 6H Speaker. Straight line dial. Long battery leads reach floor. Valves: 1R5, 1T4, 1S5, 3S4 (not supplied)	£10/-/-
KP4	"VOYAGER"—A 4-valve portable receiver in attractive leatherette case. Rola 3C speaker, 2 Minimax 45V batteries, 1 "A" battery 1.5V. Weight approx. 12 lbs. Size: 8" x 7" x 6½". Valves: 1R5, 1T4, 1S5, 3S4 (not supplied). Complete with batteries.	£12/12/-
PP4	"PERSONAL"—A four-valve receiver measuring only 9" x 4" x 5" and weighing under 5 lbs. Minimax 67½V battery and 2 No. 2 Torch Cells provide power. Rola 3C speaker. Attractive leatherette or plasticised linen-covered case with electronically fused adjustable carrying strap. "Pencil Case" slide lid for easy access to cells. Leightweight balsa wood case. Valves: 1R5, 1T4, 1S5, 3S4 (not supplied). Complete with batteries. Chassis cad. plated and already punched to facilitate addition of fifth valve, I.F., etc.	£12/12/-
PP4/5	CONVERSION KIT—Contains necessary components for conversion of PP4 to 5 valve (including valve)	£2/7/6

(Continued on next page)

KITSETS (Cont'd)

KS3/B	"ECONOMY THREE"—A 3-valve A/C mantel receiver eminently suitable for a second set and particularly for the beginner. Bakelite cabinet, with edgelit straight line dial. Chassis cadmium plated. Valves: 6J7G, 6V6G, 5Y3G (not supplied)	£7/7/–
KD/5U	"UNIVERSAL FIVE"—A five-valve D/W AC/DC Receiver for 240 Volts. Housed in attractive walnut veneer cabinet, Rola 6H speaker, edgelit dial, chassis cadmium plated. Incorporates Aegis coil assembly type K1. Valves: 12SA7GT, 12SK7GT, 12SQ7GT, 35Z5GT, 50L6GT, 1954 (not supplied). The ideal receiver for an area now on D/C and likely to be converted in the future to A/C.	£17/17/–

FOUNDATION KITS

These kits are useful for those who have sundry parts and desire to use them in circuits of their own design. All kits are packed in cartons and clearly labelled.

Type		Retail
FK1	Comprises 5V. Console chassis—USL32 Dial, Coil Assy. Type K1, 2 Aegis I.F.'s J9-J10, A.W.A. Gang, Connoisseur circuit	£7/1/–
FK2	Comprises bakelite cabinet, dial assy. and chassis similar to "Metropolis Four"	£3/4/3
FK2B	Similar to FK2, but for "Rural Four"	£3/4/3
FK3	Similar to FK2 but with additional parts as follows B/C, Aerial and Osc. Coils, I.F. Transformers J9-J10, 40 m/a Power Transformer, Rola 5C Speaker	£8/15/–

COIL ASSEMBLIES

K1	A dual-wave assembly incorporating permeability tuned Aerial and Osc. Coils for B/C (550-1600Kc.) and S/W (7-23 Mc.) Trimmers and Padder (fixed) condensers fitted. Iron Core adjustment is made from above chassis (Trimmers from beneath). Suitable for "H" & "A.W.A." Gangs. Measurements: 2½" long, 3¾" wide, 1⅞" high. Available for converters 6J8, 6A8, ECH35, EK2, 1C6. "Oak" Type Switch built in with 3" long x ¼" shaft	50/–
K1-S	As K1 but for 6SA7 Converter	50/–
K2	A dual wave assembly with same coverage as K1 type and incorporating R.F. stage. All coils permeability tuned and matched for "AWA" and "H" Gangs. Constructed on sub-chassis measuring 5¾" long, 2⅞" high, 5½" wide. Concentric air trimmers fitted, also fixed capacity padders. S/W core adjustment from above chassis—B/C core and trimmer adadjustment from beneath chassis. "Oak" switch shaft 1¾" long x ¼" dia.	140/–
K2-S	As K2 but for 6SA7 Converter	140/–
K3	This triple-wave coil assembly incorporates permeability tuned coils covering the B/C band (550-1600 Kc.) and S/W bands 13-42 and 40-110 metres. Physical details same as K2. Efco dial type USL46, 3 band AWA available to match.	160/–
K3-S	As K3 but for 6SA7 Converter	160/–
KC4	A four band unit which is the ultimate in coil assembly design. Actually constructed in 3 subsections comprising R.F. converter and oscillator stages. Finally assembled in one unit, which incorporates band set and band spread condensers, together with 2 slow-motion drive assemblies and directly calibrated plastic dial. 4 Wave Bands—550-1500 Kc., 1500 Kc.-4 Mc. 4 Mc-11 Mc., 11 Mc-30 Mc. Band Spread On—3.5-4.0 Mc. 80 metres; 6.9-7.3 Mc. 40 metres; 14-14.4 Mc. 20 metres; 20.5-22.0 Mc. 15 metres; 27-30.0 Mc. 10 metres. Overall dimensions: 8½" wide, 6¾" deep, 5⅜" high.	£26/5/–

(For details of other Aegis products write direct to the manufacturers.)

can be allowed. As the scientists can prove to you, even an inch on a ruler is seldom a true inch, but nearly always plus or minus a fraction of a thousandth part of an inch. Such is tolerance, and a thing which we would like to see more in evidence in politics, personal relationships and radio technique.

The plate loading of a valve is seldom critical. A triode type of output valve is not at all critical and it is most difficult to detect the difference in performance with a triode feeding into a load of 2,500 ohms and 10,000 ohms. Pentodes are a little more critical if you want maximum power output, but it is fortunate that a lower impedance than according to rating will mean only lower distortion and lower power output. When using a large single pentode, such as an 807 it is sometimes worthwhile to sacrifice a little power output by using a lower impedance rating. The lower level of distortion is sometimes worth the sacrifice.

Tolerances, however, are out of place when you go after the highest of high fidelity. For example, in the Radiotron A515 amplifier (the local version of the English Williamson circuit) the output transformer is a most important item and factors such as primary inductance, leakage inductance and insertion loss have to be considered in order to ensure that phase displacement is kept at a minimum.

Further data on this point is given in the August, 1947, issue, which dealt with the original Williamson circuit.

HAM CALL SIGNS

Latest lists of alterations, amendments and new issues are published regularly. Watch for this feature.

VALVES AND THEIR APPLICATIONS

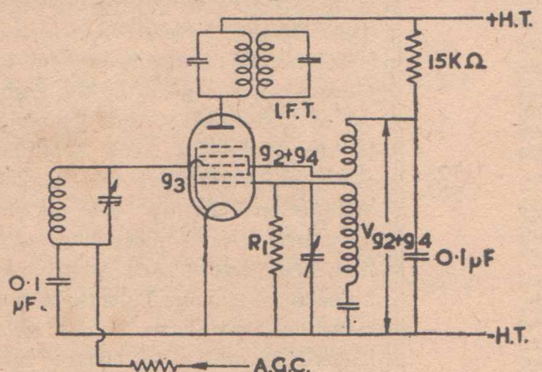
By M. G. SCROGGIE, B.Sc., M.I.E.E. (Eng.)

No. 3: MULLARD HEPTODE FREQUENCY CHANGER IR5

This is a miniature all-glass single-ended heptode with a filament consumption one twelfth that of a pen-torch bulb. An obvious role for it is in portable receivers, especially of the "personal" calibre.

In this country the triode-hexode is so popular that not everybody may be sure about how to use the heptode, or pentagrid, particularly as there are several different kinds. So here are a few notes on the 1R5.

The prescribed range of H.T. voltage is 45 to 90, but g_2+g_4 (used as the oscillator anode) must be limited to $67\frac{1}{2}$, by a dropping resistor if necessary.



This skeleton circuit diagram is merely to show how the valve should be connected; the details of tuning arrangements can follow conventional lines.

An alternative scheme, for making the whole mutual conductance of the valve effective in the oscillator, is to take the +H.T. lead from the I.F. transformer via the oscillator reaction coil instead of direct. Any voltage-dropping resistor must be inserted on the g_2+g_4 side of the reaction coil and shunted by the by-pass capacitor. It is then not available for sharing with the screen of the I.F. valve.

Normally, however, the oscillator section is quite capable of providing sufficient amplitude without help from the I.F. anode. Such help, too, is liable to be varied by A.G.C. bias on g_3.

The amplitude of oscillation is not at all critical, and there is little to be gained by striving earnestly to keep it at optimum all the time; it is generally more important to economise in H.T. current. The amplitude is measured by a micro-ammeter in series with R_1. Although 200mA is recommended, the effective optimum, with Vg_2+g_4–45 or so, is nearer 100mA, and there is not much loss of signal even at 50mA. Fortunately the optimum increases with Vg_2+g_4. The less oscillator voltage on g_2 g_4 the better; the reaction coil should be comparatively small.

A.G.C. may be applied to the 1R5; the grid base is roughly one fifth of Vg_2+g_4. It is important that the g_4-to-cathode impedance at oscillator frequency should be low, otherwise the action of g_3 may be upset by oscillator voltage from g_2+g_4. It is true that it can be neutralized out by a few pF from g_1 to g_3, but there is no need for this complication if the previous condition is fulfilled.

Students' 1-Valve Experimental Set

THIS article has been specially written, and the receiver it describes, specially designed, for the radio student who may be about to build his very first set. The receiver in question is a one-valve regenerative set, to be used with headphones, and capable of broadcast and shortwave reception. Batteries provide the power for operation.

Specially written for beginners by the Technical Staff of the AUSTRALIAN RADIO COLLEGE

It is the type of receiver from which you can derive endless fun, and furthermore, if desired, it can be fairly readily sold at a profit.

In this article, we suggest that you use a piece of plywood or similar material for the front panel. However, a small cabinet can be used if desired.

Once started experimental set building you will wish to push ahead and build bigger and more complicated receivers. Therefore, to make your very first receiver as economical as possible for you, we have, wherever possible, used components which can also be used in much larger sets. For example, a set of this description would normally only require a single gang condenser and a one valve type chassis. We have employed the standard type of two gang condenser used in larger sets, and a four valve chassis which is suitable for a 4 valve AC mantel receiver. Needless to say, all components used are readily available.

Since this may be your "very first" attempt at constructing a set, there are sure to arise many exceedingly simple things associated with set building which may have you puzzled. We therefore suggest that if you have a friend who has built a set or two before, discuss the building of this one with him before you actually go ahead. Failing this, we feel that the instructions which follow, are so carefully explained, that you should make a good showing at your first attempt. If you do strike trouble after you have completed the set, your local serviceman, for a few shillings, would undoubtedly rectify any errors you may make.

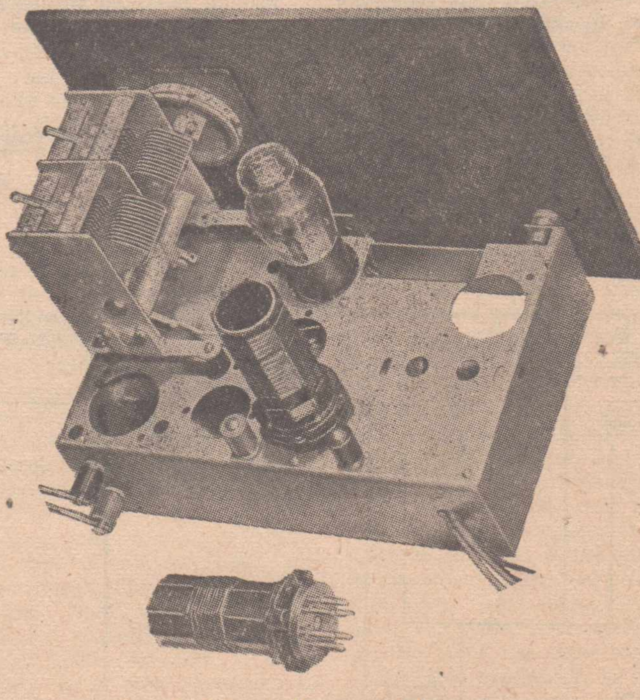
Right, you have obtained all of the necessary materials, and now you are ready to set out on the great adventure.

The first thing to be done when constructing the receiver is to carefully examine the complete contents of the kit of parts. You should do this while carefully studying both the photographs of the completed receiver, and the layout diagram contained in these pages. No attempt should be made to continue construction until you are quite certain that you have identified each and every part, and have completely read the following instructions. To assist you in this regard, you will find all the components named on the layout diagram, together with their values where applicable. Here is a complete list of the parts which you will require.

Mounting Sockets and Variable Condenser

Having located all the parts on the layout diagram, the procedure is then to mount the "2 gang" variable condenser, and bolt the two moulded sockets into the mounting holes indicated on the layout diagram.

Be very careful when you are handling the condenser to prevent accidental damage to the moving



General view of the completed receiver. Note short wave coil in foreground.

ONE-VALVER

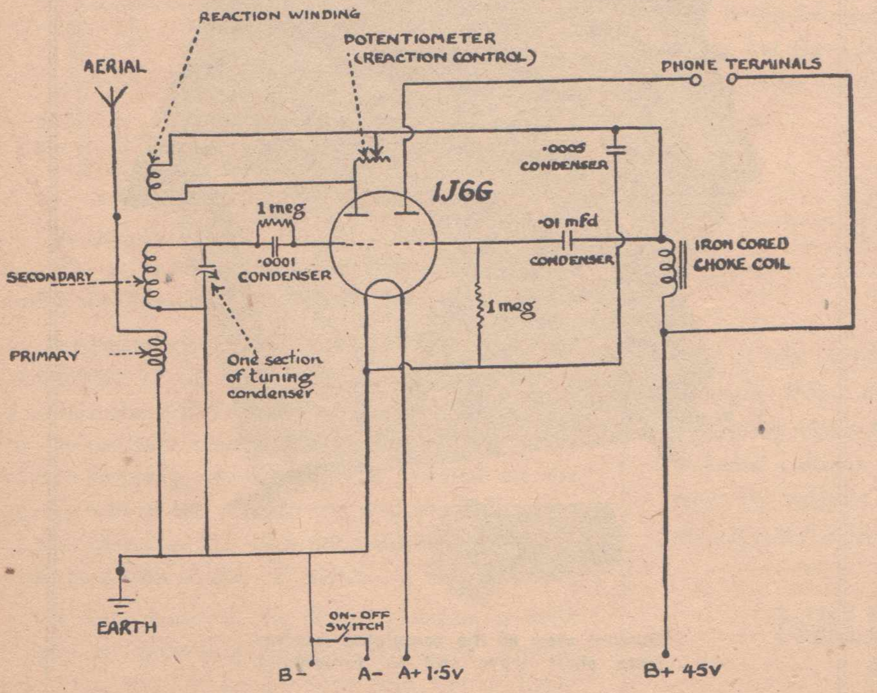
(Continued)

plates as they are extremely difficult to straighten when bent, and be sure to close the rotor (moving plates) when laying the gang aside.

If you examine the two sockets carefully, you will notice that one has six pins and the other eight. Look closely at the six pin socket. Here you will find that two of the socket holes are larger than the remaining four, and at first sight it may be difficult to distinguish which two are the larger ones. By looking at the top of the socket you will notice a tiny pip which is raised out of the material, and placed exactly between the two pins which are the larger. On the opposite side a corresponding pip will indicate the location of the two larger pins. On the layout diagram you will also notice that two of the pins have been indicated larger than the others, and so when mounting the six pin socket be sure that it mounts in the correct position with regard to the placement of the larger pins. It will be appreciated that there are only two positions in which the socket can be mounted, the correct one and the incorrect one. Now turn your attention to the 8 pin socket, and here you will notice that the pins when looking at the bottom of the socket are numbered 1 to 8. Between numbers 1 and 8 you will notice a key-way, and when mounting this socket it is important that the key-way points in the correct direction. Here again, there can be only one correct fitting, and also one incorrect fitting.

To mount the socket, turn the chassis upside down so that you are looking underneath it, and from the other side place two of the shorter bolts through the holes designed for them near the socket cut-out on the chassis. Then, working from below the chassis, place the socket over the bolt and bolt it into position with two of the small nuts supplied with the kit. Before finally tightening the socket into position, look again from the top of the chassis and ascertain that the socket is mounted exactly in the centre of the hole, as there is some allowance for varying types of sockets and socket holes.

Having mounted the socket, the next step is to mount the 2 gang condenser and to do this the feet which are supplied with the gang are firmly bolted into position in the correct manner. The feet are turned inwards as indicated in the photograph, and with the bolts supplied they may be bolted directly to the gang without the aid of any nuts, the gang being tapped for this purpose. Having the feet screwed on, we now place four bolts in the holes in the feet and, taking a nut for each, screw the nut right up to the gang foot. Having done this on each of the four corners, we now run on another nut so that it is spaced from the first one by the required amount. Having placed a nut on each of the bolts we may now drop the gang into position above the chassis and finally run on four nuts underneath. By careful adjustment of the stop nut, i.e., the four nuts above the chassis we may raise or lower the gang to the correct height indicated in the appropriate sketch. The reason we require this type of gang mounting is that the dial cut-out on cabinets normally available to suit small radio sets renders it essential that the gang be placed some little distance above the chassis. If by any chance you do not contemplate placing the set in a cabinet, then the above procedure will not be necessary, and the gang may be bolted directly to the chassis, the bolt passing through the holes provided.



Circuit diagram.

Assembling the Dial Drive

From the dial assembly take the dial drive shaft, and bolt it into position on the right hand side of the chassis looking from the front. You will find two holes ready drilled for this purpose, and in all cases, when placing bolts through the chassis, the heads of the bolts should be outermost.

Take the 25,000 ohm potentiometer, fasten it into the chassis as indicated in the photograph. Having done this, place a knob on each shaft and tighten the grub screws.

The dial drum may now be mounted by simply sliding same onto the gang shaft, and tightening the screw supplied.

PARTS LIST

1—2 gang condenser
1—Dial assembly
1—Two position single pole switch
1—25,000 ohm carbon pot.
1—Chassis
1—Pair headphones (2,000 ohms)
1—Power choke
3—Knobs
1—6 pin socket
1—8 pin socket
1—45 volt "B" battery
1—1.5 volt "A" battery
1—Terminal, green
1—Terminal, black
2—Terminals (insulated), red
1—Doz. 1/8 x 3/8 bolts
1½—Doz. 1/8 nuts
1—Trimming condenser
1—.0005 mica condenser
1—.0001 mica condenser
1—.01 paper condenser
2—1 meg. resistors
12—Solder lugs
1—Yard 1 mill spaghetti
6—1/8" x 1½" bolts
1—Yard solder (resin cored)
4—Yards of hook-up wire. (Red, white, black, yellow.)
3—Felt washers
2—Yards tinned copper wire
2—Coil formers
1—1J6G valve
Coil winding wire as follows:
43 ft. 34 S.W.G. enamelled copper wire.
15 ft. 27 B. & S. enamelled copper wire.
10 ft. 22 S.W.G. enamelled copper wire.

Fixing the Dial Cord

Procedure for coupling the dial drum to the drive shaft is simple enough, and there is no reason why this should cause you any worry.

Supplied with the dial assembly there is a piece of cord attached to which is a small spring. The cord is looped three times around the drive shaft, then around the dial drum, the end of the cord passing through the loop in the spring. The cord may then be pulled until the spring is stretched to about half its own length again, and the cord then looped on itself and knotted. Now adjust the dial drum by loosening the screws which hold it and turning it until the red line is horizontal when the gang is fully closed.

Terminals

On the top of the chassis you will need to place two terminals—one insulated from the chassis and the other not. The two terminals to use are the black and green terminals, which finally form the earth and aerial connections. It is necessary to earth the black terminal by bolting it directly to the chassis, and to insulate the green aerial terminal from the chassis. The relative position of these two terminals may be determined from the layout diagram, and it will be found that the aerial terminal is on the right of the chassis when looking from the top-front, and the earth terminal on the left. At the back of the chassis, on the right hand end, there is provision for two more terminals which in this case are the two red terminals, both insulated from the chassis so as to form the 'phone terminals.

The terminals must be carefully insulated if short circuits are to be avoided, and you must avoid them at all costs. The method suggested is as follows: Slip about $\frac{1}{16}$th of an inch of spaghetti tubing over the threaded portion of the terminal, then one of the washers supplied. The terminal is then placed in the chassis, and a fibre washer is slipped over the screw thread. Finally a solder lug, and then the nut.

The only other component which we now have to mount on the chassis is the plate choke, which should be bolted into position as indicated on the layout diagram and by the photograph. You will find that here, too, there are bolt holes provided.

Take the filament switch, and mount this on the front of the chassis in the hole provided. Having done this, we are now ready to proceed with the wiring of the receiver.

Wiring the Receiver

Solder lugs should be placed under the nuts indicated in the layout diagram, and these may be bolted directly to the chassis since onto the solder lugs we are going to place the pieces of tinned copper wire which will finally form the earth connection, and B minus return circuit for the whole receiver. Take the tinned copper wire and attach one end of it to some solid object and, with a pair of pliers, stretch the other end until the wire becomes quite straight. You will find that only a gentle pressure is required to stretch it about an inch and this is quite sufficient. It is now necessary to connect the various solder lugs together as indicated on the layout diagram.

Before trying to solder the tinned copper wire to the lugs, you should tin the lugs to facilitate ready soldering. To do this, place a very small spot of paste soldering flux on each lug, and pick up a spot of solder on the tinned surface of the iron. Place this on the lug, and you will find that the solder will flow readily onto the lug, and cover it instantly. Incidentally, it is a wise plan to do this to all parts to be soldered when wiring—a neater and more efficient joint is the final result for the extra trouble.

The chassis earth wiring is of bare tinned copper wire, and once this is completed the wiring proper may be commenced. The following is a word for word description of the wiring procedure, and should be of assistance to those who are not thoroughly familiar with radio receiver components.

Wiring of Components

On the layout diagram the pins on both the 6 and 8 pin sockets have been numbered, and these numbers which are referred to in the text, are as seen from below the chassis. To wire the receiver, proceed as follows, using spaghetti covered tinned copper wire. Connect pin No. 6, six pin socket to earth. Connect aerial terminal to pin No. 1 of six pin socket. Connect the small trimmer from pin No. 1 six pin to pin No. 2 six pin socket. Connect pin No. 3 six pin socket to pin No. 3 eight pin socket. Connect pin 2 eight pin socket to earth. Connect pin 3 eight pin socket to one side of the potentiometer. Place a 1-meg. resistor (brown body, black end, green band) from pin No. 5 eight pin socket to earth. From pin No. 5 connect the .01 mfd. condenser to the centre point of the potentiometer. From the centre point of the potentiometer take a lead to pin No. 4 of six pin socket. Also connect this pin to one end of the .0005 mica condenser and the other end of this condenser to earth. Connect pin No. 5 six pin socket to the fixed plates of the tuning condenser. Also connect from this point the .0001 mica condenser to pin No. 4 of the octal socket, and across this condenser, as shown in the layout diagram, connect the other 1 meg. resistor.

It is necessary to connect one

(Continued on next page)

ONE-VALVER

(Continued)

side of the choke to the centre point of the potentiometer and the other side of the choke is to be connected to one of the phone terminals. The other phone terminal should be connected to pin No. 6 on the eight pin socket.

You have now one of the headphone terminals connected to one side of the choke, and it is also necessary to take a "red" lead from this terminal, out through the hole in the back of the chassis, leaving the wire sufficiently long to form the B + connection to the 45 volt battery. From pin No. 7 of the eight pin socket a lead must be connected which will finally go to the positive terminal of the 1.5 volt cell, this lead is the A (+) positive lead.

For the B negative (B —) lead a black lead should be taken from the earth wiring, outside the chassis, and connected to the negative side of the B battery.

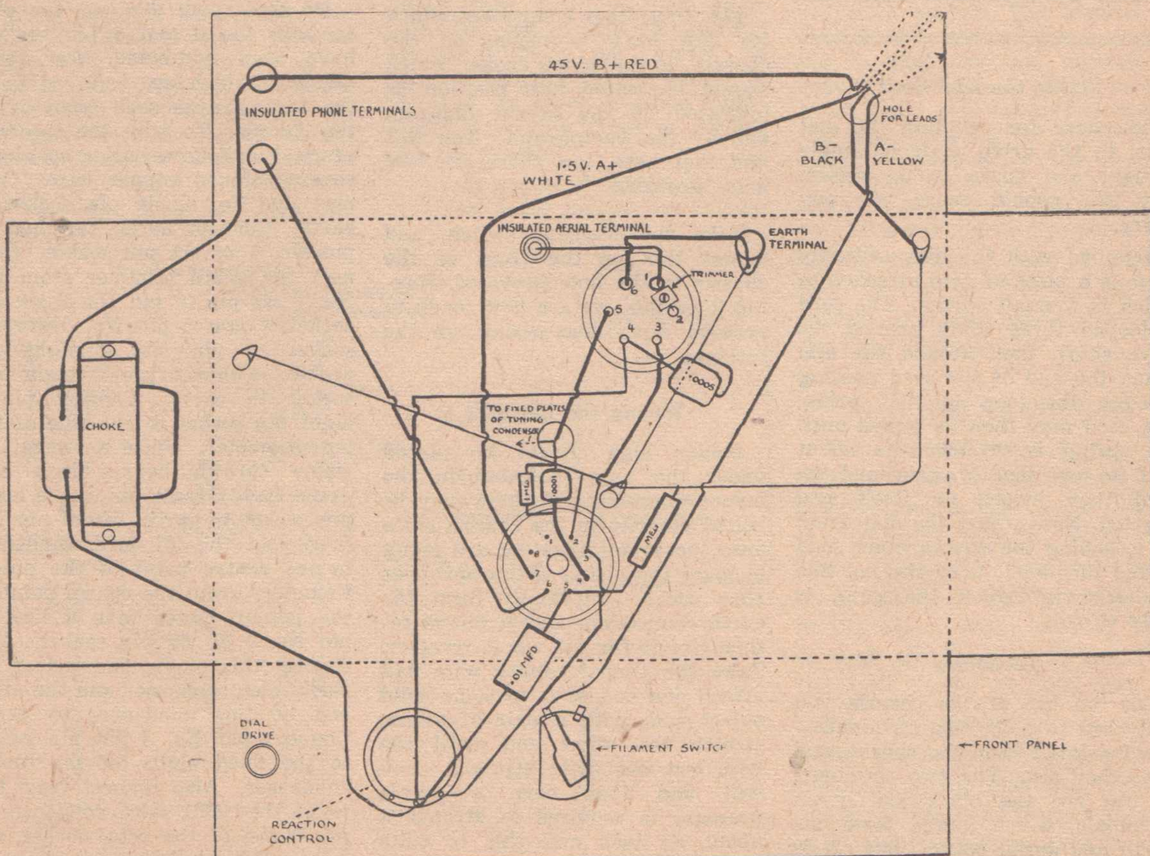
The only remaining lead required is that for the A negative (A —) connection, and this is taken from one side of the "On—Off" switch mounted on the front panel directly to the A battery negative terminal. The negative terminal incidentally is the one on the edge of the cylindrical cell, and the lead connecting to it will be the yellow lead.

The Coils

The most difficult part of constructing the receiver comes when we commence the construction of the coils, and it is here that the greatest degree of accuracy possible must be maintained.

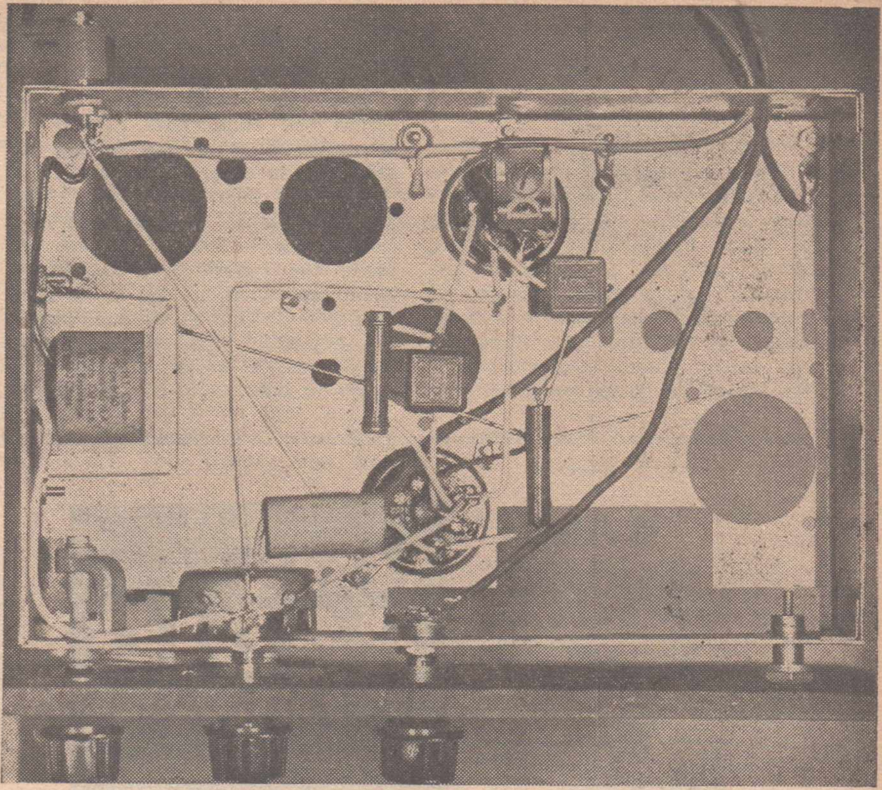
The spacing of the turns, the actual number of turns, and the distance between the individual windings are factors which must be carefully controlled if satisfaction is to be obtained.

It is on the accuracy with which you wind the coils that the final performance of the receiver will depend, and you should spare no amount of time and energy in duplicating the instructions



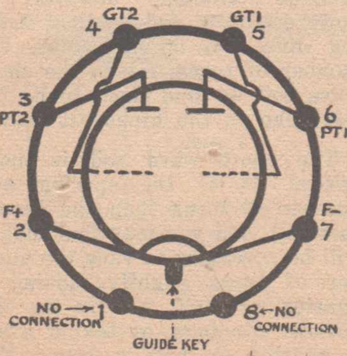
exactly. Not only is it necessary to wind the coils accurately, but it is absolutely essential that the ends of the winding be connected to the correct pin as a reverse connection on the windings can result in the receiver being totally inoperative, due to the fact that no reaction is taking place.

After describing the way in which the coils are wound, very complete descriptions are given of the method of connecting the various ends of the windings, and if you follow these carefully you should experience no difficulty. On each coil there are three distinct windings, and as a result of this there will be six different connections to be made to the base plug of each coil when it has been wound.



As it is generally easier to get the receiver into operation on the broadcast band it is suggested that this coil be wound first, and looking at the bottom end of the coil, i.e., the end nearest the plug, we find a winding having fifteen turns of wire, each turn laying exactly next to its neighbour on the former.

In commencing the coil construction, we start with the bottom winding first and wind on the required fifteen turns. To do this the wire should first be anchored through one of the small holes in the rim of the former and enough turns placed on the former so that it occupies the required amount of space. It is easy to see that fifteen turns will occupy exactly the correct space on the former. The free end of the coil should now be placed through the hole drilled in the former, the wire taken down the inside, and this end anchored through another of the small holes in the rim of the former.



Base connections for 1J6G valve.

This first winding will now constitute the aerial winding of the broadcast coil. The required space should now be left from this winding to the second winding from the bottom, i.e., the middle winding, the actual space being one quarter of an inch.

In winding the grid winding you will be using very much finer wire and it will therefore be necessary to handle the wire with due care to avoid breakage. The wire should be anchored in exactly the same way as before, and then the required 102 turns wound on, and anchored at the top end exactly as before. The next winding is the reaction and the wire used is exactly the same as that for the grid winding. Leave $\frac{1}{16}$th of an inch space and commence winding the reaction coil and you will find that it occupies enough space to bring it within ⅛th of an inch of the top of the former. On the broadcast coil each turn of the individual windings lies close up to its neighbour.

For the broadcast coils the medium gauge wire is used to wind the primary having fifteen turns, and both the secondary and reaction windings are wound with the very fine wire supplied.

Here are the connections to the various ends of the windings and the numbers given refer to the plug on the coil as viewed from below the chassis.

The bottom of the aerial coil will connect to pin 6, the top of the aerial coil to pin 1. The bottom of the grid coil also to pin 6, and the top of the grid winding to pin 5. The bottom of the reaction winding (i.e., the top winding) will connect to pin 3, and the top of the reaction winding connects to pin 4.

Having constructed the broadcast coil, it may now be plugged into position and the set connected to its batteries in the manner previously described.

A slight click should be heard when the coil is plugged into the socket, and if the connections are correct, turning the reaction control in a clockwise direction should produce a faint click or plop, and then a continuous rushing noise in the headphones. This will indicate that the tube is oscillating, but you may only find the rushing

(Continued on next page)

ONE-VALVER

(Continued)

noise in one particular setting of the reaction control.

While turning the reaction control further and further in a clockwise direction will still continue to allow oscillation, the rushing noise may not be heard in the phones, but a ready means of checking that the receiver is oscillating, is to place your finger on the stator plates (the stationary plates) of the gang condenser section in use. If the set is oscillating this will produce a distinct click in the 'phone.

You will find, when tuning across the band, that it will be necessary to vary the setting of the reaction control to allow oscillation all over the band, and generally it is necessary to decrease the amount of reaction (turn the control anti-clockwise) when approaching the high frequency end. That is, the end where the plates of the condenser are fully out of mesh. Correspondingly, it will be necessary to increase the amount of reaction by turning the control in a clockwise direction when moving towards the low frequency end where the plates of the condenser are right in mesh.

It will always be found that the most sensitive setting of the reaction control is that point where the receiver is just below oscillation, the closer you can get the receiver to the verge of oscillation without it actually oscillating the more sensitive your set will be.

If you find that the receiver refuses to oscillate, it may be due to the fact that you have connected the reaction winding in the wrong direction, and reversing the connections may allow oscillation to take place. Another very important point is that when constructing the coils it is essential that the windings all be wound in the same direction. If this is not done it is impossible for the set to oscillate, and therefore impossible for it to operate correctly.

Short Wave Coil

The construction of the short wave coil is somewhat different when compared to the broadcast coil, and also the connections to the base of this coil are slightly different.

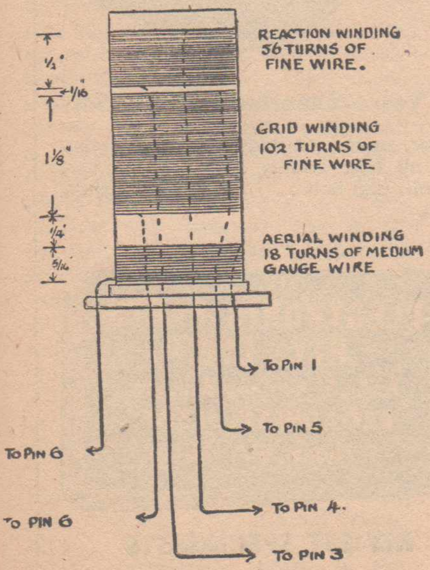
As you have seen, on the broadcast coil we wind the primary entirely separate from the secondary, and leave a space of about ¼ of an inch between the two windings. The procedure with the short wave coil is different in that the primary winding (i.e., the winding connecting to the aerial and earth terminals) is interwound in the spaces left by the turns of the secondary which are spaced to the correct amount. The reaction winding, however, is quite separate, and another striking difference is, of course, the number of turns, for in the short wave coil we find them to be far less than in the broadcast coil.

The short wave coil is more critical as to the spacing and number of turns than the broadcast coil, and you may find that it will be necessary to vary the number of turns slightly, adding a quarter or half a turn to the various windings, or taking away a quarter or half a turn. The spacing of the reaction winding from that of the grid winding is also extremely critical and a little experimenting may be necessary before it is found that the set oscillates completely over the whole tuning range. Another factor which will determine to a very great extent whether the set will oscillate satisfactorily or not, is the amount of coupling between the aerial terminal and the aerial winding. This coupling is varied by the setting of the trimming condenser which may be adjusted with a small screwdriver, and you will find that there is one particular setting which will allow the set to oscillate all over the band. Tightening the coupling to a greater extent, i.e., screwing the screw tighter, will totally prevent oscillation, and so a judicious setting of this screw must be found.

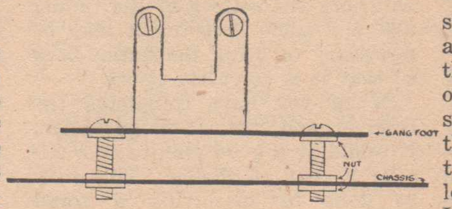
A further difference with the short wave coil is that the reaction winding is wound on the bottom end of the coil rather than the top end. While it is possible to wind the coil at the top end, this practice is not strongly recommended since it will be found that reception will waver and fade badly when you move your hand near the receiver. This effect is known as hand capacity effect, and everything possible has been done to overcome it.

Winding the Short Wave Coil

In constructing the short wave coil it is perhaps as well that we commence with the grid winding, and here we find that the winding is constructed with the heaviest gauge of winding wire supplied. The number of turns of this winding is eight, and the spacing of the coil is such that from the bottom of the winding to the top a space of ⅝th of an inch is taken up. In constructing this winding the end of the winding is anchored in just the same way as with the broadcast coil and the required number of turns (8) are wound on. Since the holes through which the ends of the winding are taken are spaced ⅝ of an inch apart, then it is only necessary to wind on the coil wire tightly, and you can space each turn an equal distance from its neighbour when the coil has been completed. A little practice, however, will allow you to wind the eight turns on so that they exactly occupy the right space, and still have an even separation between the individual turns which form the coil. The two ends of the coil are firmly anchored in the base of the former ready for connection to the base plug.



Connections to broadcast coil.

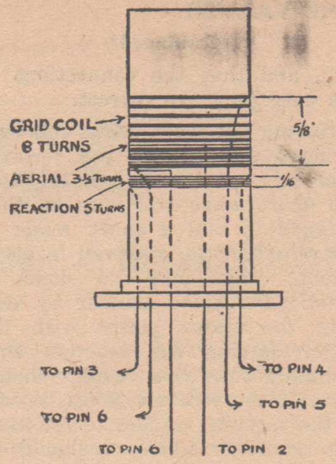


Method of mounting gang if a cabinet is to be used.

As mentioned earlier the reaction winding is placed at the bottom of the former in the short wave coil, and the winding which will form the reaction winding should, of course, be in the same direction, and should be spaced from the bottom end of the grid coil by ⅛in. See sketch of S/W coil.

As you will have seen from the diagram indicating the short wave coil connections, the number of reaction turns is five in all, and the two ends are anchored in exactly the same way.

The chief difference with the short wave coil is the fact that the aerial coil is interwound between the turns of the grid coil. The end of the winding is anchored in the same manner, and is brought up through the centre of the former to the hole provided just below the low end turn of the grid winding. It is then necessary to wind on three and one-half turns (3½ turns) and the free end will pass down through the hole provided and anchor onto the rim of the former at the bottom.



Connections to short wave coil.

It must be remembered that the wire used for the reaction and aerial turns on the short wave coil is exactly the same diameter as that used for the aerial winding on the broadcast coil, i.e., the fine wire.

The leads to the base plug should, in the case of the short wave coil particularly, be kept as short as possible, and the connections to the plug are as follows.

Commencing from the bottom of the coil, we connect the bottom end of the reaction winding to pin 3, the top end will connect to pin 4.

The bottom end of the grid winding will connect to pin 6, and the top end will connect to pin 5.

As far as the aerial winding is concerned, the bottom end of this connects to pin No. 6, and the top end to pin No. 1. Here again it is equally essential that the windings are all wound in the same direc-

(Continued on next page)

ONE-VALVER

(Continued)

tion, and that the connections to the base plug are correct.

Having the short wave coil constructed and having the receiver operating on the broadcast band, the short wave coil may be then plugged in and a check made to see whether the receiver is oscillating. This may be done in exactly the same manner by tapping the stator plates with the finger—having the reaction control fully clockwise. A click should occur if the receiver is oscillating. If the receiver refuses to oscillate, the trimmer condenser should be unscrewed to the point where oscillation commences at the low frequency end of the dial, i.e., the gang plates right in mesh, and it can be left in this position.

In the same way you will find that the most sensitive setting of the reaction control is the point just before the receiver commences to oscillate, and as you tune across the band it will be necessary to vary the setting of the reaction control so that the set is maintained at a point just below where it oscillates.

You may find at the outset that the receiver is a little difficult to handle, but a small amount of practice will soon allow you to get the maximum amount of clarity and volume.

If you are interested in receiving stations which transmit morse code, it will be possible for you to increase the reaction control a tiny amount and you will find that the incoming signal will cause a high-pitched whistle with every dot and dash forming the symbols of the letters. You may also find that a slight change in the amount of reaction applied will vary the setting of the tuning dial and some adjustment may be necessary to bring the station back so that it is correctly tuned.

When you have completed the receiver and have it in operation, it would be a good plan to give the coils a coat of shellac. This may be done by dissolving a small amount of shellac in methylated spirits, allowing it to thoroughly soften, and applying same with the aid of a small brush. This will hold the turns of the winding firmly in place and add much to the appearance of the finished article.

The Aerial

It must be realised at the outset that a receiver of this type will only give satisfactory performance when operated in conjunction with a good outdoor aerial.

It is essential that the aerial be as high as possible, carefully insulated from all earthed objects, and be preferably 50 feet in length.

Earth Connection

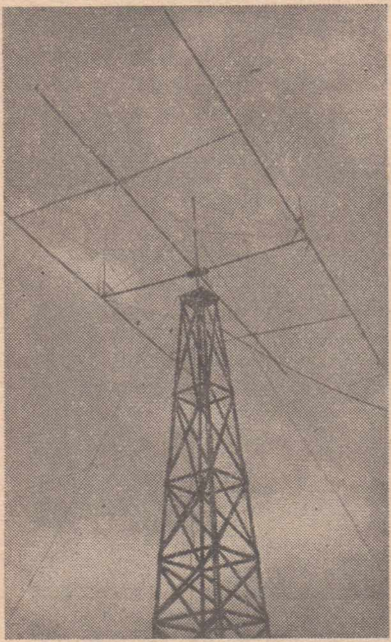
The earth terminal should be connected to some thoroughly grounded object, e.g., a pipe supplying the house with cold water from the mains, or, if this is not available, a length of ¾in. piping driven four feet into moist earth.

A final word—a good earth is just as essential as a good aerial.

CALLING CQ

By Don B. Knock, VK2NO

As a hobby, Amateur Radio is more than 30 years of age. It gained its initial impetus in those far-off days when the amateur was faced with the critical but fascinating job of making his own equipment, from start to finish. When his efforts reached the stage of try-out, he wasn't assured of myriads of powerful radiations from which to take choice of reception; he was faced with a somewhat delightful uncertainty regarding sensitivity of apparatus and accuracy of "wavelength." Signals didn't "pound in" . . . not at first, anyway . . . but they improved with bigger, better, and higher aerial systems. Massive affairs they were—huge sausage-like contraptions suspended above suburban residences the while the family feared for the safety of chimneys pressed into service to support masts. Fan-like counterpoises straddled the garden space and oft-times they were used for other purposes—on washing days. This was the picture of things 30 years or so back . . . it was a vastly romantic period for the reason that it was a probing into the unknown. Marconi himself was still a youngish man. Amateur radio today still has an aura of romance about it, even though it has been making use more or less in its present form of higher frequencies for 20 years or more. The actual utilisation of the higher frequencies so useful for world communication hasn't changed very much basically, but the technique and consequent application have advanced with the years. The first thing that a newcomer to this interesting hobby should realise is that radio amateurs the world over comprise a traditional fraternity . . . there is a profound mutual attraction which is emphasised by individual communication between people with common interests. By virtue of this fraternity, the stranger amateur arrived in a foreign community doesn't go long without acquisition of friends. He may have met them by radio contact from his own station . . . it matters little . . . he is a fellow amateur and that is enough to ensure a welcome among the fellows of the local radio club. Whether or not he lives up to his welcome —and doesn't "outlive" it—depends entirely upon the individual.



A typical example of a modern amateur rotary beam installation. This particular 14 mC/s beam is used at G3BUU, the station of Dennis Chester, Wolverhampton, England. His telephony signal with 75 watts input to the transmitter is well known in Australia.

If he is of the know-all type and airs his "superior" knowledge, or exhibits objectionable points in some manner that "sticks in the gills" of the other fellows, he will have but himself to blame if he is avoided. The new amateur is in many instances recruited from the Short Wave Listener, and, as such, the SWL is already familiar with much that goes on in the world of Amateur Radio.

He will have put in a lot of time listening to their telephony transmissions, and it is possible, but not over-likely, that he may have copied their telegraphic interchanges. The amateur bands will be familiar ground, as will also much of the telephonic jargon that prevails. From his observations he will know that there are amateurs good and bad; those who co-operate with their fellows and those who make themselves nuisances. The doings of the experts and dabblers . . . and the good operators and the "lids"; these will be well-known to our SWL aspirant to transmitting status. If he is of the right kind, he will make a mental resolve to become one of those better types . . . he obviously cannot become an expert until time has passed.

Viewpoints of the Hobby

Let me suggest at the outset that our new amateur should get firmly set in his mind the fact that his activities are concerned solely with a hobby; and that hobby is pursued solely by the permission granted on the part of the licensing authorities. The amateur may have rights morally, but he has nothing to speak of legally. If he offends the laws by which he exists, he can be closed down in a matter of minutes—and

(Continued on next page)

HAM RADIO

(Continued)

he has no redress. Functioning as an enthusiastic and careful participant in a most desirable hobby; he can be, and often is, a valuable member of the community. He can be execrated or praised for his activities—the first is easy to avoid, and the latter not difficult of attainment. Let us then consider the hobby as if it were peopled only by the desirable types; and that the few misfits don't exist. Amateurs are strictly individualistic about their hobby, and have varying ways of enjoying it. Some prefer to work mainly with kindred spirits in their own country, mainly on 'phone, and to pay prior attention to the social and friendly side. For such purpose the popular band in Australia is the 7 mC/s band, although 3.5 mC/s features this kind of contact in the winter evenings. There are those who work almost exclusively on the one band, and in so doing build up friendly groups who operate more or less to schedule. Not a great deal of power is needed for operation of this variety either on 7 or 3.5 mC/s and the man with 25 watts does just as nicely as the man with a full 100 watts. On the 14 mC/s there are those busy bees, the strictly DX men, to whom the tally of a score of 100 or more countries contacted means more than local "rag-chewing," and in this category too are the marathon QSO men, those who establish a schedule with an overseas station and concentrate on consecutive contacts until a time comes when poor operating conditions break the sequence. There are the contest men, those who derive much enjoyment from self-imposed endurance operation by participation in one of the various international QSO parties. To the winners fall the spoils of victory—the high-pointers carrying off the prizes, usually in the form of equipment or valves donated by traders. A thriving section of International Amateur Radio is that interested mainly in VHF operation, where frequencies of 50 mC/s (6 metres) and higher are the main topic. There is always the thrill on the 50 mC/s band of unusual and unexpected DX work, but this band and those running into the higher VHF regions are primarily local contact bands. It is in this field most scope lies for the experimenter, the man who likes to try the unusual. Finally there is the technically-inclined amateur to whom the main interest is the joy of putting things together on the bench and trying them out. Many amateurs are more interested in the art of making one's own equipment in its entirety, than in using it for lengthy communication when completed. It is for this kind of amateur that magazines such as this hold the main interest . . . the strictly home-constructor amateur is, as ever, very much an active member of this absorbing hobby.

To tackle every phase of the hobby of Amateur Radio would in these advanced times call for a multiple identity. Being a hobby, seldom does one have the time to devote with one's profession, the chance to take part in most phases may occur, but mostly it is a case of either one or two. Take your choice . . . the world's most interesting hobby lies before you, and if you break into it thoroughly, rest assured that the interest will remain for your lifetime, in some form or other.

A NEAT "HAM" STATION

This is a typical amateur transmitting station, of which there are thousands scattered all over the world. You can own and operate an amateur station, as explained in detail in this issue.

AUSTRALIAN AMATEUR FREQ. ALLOCATIONS

As from June 1, 1948, the following frequency bands were available for use by amateur radio station licensees:

- 3.5-3.8 mC/s ("80 metres").
- 7-7.2 mC/s ("40 metres").
- 14-14.4 mC/s ("20 metres).
- 26.96-27.23 mC/s ("11 metres").
- 28-30 mC/s ("10 metres").
- 50-54 mC/s ("6 metres").
- 144-148 mC/s ("2 metres").
- 288-296 mC/s (temporary).
- 576-585 mC/s (temporary).
- 1345-1425 mC/s.
- 2300-2450 mC/s.
- 5650-5850 mC/s.
- 10,000-10,500 mC/s.
- 21,000-22,000 mC/s (temporary).
- 30,000 mC/s upwards (temporary).

STARTING

(Continued from page 13)

was a bit of the fundamentals of electricity, which you learn in school. A radio with a circuit as depicted in Fig. 1 will work, but, due to the extremely simplified circuit, will not give worthwhile results; so do not try and build it. The purpose of it was merely to show you the principles employed in radio reception, so if you start learning the details now, you will have an idea where they will eventually fit in; that is what I wrote this article for.

How To Become A "Ham"

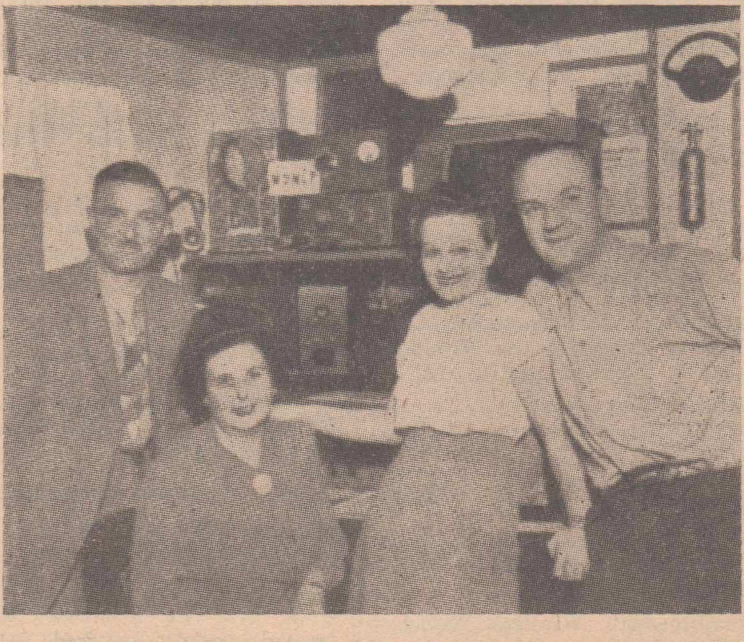
Any person over the age of eighteen years, male or female, is entitled to be granted a licence to erect and operate an amateur transmitting station on passing the required examinations. Why not join the happy ranks of the "hams"?

COMPLETE details of the requirements for and conditions of the amateur "ticket" are contained in the P.M.G. "Handbook for Operators of Amateur Wireless Stations," obtainable from the Wireless Branch at 1/6. First point that anybody considering joining in the hobby of amateur radio from the transmitting angle must bear in mind . . . is that **a licence is necessary** and that **nobody may operate radio transmitting equipment without one.** There are severe penalties for illegal operation, and the law can impose a maximum fine of £500 or 5 years "inside." The licence fee (when granted) is £1 per year. An application form is supplied for the purpose and the applicant completes all the information required and lodges it, in duplicate, with the nearest Disconditions where holders of certain commercial licences are thereby qualified for the amateur licence, but the non-qualified applicant is called upon to sit for an examination covering a knowledge of radio telegraphy and telephony electrical principles, operating proas applied to amateur stations, trict Radio Inspector. There are cedure and regulations, and the ability to send and receive correctly in morse code at a speed of 14 words per minute. When the successful applicant qualifies, he receives his "Amateur Operator's Certificate of Proficiency" and in due course his station licence. He is then able to operate his station within the prescribed frequency limits under his allocated VK callsign. From the outset the newcomer must realise that there are regulations governing radio communication, which, unlike regulations in some phases of life, are NOT made to be broken. They must be respected in order to prevent chaos and so that the large number of amateur stations may function without unreasonable inter-station "jamming." The P.M.G. authorities have the power to suspend or to cancel a licence where there may be gross infringement of the regulations but the necessity for such drastic action is almost unknown so far in Australia. Provision is made for portable station operation within certain area limits and amateur station operation under certain conditions is permitted on board vessels within Australian waters. Stations must be available for inspection by departmental officers, and in case of national emergency may be taken over by Defence authorities. The maximum power that may be used at present in Australia is 100 watts input at the anode of the output stage delivering power to the antenna. Definite frequency bands are allocated and these may be revised or altered from time to time, subject to international or Commonwealth ruling. Amateur stations may at times be the cause of interference with nearby broadcast receivers and, in this respect, there are conditions regarding the steps to be taken to cure such instances. Even the most severe cases can be eliminated by various methods. At all times, the licencee is responsible for operation of his (or her) station and the correct keeping of the log-book showing particulars of communication.

In each State of Australia an Advisory Committee is appointed by the Wireless Branch to function

(Continued on next page)

INTERNATIONAL GOODWILL



Amateur radio is a big factor in creating international goodwill. Our picture shows an English "Ham" and his wife, who, when visiting the U.S.A., took the opportunity of dropping in on an American "Ham" with whom he had been in contact "over the air."

THE MORSE CODE

How To Learn It And Use It

By

DON B. KNOCK

(VK2NO)

SAMUEL MORSE invented the code that bears his name in 1832. It is used for radio, line telegraphy and visual signalling. Various figures and letters are made up of a system of rhythmic sounds, comprised essentially of two units . . . a long sound called a "Dah" and a short sound called a "Dit." The first move in learning the Morse Code is to memorise the combination of sounds going to make up the alphabet. Don't try to send with a key until you have learned these sounds properly, and by sound . . . I don't mean that you should think of the symbols as being dots and dashes. Stick to the "Dit" and "Dah" method and get the habit of chanting the sounds as you go through the alphabet and numerals. The letter A for instance—you see from the chart that it is represented as a dot and a dash—in rhythmic form . . . a "Dit" and a "Dah." B becomes "Dah dit dit dit," and so on. Sing these sounds through the alphabet in a monotone and when the stage has been reached where you don't stumble too much over letters such as Q and Y, adopt the habit of silently reading shop signs and newspaper headlines to yourself in the chanted sound symbols. In other words, **think** in Morse. Let's start off at this business with the word "MORSE." In order to memorise well "sing" the sounds for each letter three times, thus—

Dah Dah—Dah Dah—Dah Dah .... M M M
Dah Dah Dah — Dah Dah Dah—Dah Dah Dah .... O O O
D'dah dit—D'dah dit—D'dah dit .... R R R
D'D'dit — D'D'dit — D'D'dit .... S S S
Dit—Dit—Dit .... E E E

This is the way the Second A.I.F. trained Signals recruits in breaking the ground, and the method will be found speedy.

Next reduce the repetition of three sounds for each letter to two, and, as your speed increases, to one. Remember to place full emphasis on the Dah's—a Dah is three times longer than Dit. A well-tried group of words in the Services was the sentence, "The quick brown fox jumps over the lazy dog," for in the make-up of this all the letters are included. If you have the assistance of a Morse instructor, the pathway to proficiency is somewhat easier, but much can be done by oneself. Memorise the following letter groups in the form of a rhythm: EISH, AUV; TMO, NDB; RLF, JWP; and GZQX, KYC.

Spacing is of the greatest importance—never separate the component parts of any Morse symbol. If you do this, illegibility will result. If, for example, you separate the components of C, which is Dah dit Dah dit, it can become either TR, NN, or KE. It is not difficult to realise how exasperating a mass of plain language can appear when the operator has no spacing sense. A Dit is the unit of time. A Dah equals three Dits. The interval between any letter or figure symbol equals one Dit. The interval between words should be equal to 3 Dits. Once the code is properly sound-memorised it is a good plan to listen to some of the marine shipping traffic on channels around 8 mC/s and other frequencies. There are press news periods that are useful and all the sending is by machine operation, so that spacing and copy are perfect. It will be found that there are many symbols that appear to be unfamiliar in that two letters are sent close together. These are procedure signs, comprised of "barred" letters. For example, the sign for commencement and finish of inverted commas is made up by RR, run together as a continuous symbol. The learner should, for the time being, let these signs pass until operating proficiency on plain symbols, words, figures, etc., has reached a reasonable standard.

HOW TO BECOME A "HAM" (Cont'd)

as such, rather than as a disciplinary body. The members are themselves licensed amateur operators and are under the chairmanship of an officer of the Postmaster General's Department. Addresses of officers of the Wireless Branch in the capital cities are:

Chief Inspector (Wireless), Treasury Gardens, Melbourne C2, Victoria.

Superintendent, Wireless Branch, G.P.O., Sydney, N.S.W.

Assistant Superintendent, Wireless Branch, Treasury Gardens, Melbourne C2, Victoria.

Superintendent, Wireless Branch, G.P.O., Brisbane, Queensland.

Superintendent, Wireless Branch, Commonwealth Offices, Post Office Place, Adelaide, S.A.

Superintendent, Wireless Branch, G.P.O., Perth, W.A.

Superintendent, Wireless Branch, Telephone Building, Harrington Street, Hobart, Tas.

District Radio Inspector, Wireless Branch, Post Office, Newcastle, N.S.W.

District Radio Inspector, Wireless Branch, Clevelend Street, Townsville, Queensland.

NEXT MONTH—

The sweetest little 4-valve mantel model, described in detail. Order your copy NOW.

Sending

With the preliminary stages of reception overcome, our learner can start to get the feel of the Morse key. There are various forms of operating keys, and in most instances British services use what is called the "straight" key. The Americans use a type with a curved down lever, dubbed the "lazy operator's key" for the reason it may be used with the arm and wrist lying along the operating table. With our "straight" key the forearm is extended and the knob handled by the fingers to take full advantage of wrist action. The muscles are kept relaxed always, excepting during the downward movement of the wrist. They are relaxed at the end of each Dit and Dah. If you tense your arm muscles you will never make a really good operator, so take it easy and get the habit of a good "swing." Remember that rhythm applied to the Morse Code is a smooth flow of correctly-made symbols. You will know by now just what correctly-made symbols should sound like, and a little practice by yourself on a key with a buzzer or tone oscillator will give a measure of confidence in your ability. Don't grip the key as if in grim earnest about something—place the first and second fingers of the right-hand on the knob with the ball of the thumb under the left side of the knob. The third finger can touch the bottom of the knob or hang loosely on the other side, depending upon the manner you prefer. The fourth or "little" finger doesn't play any part at all but is just relaxed. The key should have the spring tension so adjusted that the lever returns to the idle position with the fingers resting on the knob but not tightly enough as to cause any fatigue. Too wide a gap should not be used between the key contacts—a sheet of writing paper folded once can be used as a gauge. Set the gap so that the paper may be withdrawn from between the contacts without tearing. An important feature of sending practice is to acquire the habit of sending the letters in a group at a speedy rather than a slow speed, observing, of course, a reasonable time interval for spacing between letter symbols. Make up a chart with a series of five-letter groups with five groups to each arrangement. Jumble the letters to give meaningless combinations and go to work on sending these groups to yourself. You can apply these groups both vertically and horizontally. Then go to the stage of having a proficient instructor send five-letter groups to you for a steady period, and check for errors at intervals. When you have reached a fair stage of operating ability where you can send and receive well in plain language, bear in mind this very important point: In copying plain English, never at any time try to anticipate. If you are in the middle of copying a word and it starts off, for example, as "COMMUNI—," you may, by sensing the text, think you can jump ahead and finish the word before it is actually sent. So you may write down "COMMUNICATE"—whereas the word may turn out to be "COMMUNIST" or something like that. Another thing to get well into the mind is to avoid the habit of trying to read the text whilst receiving it. In other words, you have been copying nicely a few words of a sentence and suddenly you miss out on a few symbols; you pause and try to think what it could be, and before you know it you are several words behind. **Never pause to think what you have missed but carry on with what you hear immediately following.** You will be able by reading the text of the message later on to fill in the missing words and make sense of it. In commercial operating practice, of course, and also in some amateur working, "break-in" is used. That means that the sending station can be interrupted by the receiving station and asked for an immediate repeat on a symbol or word missed. But in Morse Code training, you cannot expect to interrupt your instructor and ask him what that was you just missed. Follow the advice in this brief discussion on how to go about learning the Morse Code, and you should have no qualms when sitting for the P.M.G. amateur Code test.

A	· —	didah
B	— · · ·	dahdididit
C	— · — ·	dahdidahdit
D	— · ·	dahdidit
E	·	dit
F	· · — ·	dididahdit
G	— — ·	dahdahdit
H	· · · ·	didididit
I	· ·	didit
J	· — — —	didahdahdah
K	— · —	dahdidah
L	· — · ·	didahdidit
M	— —	dahdah
N	— ·	dahdit
O	— — —	dahdahdah
P	· — — ·	didahdahdit
Q	— — · —	dahdahdidah
R	· — ·	didahdit
S	· · ·	dididit
T	—	dah
U	· · —	dididah
V	· · · —	didididah
W	· — —	didahdah
X	— · · —	dahdididah
Y	— · — —	dahdidahdah
Z	— — · ·	dahdahdidit

1	· — — — —	didahdahdahdah
2	· · — — —	dididahdahdah
3	· · · — —	didididahdah
4	· · · · —	dididididah
5	· · · · ·	dididididit
6	— · · · ·	dahdidididit
7	— — · · ·	dahdahdididit
8	— — — · ·	dahdahdahdidit
9	— — — — ·	dahdahdahdahdit
0	— — — — —	dahdahdahdahdah

Period	· — · — · —
Comma	— — · · — —
Question mark	· · — — · ·
Error	· · · · · · · ·
Double dash	— · · · —
Wait	· — · · ·
End of message	· — · — ·
Invitation to transmit	— · —
End of work	· · · — · —

International Amateur Prefixes

Prefix Country	Zone
AC3—Sikkim	22
AC4—Tibet	24
AR—Syria	20
C(XU)—China	23, 24
C9(MX)—Manchuria	24
CE—Chile	12
CM, CO—Cuba	8
CN8—Morocco (French)	33
CP—Bolivia	10
CR4—Cape Verde Islands	35
CR5—Guinea, Portuguese	35
CR6—Angola	36
CR7—Mozambique	37
CR8—Goa (Portuguese)	22
CR9—Macao	24
CR10—Timor	28
CT1—Portugal	14
CT2—Azores Islands	14
CT3—Madeira Islands	33
CX—Uruguay	13
D—Germany	14
EA—Spain	14
EA6—Balaeric Islands	14
EA8—Canary Islands	33
EA9—Morocco, Spanish	33
EI—Eire	14
EK—Tanzier Zone	33
EL—Liberia	35
EP, EQ—Iran, Persia	21
ET—Ethiopia	37
F—France	14
FA—Algeria	33
FB8—Madagascar	39
FD8—Togoland	35
FE8—Cameroons	36
FF8—French West Africa	35
FG8—Guadaloupe	8
FI8—French Indo China	26
FK8—New Caledonia	32
FL8—Somaliland, French	37
FM8—Martinique	8
FN—French India	22
FO8—French Oceania	32
FP8—St. Pierre & Michelon Islands	5
FQ8—French Equatorial Africa	36
FR8—Reunion Island	39
FT4—Tunisia	33
FU8—New Hebrides	32
FY8—Guiana, French	9
G—England	14
GC—Channel Islands	14
GD—Isle of Man	14
GI—Ireland (Northern)	14
GM—Scotland	14
GW—Wales	14
HA—Hungary	15
HB—Switzerland	14
HC—Ecuador	10
HE1—Lichtenstein	14
HH—Haiti	8
HI—Dominican Republic	8
HK—Colombia	9
HP—Panama	7
HR—Honduras	7
HS—Siam	26
HZ—Saudi Arabia	21
I—Italy	15
J—Japan	25
J9—Ryukyu Islands	25
K—U.S.A.	3, 4, 5

Prefix Country	Zone
KA—Philippine Islands	27
KB6—Baker, Howland and American Phoenix Islands	31
KC4—Little America	13
KG6—Guam, Saipan, Tinian	27
KH6—Hawaiian Islands	31
KJ6—Johnstone Island	31
KL7—Alaska	1
KM6—Midway Island	31
KP4—Puerto Rico	8
KP6—Palmyra Group, Jarvis Island	31
KS6—American Samoa	32
KS4—Swan Island	4
KV4—Virgin Islands	8
KW6—Wake Island	31
KZ5—Canal Zone (Army)	7
LA—Norway	14
LI(TR)—Libya	34
LU—Argentina	13
LX—Luxembourg	14
LZ—Bulgaria	20
MD1—Cyrenaica	34
MD2—Tripolitania	34
MD3—Eritrea	37
MD4—Somalia	37
MD5—Suez Canal Zone	34
MD7—Cyprus	20
M16—Eritrea	37
NY4—Guantanamo Bay	8
OA—Peru	10
OE—Austria	15
OH—Finland	15
OK—Czechoslovakia	15
ON—Belgium	14
OQ—Belgian Congo	36
OX—Greenland	40
OY—The Faeroes	14
OZ—Denmark	14
PA, PI—The Netherlands	14
PJ—Netherlands West Indies	9
PK1, 2, 3—Java	28
PK4—Sumatra	28
PK5—Borneo (Dutch)	28
PK6—Celebes and Molucca Isles	28
PX—Andora	14
PY—Brazil	11
PZ—Guiana (Dutch)	9
SM—Sweden	9
SP—Poland	15
ST2—Anglo-Egyptian Sudan	34
SU—Egypt	34
SV—Greece	20
SV—Crete	20
SV5—Dodecanese Islands	20
TA—Turkey	20
TF—Iceland	40
TG—Guatemala	7
TI—Costa Rica	7
TI—Cocos Islands	7
UA1, 3, 4, 6—European Russian Federated Soviet Republic	16
UA9, 0—Asiatic S.F.S.R.	18, 19
UB5—Ukraine	16
UC2—White Russian S.S.R.	16
UD6—Azerbaijan	21
UF6—Georgia	21
UG6—Armenia	21
UH8—Turkomen	17
UI8—Uzbek	17
UJ8—Tadzhik	17

Prefix Country	Zone
UL7—Kazakh	17
UM8—Kirghiz	17
UN1—Karelo-Finnish Republic	16
UO5—Moldavia	16
UP2—Lithuania	15
UQ2—Latvia	15
UR2—Estonia	15
VE—Canada	1, 2, 3, 4, 5
VK—Australia, including Tasmania	29, 30
VK9—Papua	28
VK9—New Guinea	28
VO—Newfoundland and Labrador	5, 2
VP1—British Honduras	7
VP2—Leeward and Windward Islands	8
VP3—British Guiana	9
VP4—Trinidad and Tobago	9
VP5—Jamaica and Cayman Islands	8
VP6—Barbadoes	8
VP7—Bahamas	8
VP8—Falkland Islands	13
VP8—Sth. Georgia Island	13
VP8—Sth. Orkney Islands	13
VP8—Sth. Sandwich Islands	13
VP8—Sth. Shetland Islands	13
VP9—Bermuda	5
VQ1—Zanzibar	37
VQ2—Northern Rhodesia	36
VQ3—Tanganyika	37
VQ4—Kenya	37
VQ5—Uganda	37
VQ6—Brit. Somaliland	37
VQ8—Mauritius and Chagos Islands	39
VQ9—Seychelles	39
VR1—Gilbert and Ellis and Ocean Islands	31
VR2—Fiji Islands	32
VR3—Fanning Island (Christmas Island)	31
VR4—Solomon Islands	28
VR5—Honga Islands	32
VR6—Pitcairn Island	32
VS1—Straits Settlements	28
VS2—Federated Malay States	28
VS2—Non-Federated Malay States	28
VS4—Brit. North Borneo	28
VS5—Brunei	28
VS5—Sarawak	28
VS6—Hong Kong	24
VS7—Ceylon	22
VS8(VU7)—Bahrein Island	21
VS9—Maldive Islands	22
VS9—Aden Islands	21
VS9—Socotra Islands	37
VU—India	21, 22
AP—Pakistan	21, 22
VU4—Laccadive Islands	22
W—U.S.A.	3, 4, 5
XE—Mexico	6
XU—China	23, 24
XZ—Burma	26
YA—Afghanistan	21
YI—Iraq	21
YN—Nicaragua	7
YR—Rumania	20
YS—Salvador	7

THE "Q" CODE

In the International Radiotelegraph Regulations the following very useful and internationally agreed code is given to meet the major needs in international radio communication. We have omitted several signals which have little bearing on Amateur work.

When the abbreviation is followed by an interrogation mark (?) it has the meaning shown. When without the (?), the signal becomes the appropriate answer.

QRA—What is the name of your station?

QRB—How far approximately are you from my station?

QRG—Will you tell me my exact frequency (wave-length) in kC/s (or m)?

QRH—Does my frequency (wave-length) vary?

QRI—Is my note good?

QRJ—Do you receive me badly? Are my signals weak?

QRK—Do you receive me well? Are my signals good?

QRL—Are you busy?

QRM—Are you being interfered with?

QRN—Are you troubled by atmospherics?

PREFIXES

(Continued)

Prefix Country	Zone
YT, YU—Yugoslavia	15
YV—Venezuela	9
ZA—Albania	15
ZB1—Malta	15
ZB2—Gibraltar	14
ZC1—Transjordan	20
ZC2—Cocos Islands	29
ZC3—Christmas Island	31
ZC4—Cyprus	20
ZC6—Palestine	20
ZD1—Sierra Leone	35
ZD2—Cameroons (British)	36
ZD2—Nigeria	35
ZD3—Gambia	35
ZD4—Togoland, Gold Coast	35
ZD6—Nyasaland	37
ZD7—St. Helena	36
ZD8—Ascension Island	36
ZD9—Tristan da Cunha and Gough Island	38
ZE1—Southern Rhodesia	38
ZK1—Cook Islands	32
ZK2—Niue	32
ZL—New Zealand	32
ZM6—British Samoa	32
ZP—Paraguay	11
ZS1, 2, 5, 6—Union of South Africa	38
ZS3—South West Africa	38
ZS4—Basutoland	38

QRO—Shall I increase power?

QRP—Shall I decrease power?

QRQ—Shall I send faster?

QRS—Shall I send more slowly?

QRT—Shall I stop sending?

QRU—Have you anything for me?

QRV—Are you ready?

QRW—Shall I tell............that you are calling him on............kC/s (or............m)?

QRX—Shall I wait? When will you call me again?

QRY—What is my turn?

QRZ—Who is calling me?

QSA—What is the strength of my signals (1 to 5)?

QSB—Does the strength of my signals vary?

QSD—Is my keying correct; are my signals distinct?

QSG—Shall I send............telegrams (or one tel(egram) at a time?

QSK—Shall I continue with the transmission of all my traffic, I can hear you through my signals?

QSL—Can you give me acknowledgement of receipt?

QSM—Shall I repeat the last telegram I sent you?

QSO—Can you communicate with............direct (or through the medium of............)?

QSP—Will you retransmit to............free of charge?

QSR—Has the distress call received from............been cleared?

QSU—Shall I send (or reply) on............kC/s (or m) and/or on waves of Type A1, A2, A3, or B?

QSV—Shall I send a series of VVV............?

QSW—Will you send on............kC/s (or............m) and/or on waves of Type A1, A2, A3 or B?

QSX—Will you listen for............(call sign) on............kC/s (or............m)?

QSY—Shall I change to transmission on............kC/s (or............m) without changing the type of wave? Shall I change to transmission on another wave?

QSZ—Shall I send each word or group twice?

QTA—Shall I cancel telegram No. ....as if it had not been sent?

QTB—Do you agree with my number of words?

QTC—How many telegrams have you to send?

QTG—Will you send your call sign for fifty seconds, followed by a dash of ten seconds on............kC/s (or............) in order that I may take your bearing?

QTH—What is your position in latitude and longitude (or by any other way of showing it)?

QTQ—Can you communicate with my station by means of the International Code of Signals?

QTR—What is the exact time?

QTU—What are the hours during which your station is open?

QUA—Have you news of............(call sign of the mobile station)?

QUC—What is the last message received by you from............(call sign of mobile station)?

QUD—Have you received the urgency signal sent by............(call sign of the mobile station)?

QUM—Is the distress traffic ended?

INDEX TO VOLUME 12

At the request of several readers we publish this index to Volume 12. Back numbers are available at 6d. each, post free, by sending postal note (or 4 1½d. stamps) to Australasian Radio World, Balcombe Street, Mornington, Victoria. The complete set of twelve issues is available for 5/-, post free.

AMPLIFIERS

TEST EQUIPMENT

AMATEUR RADIO

THEORY AND FUNDAMENTALS

RECEIVER CIRCUITS

CONSTRUCTIONAL ARTICLES

HINTS AND TIPS

GENERAL

Shortwave Review

CONDUCTED BY L. J. KEAST

LET'S TALK ABOUT THE SHORT-WAVE

I am going to try and persuade some of the owners of Dual-wave receivers to switch over to the short-wave side of their sets. Few realise that in front of them they have a really wonderful piece of machinery, machinery that does not call for a great amount of knowledge as regards its use, but if mastered your set becomes an encyclopaedia, an entertainer, a veritable magic carpet.

Yes, you can fly without fuss or bother to any part of the world. . . no passport required, no worry about Dollar restrictions, you just tune-in and stay as long as you please. And what do you hear? Tales of other lands, how the other fellow lives, the music he loves, a trip through his country and the news of the world as he is told. Yes, you can hear this each and every day. At this particular time of the year you will find over-seas listening best in the day time but there will still be plenty of stations to choose from in the evenings and right throughtout the night.

Start to-day and it will not be very long before you will became so expert as to recognise the stations long before they announce or any identification signal is heard.

There is nothing to be afraid of and no great skill is required to bring in an overseas station. You must however tune very very slowly as you have not the same margin as when on the broadcast band, Short-wave tuning demands care and concentration if you want to "hear" all the stations and they are as close as an hairs' breath. But do not worry as after a very few evenings or days you will gain confidence as you tune the different ones in. It is quite possible at first you will find perhaps two stations which at first blush seem together but if you turn the dial just a tiny little bit to the right or left you will notice how one comes up and stays clear.

In this issue I am giving a fairly long list of well known and often heard stations and in the next issue I will give the present schedules of the principal stations. In the meantime just try those short-waves and get a new thrill from your Radio.

HOW TO GET AN EXTRA THRILL FROM DX-ING

Dx-ing is the term given to listening to over-seas stations and apart from the pleasure one gets in logging a foreign station, this can be further enhanced by the reception of a verification from the station for a correctly prepared report sent to them.

Most short-wave stations will send an acknowledgement if your report is correct but you will assist the monitors if you prepare your report in a manner that will allow them to check same quickly with their records and you will earn the gratitude of the engineers if you let them have some of the information they require. This need not be of a highly technical nature and if the suggestions mentioned hereunder are followed out you will most likely soon build up a nice list of verifications. These quite often take the shape of most attractive cards, sometimes accompanied by beautifully illustrated brochures.

The report should be prepared as follows:

1. Write your name and address carefully. Particularly mention the Country in which you are located, giving also the State and if you are not situated in a Capital City give the approximate distance from the Capital and also whether you are North, South East or West of same. If you know your latitude and longtitude so much the better,

2. Give the date and exact time taking care to what time you are quoting. From the table shewn in this issue you can GMT equivalent which will probably suit them better.

3. Mention the Call-sign and the frequency.

4. Give a list of at least 12 items or say 30 minutes listening.

If all announcements were in a foreign tongue which you connot understand, try and mention a particular piece of music you heard or which uses an identification signal such as chimes, bells or gongs.

5. Enclose a reply coupon. Your postmaster will tell you what you want.

The above is generally sufficient to secure an acknowledgement but no station unless asking for reports is under any obligation to reply.

You can mention the type of receiver you are operating as well as the aerial and is height. Weather conditions are not necessary.

WAVE LENGTH AND FREQUENCY

Licensed Broadcast stations are granted a wave-length or frequency. The number of radio impulses, or waves sent out per second, is the station's assigned frequency. The distance between successive impulses, as they travel from the transmitter is the station's wave-length.

Over-seas stations generally state they are operating on . . . . kilocycles, as they figure greater accuracy is possible by expressing the station's frequency in cycles per second. A kilocycle means a thousand cycles per second. Most United States of America stations speak in terms of megacycles which means a million cycles per second.

If you want to work out a station's wave-length when the frequency is given here is a simple table. As radio signals travel at the rate of 300,000 metres per second we can find the wave-length in metres by dividing the frequency into 300,000. As an example take a station on 15,140 kilocycles, the wave-length would be 19.82 metres. If you want to convert kilocycles into megacycles simply move the decimal point three places to the left.

Thus 19.82 metres equals 15, 140 kilocycles or 15.14 megacycles. For the sake of brevity metres is shewn as m., kilocycles as kc, and megacycles as m.c.

●

Here is a list of short-wave stations that should be heard at various times of the day or night on any reasonably good Dualwave receiver.

This list does not represent all the stations in the 13, 16, 19, 25 and 31 metre bands but is given as a start for the new convert to this all absorbing hobby. Commence now and "Tour the World" by short-wave. Schedules are given in our regular monthly issues.

25.60	11.71	WRUX — Boston.
21.75	13.8	GVT—London.
21.74	13.81	KCBF—San Francisco.
21.74	13.81	Radio Paris
21.73	13.81	WNRX — New York.
21.72	13.81	RADIO — Singapore.
21.69	13.83	WLWL-1 — Cincinnati.
21.71	13.82	GVS—London.
21.67	13.83	GVR—London.
21.65	13.85	WLWS-½ — Cincinnati.
21.64	13.86	GRZ—London.
21.62	13.87	SEAC — Colombo.
21.59	13.89	WGEA — Schenectady.
21.57	13.9	WCRC — New York
21:55	13.92	GST—London.
21.54	13.93	VLB5 — Australia.
21.53	31.92	GSJ—London.
21.51	31.94	VUD8—Delhi.
21.5	13.95	WOOW — New York.
21.48	31.96	PCJ—Holland.
21.47	13.97	GSH—London.
21.46	31.98	KNBA—San Francisco.
19.05	15.75	VPO8 — Barbados.
18.16	16.55	WNRI — New York.
18.13	16.57	GRP—London.
18.08	16.59	GVO—London.
18.02	16.64	GRQ—London.
17.88	16.78	KGEX—San Francisco.
17.84	16.82	VLC9 — Australia.
17.83		WCBX — New York.
		VUD10—Delhi.
17.82	16.82	CKNC — Sackville
17.81	16.84	GSV—London.
17.8	16.85	WLWO — Cincinnati.
		WLWK — Cincinnati.
17.79	16.86	GSG—London.
17.78	16.87	HER7 — Switzerland.
17.78	16.87	WNBI — New York.
		KWID—San Francisco.
17.77	16.88	PCH2—Holland.
17.77	16.88	KROJ—San Francisco.
		Radio Paris.
17.76	16.89	VUD3—Delhi.
		KWID—San Francisco.
17.75	16.9	WRUW — Boston.
17.76	16.88	XGRS — Nanking.
17.75	16.9	WRUX—Boston.
17.74	16.9	OTC5 — Leo'ville.
17.73	16.92	GVQ—London.
17.73	Radio	SEAC—Ceylon.
17.71	16.93	GRA—London.
17.7	16.95	GVP—London.
15.59	19.25	FZI — Brazzaville.
15.45	19.42	GRD—London.
15.43	19.44	GWE—London.
15.39	19.49	FGA—Dakar.
N15.39		Radio Centre Moscow.
15.36	19.52	Radio Centre Moscow.
15.35	19.53	WLWR-½ — Cincinnati.
		Radio Paris.
15.35	19.53	Radio Athens.
15.34	19.56	Radio Centre Moscow.

15.33	19.54	WLWR-2 — Cincinnati.
15.33	19.54	WGEO — Schenectady.
15.33	19.54	MAN10A — Manila.
15.32	19.56	OQ2RC — Leo' ville.
15.32	19.58	CKCS—Montreal.
		VLA-5 Shepparton.
		OZH2 — Denmark.
15.31	19.59	HEU6 — Switzerland.
15.31	19.59	GSP—London.
15.3	18.61	Radio — Singapore.
15.29	18.62	VUD11 Delhi.
15.29	19.62	WRUA—Boston.
15.29	19.62	WRUL—Boston.
15.28	19.63	WNRE — New York.
15.28	19.63	Radio—Moscow.
15.27	19.65	WCBN — New York.
15.27	19.65	WCRC — New York.
15.26	19.66	GSI—London.
15.25	19.67	WLWK — Cincinnati.
		KNBX—San Francisco.
15.24	19.68	Radio—Paris.
		KNBA—San Francisco.
15.23	19.68	JVW3 — Japan.
15.23	19.70	VLG—Melbourne
		VLG-6 — Melbourne.
		VLH5 — Melbourne.
		VLA-6 — Melbourne.
		SEAC—Ceylon.
15.22	19.7	PCJ—Holland.
		OLR-A—Prague.
15.21	19.72	WBOS—Boston.
		VLG-11 — Lynohurst.
15.2	19.74	WRUA—Boston.
		VLC — Shepparton.
		VLG-11 — Lyndhurst.
15.19	19.75	TAQ—Ankara.
15.19	19.75	OIX4 — Lahti.
		VUD5—Delhi.
		CKCX—Canada.
15.18	19.76	GSO—London.
15.17	19.77	XGOY — Chungking.
		TGWA — Guatemala.
		Radio Centre Moscow.
15.16	19.79	VUD7—Delhi.
		XEWW — Mexico
15.16	19.79	VLB11 — Belbourne.
15.15	19.8	SBT — Stockholm.
15.15	19.81	WRCA — New York.
		KCBA—San Francisco.
15.14	19.81	YDC—Java.
15.14	19.82	GSF—London.
15.13	19.83	VUD11—Delhi.
		KCBR—San Francisco.
		WOOC — New York.
15.12	19.83	SEAC—Ceylon.
15.11	19.85	GWG—London.
		HCJB—Ecuador.
		Radio Centre Moscow.
15.10	19.86	EQB—Teheran.
15.09	19.87	HVJ — Vatican City.
15.09	19.88	CBLX — Montreal.
15.07	19.91	GWC—London.
15.0	20.0	WWV — Washington.
12.44	24.11	HCJB—Quito.
12.42	24.2	Netherlands Indies
12.26	24.47	Moscow.
12.09	24.8	GRF—London.
12.04	24.92	GRV—London.
12.0	25.0	CE1180—Chile.
11.97	25.05	FZ1 — Brazzaville.
11.96	25.08	HER5—Berne.
11.95	25.09	GVY—London.
11.95	25.09	ZP5—Paraguay.
11.94	25.11	Moscow.
11.93	25.15	GVX—London.
11.92	25.17	XGOY — Chungking.
11.9	25.21	KWID—San Francisco.
		CE1190—Chile.
11.89	25.22	Moscow.
		KRHO — Honolulu.
11.89	25.22	Voice of U. S. A. Manila.
11.88	25.22	Radio Paris.
11.88	25.25	VLH4 — Melbourne.
11.87	25.26	XEHH—Mexico.
11.87	25.27	VUD9—Delhi.
		Munich.
		WNRA — New York.
11.86	25.28	HER5—Berne.
11.86		KWIX—San Francisco.
11.86	25.3	GSE—London.
11.85	25.3	Voice of Free Indonesia.
11.85	25.31	VUD3—Delhi.
11.84	25.33	Paris.
11.84	25.34	OLR4A—Prague.
11.84		KXFM—Manila.
11.83	25.35	Radio Algiers.
11.83	25.36	VLW3—Perth.
11.83	25.36	XGOA — Nanking.
		WNRX — New York.
		WCDA — New York.
		CXA19 — Uruguay.
11.82	25.37	Radio Centre Moscow.
11.82	25.38	GSN—London.
11.81	25.39	HEU5 — Switzerland.
11.81	25.4	KCBF—San Francisco.
		WGEA — Schenectady.
		Radio Milan Italy.
		VLC7 — Melbourne.
11.8	25.42	GWH—London.
11.79	25.45	KNBX—San Francisco.
		WLWO — Cincinnati.
		WRUA—Boston.
11.78	25.47	Radio Batavia.
11.77	25.48	Radio Centre, Moscow.
		OIX3—Finland.
11.78	25.47	Radio Saigon.
11.77		SEAC—Colombo.
		GVU—London.
		KNB1—San Francisco.
		WGEA — Schenectady.

(Continued next month)

BARGAIN CORNER

Advertisements for insertion in this column are accepted free of charge from readers who are direct subscribers or who have a regular order placed with a newsagent. Only one advertisement per issue is allowed to any subscriber. Maximum 16 words. When sending in your advertisement be sure to mention the name of the agent with whom you have your order placed, or your receipt number if you are a direct subscriber.

FOR SALE.—FS6 transceiver, with vibrator power supply, complete, as new. W. A. Reid, 96 Beach Road, Sandringham, Vic. Telephone XW 2007.

FOR SALE.—Genemotor, 12-volt input, 240v. 60ma. output, £2/5/-; Ford T generator and cut-out, £1/15/-; low-powered microscope, 25/-. Apply to A. Duncan, Callignee North, via Traralgon, Vic.

WANTED to locate a supplier of a mu-metal shield for a 5BP1 cathode ray oscilloscope. Any information appreciated by J. A. Catterall, c/- Tahunanui Service Station, Nelson, N.Z.

RESISTANCES

(Continued from Page 20)

heaters). The resistance required is obtained by dividing the voltage drop by the current in amps. This is a simple rule which is easily remembered, and with half an amp it will be seen that in order to drop 220 volts we require 440 ohms. We can obtain this with 112 yards of No. 28 double-silk-covered or 79 yards of 30 enamelled Eureka.

The heat generated is sufficient to cause ebonite to become soft and even to burn. Paxolin may be used or even a good hard-wood former.

Nichrome

An even simpler solution is the use of Nichrome wire. This wire is made of an alloy much used for the elements of electric heaters. It has a resistance rather more than twice as great as the corresponding gauge of Eureka, and it will run red hot without any deterioration and is much more economical. For example, even if we keep our temperature down to 200 degrees centigrade we can use 33 gauge which only requires something like 24 yards to give us the required resistance. This may easily be spiralised first by winding it round a small diameter rod, such as a pencil, and the complete spiral may then be wound lightly round the porcelain former with sufficient space between the turns to ensure that none of the wires touch. By this means an open spiral is obtained with adequate ventilation for all the turns, and a resistance is obtained which is easy to make.

THE OCTOBER ISSUE

should be on sale well before the publication date, so make sure of your copy by placing an order NOW.

F.M.

(Continued from Page 8)

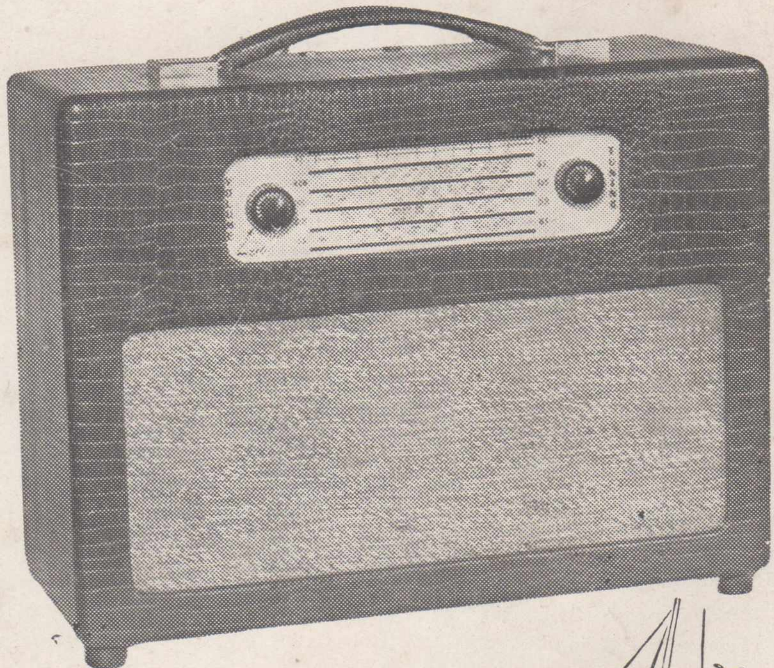
cuit and, if necessary, adjustments to the selectivity characteristics, can change any existing receiver to FM, for the same frequency of range the set was built for originally. Only the fact that the coming FM wil be on very high frequencies and on a wide band of about 75 K.C. (to improve noise to signal ratio) makes the design of special multivalve receivers necessary, also erection of special aerials. Wide range and high fidelity are no attributes particular to FM. In hilly country, the successful reception of the projected looMC FM in low lying parts, "hidden away" from the transmitter, becomes doubtful.

This article is merely intended to give an outline on FM and as such is necessarily incomplete, leaving out many peculiarities of lesser importance and generalising on many points with complete disregard to limitations and exceptions to the rule, for the sake of keeping things clear and simple and avoid confusion.

Back Again And Better Than Ever!

New University PK4X 4-valve Portable Kit Set offers endless pleasure

University's great portable kit set is back again—improved in sensitivity, tone, appearance and ease of construction.



ALL LATEST ADVANCES

The new PK4X Portable is a greatly improved radio and incorporates all the latest technical advances. Even the famous PK3, PK4 and PK5 of the 1940 range are superseded.

The new PK4X is a four-valve portable kit set employing the latest bantam-type valves and minimax-type batteries.

Housed in a genuine leather-covered carrying case, it includes all the parts necessary for the construction of a modern receiver. Carefully engineered and designed, the PK4X is simple to assemble with a few ordinary tools. A complete book of instructions specially written for the kit set is included in every package and the easy-to-read and easy-to-follow text is accompanied by clear photographs showing wiring diagrams, circuits and completed appearance.

INSTRUCTIONS ARE SIMPLE, EASY-TO-FOLLOW

The instrument is all assembled for you and wiring is simple and capable of being carried out by anyone who can use a soldering iron.
A clearly marked dial carries all the major stations in Australia and this portable PK4X is suitable for every State.
Get your PK4X now. It is available from all leading distributors throughout the Commonwealth and your satisfaction is guaranteed and backed by a name that is well-known in the radio industry.

TECHNICAL DETAILS

Attractive technical details of this popular kit are a well-designed cabinet covered in solid leather, 5" Alnico type speaker is used, four modern bantam series valves, modern straight line dial, Minimax batteries, special effectively designed loop aerial, provision for external aerial for use in country districts, good tonal quality and excellent sensitivity.

Retail price including sales tax is **£16/19/6**

MANUFACTURED BY RADIO EQUIPMENT PTY. LTD.
5 NORTH YORK STREET, SYDNEY, N.S.W. PHONES: B1960, B3678

Printed by the Bridge Printery Pty. Ltd., 117 Reservoir Street, Sydney, N.S.W., for the Proprietor of the "Australasian Radio World," Balcombe Street, Mornington, Victoria.