THE AUSTRALASIAN

Radio World

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VOL. 8 ..... NO. 8 JANUARY 15 1944

★ **Simple vacuum-tube voltmeter uses magic-eye indicator.**

★ **Constructional details of a high-fidelity gramophone pick-up.**

★ **Band-pass and pre-selectors to improve selectivity of old sets.**

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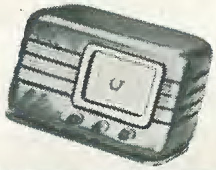

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EDITORIAL

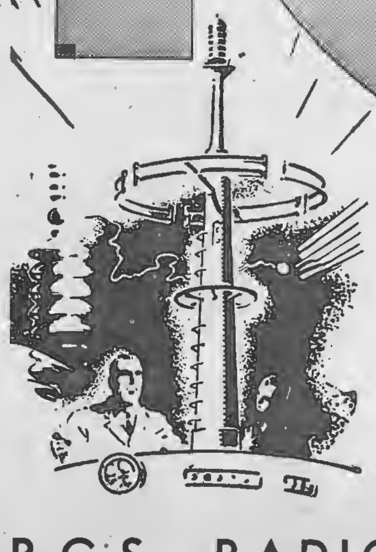
Lunching recently with Captain Knock (you would know him as Don Knock, radio editor of the "Bulletin" and a frequent contributor to "Australasian Radio World" in the good old days) the discussion veered to the influence of war on the future trends in radio set design and construction.

It is very evident that the present demands in the matter of tropic-proofing will ensure that the commercial sets of the future will not be affected by humidity. Radio sets for the forces are tested by operating them with a hose playing on them. An army receiver is built in anticipation of being thrown overboard into saltwater, dragged up the beach on the end of a rope and then operating to perfection as soon as it is switched on!

Country readers will be pleased to hear that the shelf life of batteries has been vastly increased through improved construction methods for providing better internal insulation. Post-war batteries should last nearly twice as long as previously.

Australian technicians are also gaining valuable experience in handling communications-type receivers, some of the latest jobs being available "in official circles." It is expected that these designs will be studied intently and their best features digested so that Australian enthusiasts can hope to be catered for adequately with sets of a type which have previously existed only as pictures in American magazines.

—A. G. HULL.



A SIMPLE VACUUM-TUBE VOLTMETER

Constructional details of a vacuum-tube voltmeter using a "magic eye" tube as the indicator.

A VACUUM-TUBE voltmeter has a number of functions depending on the three ways in which it is different from an ordinary voltmeter. First of all, it may be more sensitive on account of the amplifiers it contains. Second, the instrument draws practically no current from the circuit being checked, so it does not disturb the circuit voltages. Third, the instrument measures alternating voltages — some instruments will record peak voltages in each direction, average voltages and R.M.S. voltages!

Compactness.

The particular device described here is extraordinarily compact, fitting into a tin can about six inches each way. Unfortunately, metal tubes are no longer obtainable, so experimenters must increase the size a bit if they wish to build a similar model. Still, there's not very much to it, only a couple of valves and a power pack which has to put out only a couple of milliamps.

The chassis consists of a sheet of metal, aluminium or tinplate will do, spaced by threaded brass rods from the bakelite panel. The latter carries input terminals and a pair of controls, one of which is a sensitivity or range selector, whilst the other is a bias control to allow for variations in mains voltages. Actually this latter control can be omitted — in fact, we found it possible to leave bias off the 6E5 tube and use it as a leaky-grid detector.

Valves Used.

The first tube is a 6J7 (the 6C6 is an equivalent) connected to operate as a resistance-capacity coupled amplifier. As a high resistance grid leak is employed (5 megs. is O.K. — some tubes work with 10 or 25 meg.!) only

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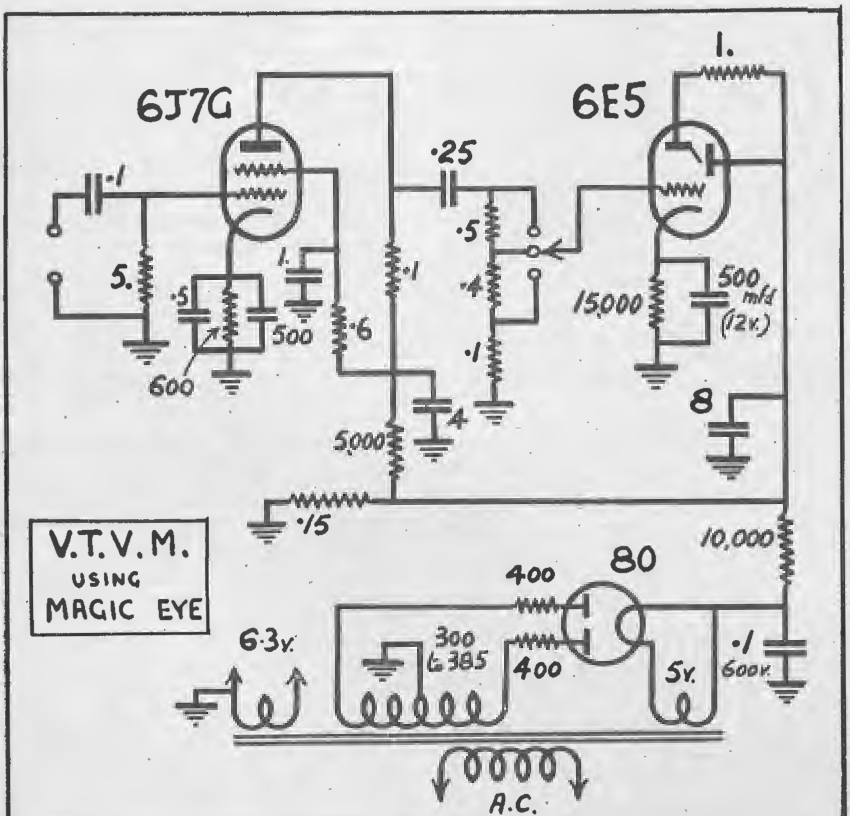
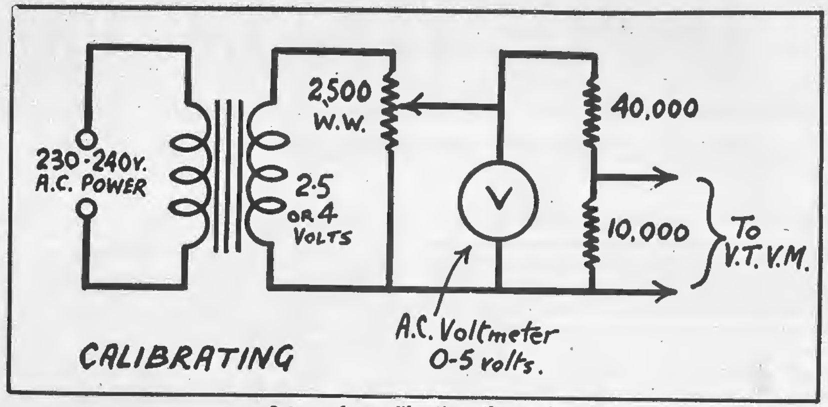
At right: Three views of the unit showing the novel lay-out arrangements. Below: the schematic circuit.





Set-up for calibrating the meter.

V.T.V.M.

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an extremely small current is drawn when this V.T.-V.M. is used. In fact, its sensitivity is greater than 30 million ohms per volt! The resistors are not critical — just ordinary ½ or 1 watt "carbon" types.

Constants are chosen so that the frequency response goes down to a very low frequency — less than 1 db. drop at 10 cycles per second, whilst the high frequency response is limited only by shielding, inter-element capacities in the valves, etc. (It goes well up into the radio frequencies.)

The second valve is a 6E5, a triode combined with a cathode ray type indicator. The triode acts as a "detector". If no bias is employed, the grid and cathode of the 6E5 act as a diode, whilst the whole triode section acts as a directly-coupled triode. If a large bias is used, then the triode acts as an anode-bend detector. We found the first system to be the better, especially as one less control is used. Moreover, the first method was less liable to mains voltage variations.

Power Supply.

The third valve is a metal-envelope rectifier, a 5Z4, but any type of rectifier can be used as the current drain (a couple of ma.) is negligible. This low current drain means that filtering is quite easy — there is only one electrolytic (the "second") and not even a choke — just a 10,000 ohm 1 watt resistor. In place of the "first" electro., a .1 mfd. condenser is used, not for filtering, but because we found the transformer buzzed a bit without it. This small condenser should be of 600 volt rating.

To discharge condensers after switching off, a .15 meg. 1 watt resistor is connected across the electrolytic condenser.

Power packs and rectifiers get warm so a large number of smaller holes is drilled in the panel to provide ventilation.

Sensitivity Control.

The range is controlled by tapping the grid resistor of the 6E5. In our original model, it was variable so that we could experiment, but it was found difficult to reset the pointer to the same position each time.

The ranges obtainable are .08, .4 and .8 volts max. For higher ranges the input to the 6J7 could be tapped, i.e., the input resistor for the 6J7 could be replaced by 4 meg., .5 meg., .4 meg., and .1 meg. in series, the latter being earthed. A range with about 4 volts max. would be obtained by connecting the 6J7 grid to the junction of the 4 and .5 meg. resistors, about 8 v. using the next junction, and 40 volts at the next.

Parts Required.

1 yd. 5-wire Cable.
1 only 2 meg. Resistor.
1 Chassis and Panel.
1 13-plate condenser (C1).
2 23-plate condensers (C2 and C3).
1 Dial. 2 Knobs.
1 .0001 Mica Condenser.
1 .25 Condenser.
1 4-Pin Socket.
2 5-Pin Sockets.
1 On-off Toggle Switch.
2 Terminals.
1 Transformer, Audio.
1 Phone Plug, 1 Phone Jack. Coil Wire.
1 S.W. Choke. P.B. Wire. 3 Bushes.
18 Assorted Nuts and Bolts.
6 4-pin Formers.
1 10-ohm C.T. Resistor.

Calibration.

With practice it is not difficult to read the "shadow angle" of the cathode ray tube, especially if a magnifying lens is used. Experimenters should find no difficultly in directly calibrating the instrument to read in, say, centivolts. Calibration can be performed against an ordinary A.C. voltmeter which is connected across a 2500 ohm potentiometer across a 2.5 or 4-volt filament supply. Further reduction of the voltage is made by connecting a

(Continued on page 17)

The Measurement Of Inductance

A discussion of the three main ways of inductance measurement

INDUCTANCE is defined as the ability of a coil, circuit or conductor to have induced in it an electromotive force or voltage when the intensity of the magnetic field linked by the coil, etc., is changed.

As this magnetic field changes when current through the inductance changes, a rise or fall of current induces an e.m.f. in the same inductance. The unit of inductance is the "henry" and a coil or circuit has this unit inductance if one volt is induced in it whenever the current is changing at the **rate** of one ampere per second. If the current is increasing the voltage is in such a direction as to oppose the current and vice versa. The result is that the presence of inductance produces voltages opposing changes in current! This property is utilised in smoothing chokes where pulsating current is to have its wrinkles removed. Now let us consider the influence of inductance on alternating current.

A.C. Effects.

An alternating current is continually changing, increasing first in one direction and then in the other. If inductance is present, voltages are induced opposing these increases, so inductance acts something like a resistance to A.C. But not quite the same! If the alternating current has a high frequency, i.e., is alternating rapidly, then the current is changing more rapidly and so higher voltages are produced to oppose the flow of current.

The opposition offered to A.C. by inductance is called **Inductive Reactance** and is measured like resistance in ohms. Its value is obtained quite simply from the formula

$$XL = 2 \pi f L$$

where XL=inductive reactance in ohms,
π=3.1416,
f=frequency in cycles per second.
L=inductance in henries.

This formula leads us to the simplest method of inductance measurement:—

A.C. Ammeter Method

This method requires an ammeter (or milliammeter) capable of responding to A.C. The inductance to be measured is connected to an alternating voltage (2 or 4 volts for small inductances, 230 volts for large inductances) in series with the ammeter. A current flows and this is registered by the meter; from that the oposition (reactance) offered by the inductance can be calculated by the formula:—

$$XL = \frac{E}{I}$$

where E=alternating voltage
I=A.C. in amperes.

Care must be taken with this method as too high an alternating voltage will cause too much current to flow resulting in destruction of the inductance or ammeter. Now, although this method is so simple, there are catches. First of all, the inductance is not a pure one — it contains resistance for which we have not allowed. If this resistance can be measured separately (by an ohmmeter for example) then it

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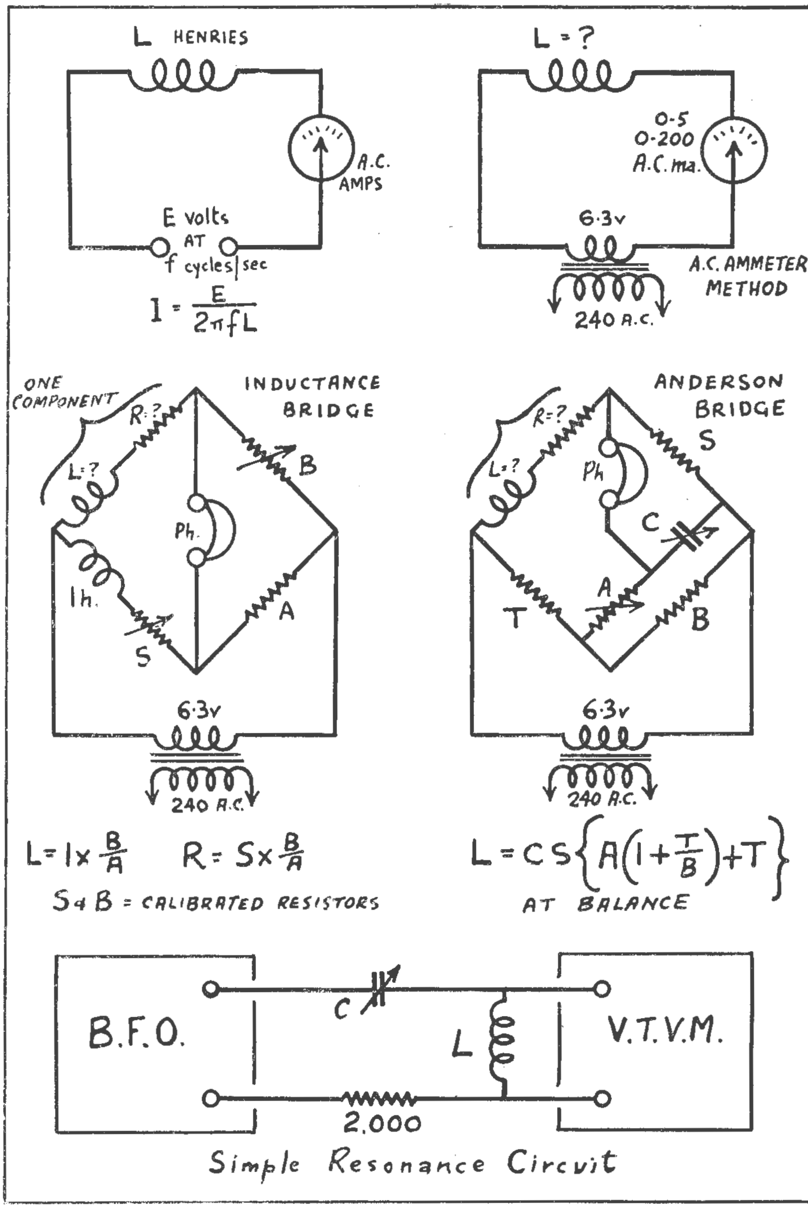

INDUCTANCE

(Continued)

can be allowed for:—

$$X_L = \sqrt{Z^2 - R^2}$$

where

Z=total opposition of coil and resistance and
R=resistance, in ohms.

For most iron-cored inductances, such as speaker primary winding (on the cores, of course) 5-henry or over power chokes and A.F. transformers, the resistance R can usually be neglected and the 230-v. 50-cycle A.C. supply be used. A meter reading 0—5 and 0—200 ma. (A.C.) will cover most of these.

For more accurate measurements, bridge systems may be employed. (We have recently described bridges for condenser and resistor measurement.) Inductances generally require more complicated bridges, as there is both inductance and resistance to be "balanced."

Bridges for Inductances.

In order that both resistance and reactance can be balanced in an A.C. bridge, a variable resistance and a variable reactance must be provided in one or other of the other three arms of the "bridge." For very large inductances, the variable reactance may be a calibrated variable condenser placed in the opposite (not adjacent) arm of the bridge. Alternatively, a known fixed inductance, together with a variable resistance (calibrated to read in conjunction with the resistance of the inductance coil) can be connected in series in an arm of the bridge, adjacent to that containing the unknown.

The first type is exemplified by the Anderson Bridge in which the inductance is balanced by a condenser ("capacitance", to the high-brows), whilst the second is one form of a Maxwell Bridge. The latter is very suitable for servicing work, using a 6E5, or similar cathode ray tube as an indicator. For an A.C. source either 50-hertz current from the mains (via the transformer) or the output of an audio oscillator may be used.

In both these bridge circuits the conditions of balance are independent of the frequency, whilst to obtain an absolutely "null" point, both reactance and resistance must be correctly adjusted. This means that in practice, the one measurement may be used to give both inductance and resistance of the component.

There is, however, still a third method of inductance measurement employing the cancellation of inductive reactance by the reactance of a condenser.

Resonance Method.

When an inductance and a capacity are in series, they both have reactances, but these reactances oppose one another, the nett opposition to A.C. being the difference between their reactances. Inductive reactance increases with frequency whilst capacitive reactance decreases. Hence at a certain frequency, the reactances will be equal and the total opposition to A.C. flow will begin. We should then expect an infinitely large current to flow at this "resonant" frequency, but in practice, there is resistance present, so at the resonant frequency the usual result is an increase in current.

The rule connecting inductance, capacity and frequency for a series circuit is given by

$$f = \frac{1}{2\pi\sqrt{LC}}$$

where f = frequency in hertz (or cycles per second),
L = inductance in henries,
and C = capacity in farads.

If the inductance is unknown and a standard condenser used, whilst the frequency is varied to obtain resonance, then the rule becomes:—

$$L = \frac{1}{4\pi^2 f^2 C}$$

Resonance is shown by maximum current flowing, a pea-lamp, A.C. milliammeter, phones or 6E5 tube being used as a detector.

If a condenser decade-box is available, a fixed frequency (e.g. current at 50 hertz from a filament transformer) may be used and the capacity varied. For variable low frequencies a beat-frequency oscillator and for variable high frequencies an R.F. signal generator may be used.

This resonance method is very convenient for the measurement of small air-cored inductances such as tuning coils and R.F. chokes at radio-frequencies.

Choice of Methods.

For iron-cored inductances, such as power chokes, where only fair accuracy is required, the first method described is most suitable.

For chokes containing large resistances, where better accuracy is needed, the bridge methods are best.

Resonance methods at high frequencies are very nice in laboratories, but are rather difficult for servicemen and experimenters who are unaware of snags such as stray capacities.

We urge all radio servicemen to build up some type of A.C. bridge and become familiar with its use, because bridge methods of measurement are becoming more and more popular in radio work. We plan to describe various useful types of bridges in future issues.

HOME-MADE HI-FI GRAMO PICK-UP

THE great improvements in the fidelity of mechanical recordings which have appeared in the past few years make it possible for the best music to be enjoyed at home under more comfortable conditions than in the average concert hall. The complete appreciation of such, however, demands the greatest absence of distortion in the acoustic output of the gramophone. It is now a relatively simple matter to make the electrical circuits of a reproducing system almost completely distortionless, and, as usual, the weak links are the loud speaker and gramophone pick-up. A pick-up is essentially a device for transferring the vibrations from the record groove to a moving system and then converting these vibrations in electrical output The first process presents the more difficult problem, as we are not able to fix the needle rigidly to the walls

By

G. A. HAY. B.Sc.

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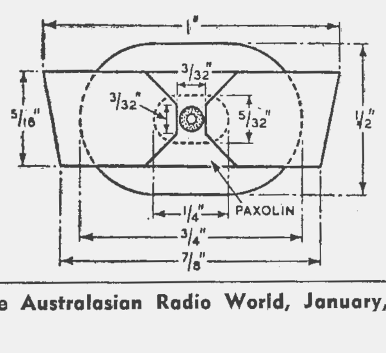
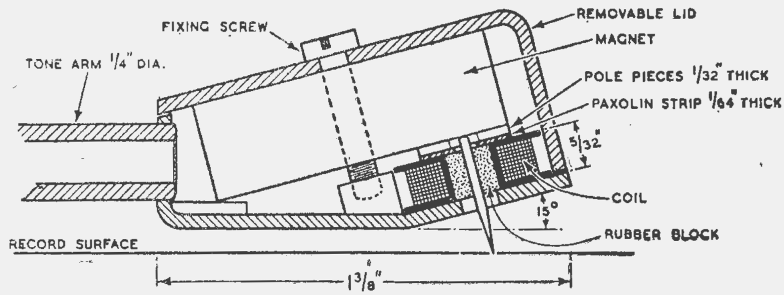
of the groove, but must rely on contact provided by mere pressure. The choice of the value of this downward pressure is important, as it affects the whole design of the pick-up. It depends mainly on two considerations: (1) the wear produced on the record and needle, and (2) the force required to prevent the needle from jumping out of the groove. The first is a function of the **pressure** (i.e., force per unit contact area), and the second depends on the **total downward force** on the needle point.

Needle Contact.

There are three courses open to the pick-up designer. Either we can use a soft needle such as fibre and tolerate needle wear with consequent loss of high notes and general lack of clarity, or we can use a very hard needle such as a diamond point, which will give record wear but no needle wear. The third course is to use a





needle of moderate hardness, such as steel, and allow mutual wear on both record and needle. This seems rather a drastic course, but a necessary corollary is to reduce the pressure at the needle point to as small a value as possible consistent with stable operation.

Downward Force.

Turning now to the force required to keep the needle in the groove, as the record groove is roughly triangular in cross-section, any sideways force produced on the needle point is also accompanied by an upward vertical components due to the inclined plane effect of the groove wall. Assuming the angle of this to be 45 degrees (an underestimate), the downward force necessary will be exactly equal to the lateral force on the needle. In practice it will be advisable to make it many times greater to ensure complete freedom from groove jumping. It has been found with the type of needle suspension discussed below that a downward force of about ten grams is entirely adequate for all modern recordings. Actually, adjustment is provided by the movement of a counterweight.

Factors Relative to Mass.

The mass of the pick-up and arm depends on (a) this downward force, (b) the lateral force exerted by the needle on the body of the pick-up and (c) the possible mechanical resonances of the pick-up as a whole. Factor (a) would seem to indicate an optimum mass of pick-up head equal to the required force on the record surface. This, of course, would result in an extremely light pick-up. Factors (b) and (c), however, indicate that a rather different course should be pursued. In the first place, a sideways force on the needle due to the record groove will first tend to move the needle sideways, and then the whole body of the pick-up. If the mass of the latter is small, then the total resultant angular motion of the needle relative to the body of the pick-up will be reduced by the sideways motion of the arm as a whole. This effect in any practical case will be small, but it can still be further minimised by making the tone arm and head relatively heavy, and counterbalancing by means of a weight. Secondly, the whole bass characteristic of the pick-up depends on its mass, and if we are to avoid a pronounced resonance in the audible bass region we must make the instrument relatively heavy. This point will be elaborated later. The only disadvantage, so far as the writer knows, of a heavy counterbalanced pick-up is that of difficulty in following the groove in the case of a badly warped record. Against this may be set the writer's experience, and that of others, that it requires a very badly warped record to cause groove jumping, and this is likely to be unsatisfactory for other reasons.

Mechanical Resonances.

The mechanical resonances present in a pick-up affect its performance considerably. Such resonances are harmful, not only because they give rise to a large increase in electrical output at the resonant frequency, but also because the increased amplitude of the needle movement causes excessive record wear where notes of the resonant frequency occur. This causes distortion of all other notes existing on the record at that point. There are three possible modes of vibration of a conventional pick-up, (1) the so-called bass resonance, due to the whole instrument vibrating about the tone arm pivot, controlled by the elasticity of the needle in its suspension; (2) the

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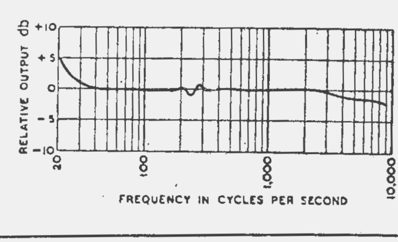

PICK-UP

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torsional vibration of the pick-up head about the axis of the tone arm, controlled in the same way; (3) the treble resonance, caused by the vibration of the needle system about its axis, controlled by the needle suspension and stiffness of the needle itself.

False Bass.

The bass resonance affects the trend of the lower part of the curve materially. Modern recordings have a falling characteristic below 250 c/s to about 14 db. down at 50 c/s. It has been the custom in the past to compensate for this by placing the bass resonance at about 50 c/s, giving a false increase in output, and hence a more or less complementary lift in the bass. Not only does this increase record wear, but the increased amplitude of needle vibration is liable in certain circumstances to cause bad amplitude distortion. The alternative course is to aim at a flat response and correct for the recording electrically in the amplifier. It is impracticable completely to eliminate the bass resonance, and the method of placing it at 15-20 c/s results in the output being well maintained at 50 c/s. No record wear is caused, as frequencies of 15-20 c/s are not recorded. This requires a heavy pick-up and light damping of the needle, the latter also greatly reducing the tendency towards grooving jumping.

The torsional resonance is relatively unimportant, as its effect is inaudible and only measurable if a gliding tone record is used. It will, however, cause record wear, and for this reason it is advisable to reduce it in magnitude as far as possible. The most satisfactory method of doing this, which the writer believes is original, is to make the tone arm axis as near as possible to the surface of the record. This reduces the moment of torsional forces due to the elasticity of the arm about the needle point, and in practice a peak and trough not more than 1 db. high are obtained. With the tone arm about 1-in. above the record surface, this peak was 10 db. high, and other irregularities appeared below the resonant frequency, which had a value of about 250 c/s.

The treble resonance is the most troublesome of all. In the average commercial moving iron pick-up it appears between 2,000 and 3,000 c/s, and causes record wear, excessive and unnatural brilliance, and excessive scratch due to the shock excitation of the needle resonance by the random surface irregularities. There are two methods of driving this up beyond the audible range; either the stiffness of suspension can be increased or the armature mass reduced. We have al-

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ready decided that a free suspension is desirable, and so we must choose the second alternative. The limit is reached when the armature is formed by the needle itself — the so-called needle armature pick-up. By adopting this construction it has been found possible to make the treble resonance of the order of 15,000 c/s, at which frequency it does no harm.

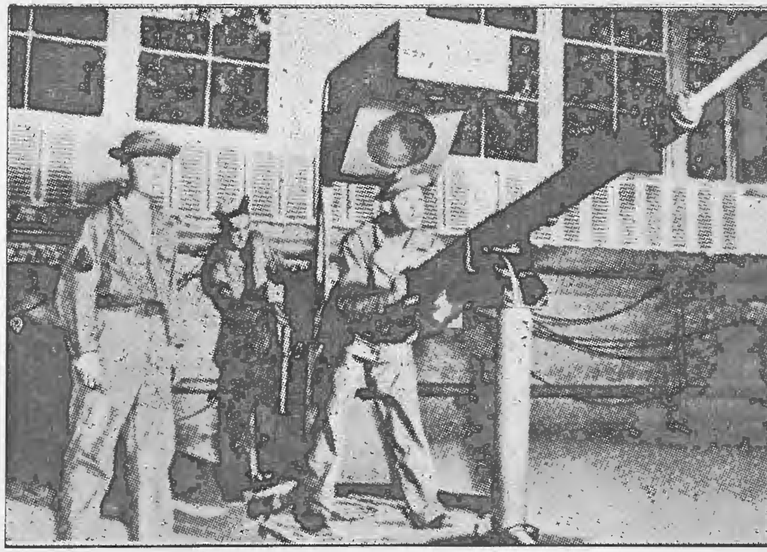
Finally, the pivoting arrangements must be considered. In order to reduce record wear on the sides of the groove, it is essential that the pivots should be of the highest quality, both laterally and vertically, and in practice ball bearings are necessary. Moreover, the turntable must be dead level to reduce any tendency for the pick-up to swing and press against one wall of the groove more than the other.

Turning now to the final design, the following is a brief summary of the requirements. The pick-up as a whole should be relatively heavy, pivoted very lightly, the bearings being exactly horizontal and vertical, and counterbalanced to reduce the downward force on the needle point to about ten grams. The needle, which should fit the groove closely and also act as armature, should be of small dimensions and mass, and consist of a suitable magnetic material. It should be suspended in a magnetic field by a fairly light but well-damped suspension, and the clearance between needle and pole pieces must be relatively large to reduce amplitude distortion. The tone arm should be as near to the record surface as possible to reduce the forces tending to stimulate torsional resonance.

Design Details.

The design shown in Fig. 1 has been found to cover the above requirements, and to give remarkably good reproduction. The magnetic field is provided by an "Eclipse" horseshoe magnet which is roughly 1-in. in diameter and 3/8-in. thick. Any reasonably small magnet taken from an old pick-up will serve the same purpose, although the dimensions of the case will have to be adjusted to suit. The pole pieces and coil form one unit, the former being cut out of 1/32-in. Stalloy transformer laminations to the shape shown in Fig. 2. These pieces are cemented on to a paxolin supporting piece, which has a hole cut in the middle to clear the needle. This piece is cemented in turn to the coil, which in the writer's model was removed from an old B.T.H. Minor pick-up. Suitable data are given in Fig. 2 for a similar coil if this has to be wound.

The needle is embedded in a rubber block, being held in place merely by the friction between the needle and rubber. Originally an interchangeable unit was used, the whole unit, rubber and all, being removed when changing the needle. This was subsequently found to be unnecessary, and the latest model consists of a permanently fixed rubber block into which needles are pushed, being held by a pair of fine-nosed pliers. When inserting the needle for the first time into the block, it is essential to take the greatest care to place the needle centrally between the pole pieces, or amplitude distortion will result. Subsequent insertions will follow the original hole if reasonable care be taken.



When teaching how to fire the guns, the sounds of battle are realistically reproduced from a power amplifier; a novel idea from the U.S.

Choice of Needles.

The needles originally used were the H.M.V. Silent Stylus miniature type, but the Columbia Type 99 are exactly equivalent. The type of rubber has naturally a big effect on the response, and it has been found that the rubber used in pencil erasers is the most suitable. In the writer's experience there is little deterioration in high note response after fifty 12-in. playings on heavy orchestral records, and this probably represents a good compromise between quality and economy. The rubber block will eventually need renewal, but this will certainly not be necessary more than once a year with fairly constant use.

The pole pieces are not fixed to the magnet poles, but are merely held down by magnetic attraction. In addition, the bolting down of the cover on top of the magnet clamps the whole assembly together and down to the base-plate. The tone arm consists of a ¼-in. diameter brass tube, soldered into the brass pick-up case, and bent horizontally to give correct tracking. The use of a longer arm than usual is beneficial in reducing the angle of inclination of the pick-up to the tone arm axis, and thus reducing the overhang of the needle point over the turntable axis at the centre of the record.

With a tone arm 11½-in. long, the pick-up must be inclined to the tone arm axis at an angle of 18 deg., and the needle must be ½-in. in advance of the record centre; the tracking error is then about 1½ degrees.

Trailing Angle.

The trailing angle of the needle is important. The cutting stylus used in recording is vertical, and it is reasonable to suppose that best results would be obtained with a vertical reproducing needle. Actually, the best compromise between high note response and scratch seems to be obtained with an angle of about 15 degrees from the vertical.

The pivoting arrangements in the writer's present instrument are not satisfactory. They consist of inferior ball races as fitted to medium quality pick-ups, and a relatively big force is required to move the pick-up sideways. It is particularly important that the vertical movement should be free, as the heavy counterweight imposes a relatively large downward force on this pivot. Connection to the coil is made by means of a single cotton-covered stranded flex, to give freedom of movement. The earthy end of the coil is connected to the metal frame of the instrument. The case is built up of 1/16-in. brass sheet, bent and soldered, this in conjunction with the magnet giving a satisfactorily large mass. The counterweight was cast in one-half of an aluminium container in which 35 mm. Leica films were sold: it is merely a tight push fit on a brass

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THE N.Z. ALL-WAVE TWO-VALVE SET

Originally described in the 1939 Lamphouse Annual (published by The Lamphouse, 11 Manners Street, Wellington, N.Z.) this little two-valve set has proved to be a wonderful little job for headphone use. One of its biggest attractions is the extremely low voltage necessary for the B supply. Full-powered results are obtained with from 12 to 16 volts plate supply.

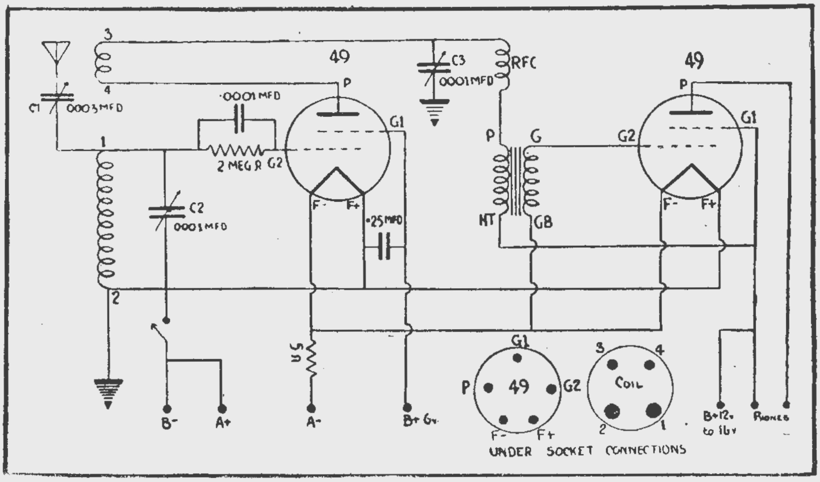
Commence by mounting all the components on the chassis and panel as shown in the illustration. The audio transformer is mounted so that the correct terminals come opposite the holes marked G, GB, HT and P on the under-chassis diagram. Do not as yet attach the panel to the chassis, but you can solder the leads to C1, C2 and C3, leaving them long enough to connect to their respective destinations under the chassis. Also wire the moving plates of C1 (which are insulated from the panel by means of two of the insulating washers provided) to the fixed plates of C2. The moving plates of C2 and C3 are also connected, the lead from these being left long enough to pass through the chassis to earth. The aerial series condenser should have the outside rotor plate bent in a little, so that when the plates are fully enmeshed it will touch the stator plate, thus shorting itself out. Turning now to the chassis, wire up the components as shown in the diagrams. Always try to do your wiring from the schematic diagram, not the under-chassis diagram. Note particularly the connections to the coil socket. If a two-volt accumulator is to be used in place of the two only 1½v. dry cells for the "A" supply the A negative resistor (5 ohms) will not be required, the A lead being taken direct to the valve socket. If you are unable to obtain a 5 ohm. resistor, you can use a centre-tapped 10 ohm one, connections being taken from one end and the centre tape. You can now attach the panel and phone jack, which must be insulated from the chassis with two insulating washers. As you are wiring in the battery cable, make a note of the colours and their battery connections, such as "Red A," etc.

The Coils.

These are close wound on 1¼-in. former with 1/8-in, spacings between the grid and reaction coils. All coils must be wound in a clockwise direction and connected to the correct base pins. See Coil Connection illustration. Gauge 26DCC is used for the short-wave coils and gauge 32 or 34 enamel for the broadcast coils. If heavier wire is used for the BC coils difficulty will be experienced in getting all the turns on the former. On the BC coils, the reaction is wound over the grid coil at the bottom end, being separated by a piece of paper wrapped round the grid coil and gummed in position. The larger reaction coils are necessary because of the low "B" supply.

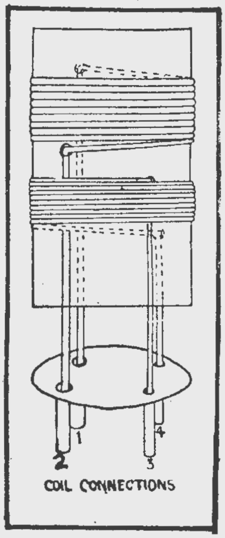
Coil Details.

	Grid Coil	Reaction Coil.
20 metre band ..	5	6
40 metre band ..	10	9
80 metre band ..	22	14
160 metre band ..	45	21
165 to 22 metres .	165	30
210 to 350 metres .	210	38



Operation.

Having connected up the batteries, aerial and earth, plug in the phones and switch on the set. The reaction condenser (C3) should only be in sufficient to produce a faint rushing noise in the phones. The aerial condenser (C1) is used on the broadcast coils to obtain greater selectivity, and the short-wave coils to remove blind spots and ensure smooth oscillation over all the wave-lengths. If the set oscillates uncontrollably, it will be necessary to



remove some of the turns, one at a time, from the reaction coil. On the short-wave coils, only remove turns if moving the reaction coil further away from the grid coils does not produce the desired result. In tuning, turn the tuning condenser (C2) slowly and listen for station whistles. When a station is located, the whistle will change its note as the receiver is tuned over and past the station. When such a whistle is heard, tune till it is lowest in note and decrease the reaction condenser. The whistle will either get a little higher or lower, but re-tune as reaction is being adjusted until oscillation just stops. The station will now be heard clearly on music or speech. Do not allow the set to remain oscillating on a phone station. This will cause trouble with your neighbours. If the set goes out of oscillation with a loud howl, reducing the "B" voltages will remedy the complaint. When the "feel" of the tuning and reaction coils is found, the aerial coupling condenser should be adjusted. This will probably require further adjustments to both C2 and C3. The smaller the capacity left in C1, the better local

(Continued on page 26)

Radio Nails For Plywood

THE "tacking" of plywood, plastics and other industrial materials with "radio nails" — an almost instantaneous method of spot joining thin sections of material — is made possible by one of the newest electronic developments of the Radio Corporation of America.

The so-called "radio nail" is a discharge of high-frequency current which can be directed through a sheet of material, generating a quick and intense heat in its path. When two sheets of material are placed together with a coating of plastic glue between them, heat thus induced can be used to form a bond at the point of application.

The "radio nail gun" or spot gluer which RCA has developed is an experimental device which has not as yet been offered commercially, but its operating principles bear promise of varied industrial usefulness. One field of use now foreseen, for example, is in the fitting together of thin veneers in the manufacture of moulded plywood aircraft parts.

The radio nailing outfit in operation.

Before assembly, such sheets are coated with plastic glue. They are then "laid up," one at a time, on a wooden mold, and each sheet is cut and trimmed to fit the mold before the next one is applied. To prevent shifting of the veneers during this operation, the conventional procedure is to tack each sheet in place with metal tacks or staples, which must be pulled and reset as each successive layer is added to build up the preformed piece. The use of "radio nails" in place of metal fasteners would eliminate this tedious and time-consuming procedure.

Resembling a short-barreled automatic pistol or a narrow-based electric flat-iron in the two styles thus far designed, the "gun" or applicator is attached by a cable to a portable radio-frequency generator. Manoeuvrability is enhanced by the use of a principle which makes it possible to locate both electrodes in the "muzzle" of the gun, whereas earlier dielectric heating devices have required passage of the material to be heated between the two electrodes.

In the spot gluer, a pin extending lengthwise down the centre of the barrel forms one electrode, while the casing of the barrel is the other. In operation the muzzle is pressed against the material over the spot to be bonded and the current is applied by pressing the trigger. Since the material to be bonded is a better conductor than the air between the pin and the casing of the barrel, the current, following the electrodes, follows a curved line through the material.

In laying up veneers on a molding form, as well as in some other operations, it may be desirable to advance the resin only enough to set the glue to a thermoplastic state — a sufficient bond to prevent accidental shifting of the sheets while handling, but with enough flexibility to allow for necessary shifting when pressure is applied to effect the permanent bond.

BAND-PASS AND PRE-SELECTOR UNIT

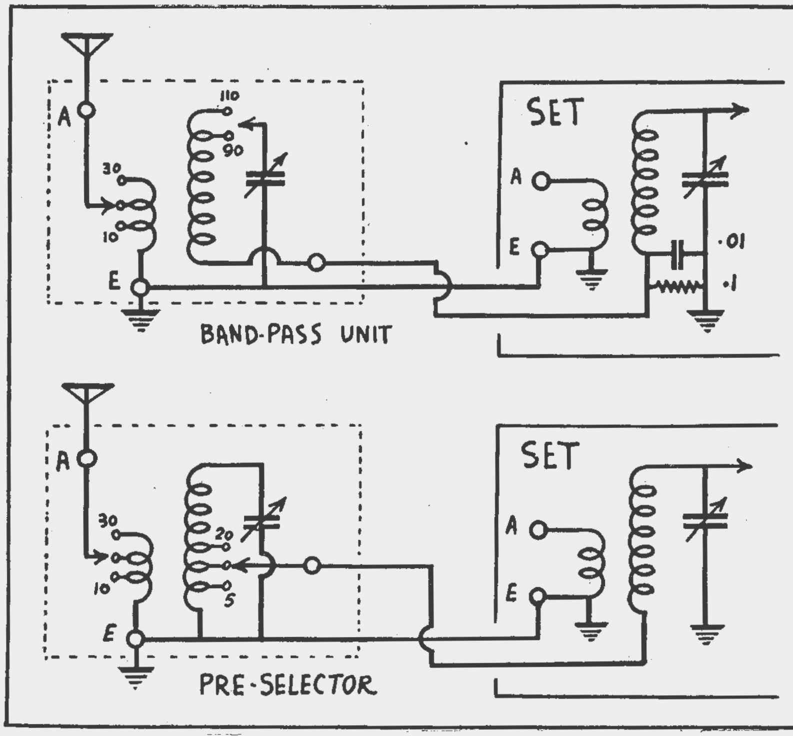
Simple devices for improving the selectivity of simple T.R.F. and regen.-det. receivers.

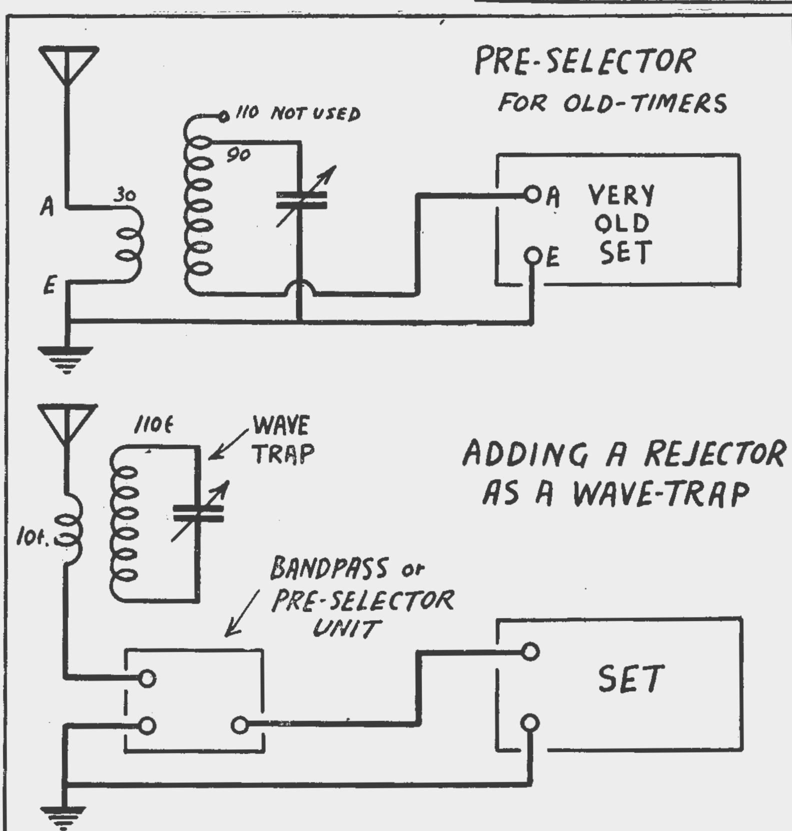
ALTHOUGH the circuits of the two units here described are similar, their modes of actions are different. So are the ways in which they are connected to the receiver. The band-pass circuit actually increases the width of the band of frequencies received, but aids station separation by providing a sharper cut-off at the ends of the band.

The preselector unit on the other hand has a negligible effect on the band-width (due to its different method of coupling) but increases the sharpness of the resonant peak. As the circuits are quite similar, it is easy to change from one to the other, so the experimenter can try both ideas. At the end of the article it shown how to include a wave-trap to help still further in removing unwanted stations.

Band Pass Unit.

Each circuit includes a coil and tuning condenser, and for best results the





coil and condenser should be of the same types as in the receiver. If these cannot be obtained then a coil can be wound as shown in the diagram, and a good-quality secondhand variable condenser of about .0004 to .0005 mfd. maximum capacity will do the trick.

The connection of the bandpass unit to the receiver is achieved by breaking the earth return of the first grid coil and inserting a fixed condenser shunted by a .1 meg. resistor, the size of the condenser depending upon the selectivity required. A large condenser such as .1 mfd. gives greatest selectivity, but results in a loss of signal at the high-frequency end of the broadcast band Generally about .005 to .02 mfd. will be about right.

The junction of the grid coil and condenser and resistor is connected to the 'output" terminal of the bandpass unit. In the coil data given, a number of aerial tappings are specified so that either a long aerial or short aerial may be used. (The aerial or primary winding of the first coil in the receiver is disregarded.)

When using the bandpass unit, its dial should be rotated in unison with that of the receiver. After a station is received, both set and bandpass unit should be carefully adjusted so that the dial readings can be noted. Altern-

(Continued on next page)

BAND-PASS
(Continued)

atively the stations can be marked on the dial of the unit.

Preselector Unit.

This circuit uses the same "one-gang" condenser and coil as the band-pass unit but the method of connection is different. Again the earth return of the receiver's first grid coil must be broken, but this time no condenser or resistor is inserted. Instead the circuit is completed by connecting the free end to the "output" terminal of the preselector, which goes to a tap on its tuning coil. An alternative system if the set is a very old one with a low-impedance aerial coil (one of only a few turns) is to leave the receiver grid coil intact and complete the preselector tuning circuit through the aerial coil of the receiver.

The preselector unit is used in the same way as the bandpass unit, but generally results in a greater loss of volume, the actual loss being dependent on the accuracy and care with which the unit is adjusted.

Wave Trap.

Where only one station is interfering, its strength may be reduced by inserting a wave trap in the aerial circuit (ahead of the bandpass or preselector unit). This wave trape consists of an oscillatory circuit (i.e., a coil and condenser) coupled to the aerial lead-in by a primary coil of about 10 or 12 turns. This wave trap acts as a rejector circuit, and so is tuned to the interfering station by means of an adjustable condenser (sometimes a trimmer condenser can be used for a station at high-frequency end of dial or a padder for a low-frequency station). If a wave trap is employed, the entire tuning system of both bandpass (or preselector) and receiver must be carefully shielded to prevent pick-up after the wave-trap.

Tuning Coil Data.

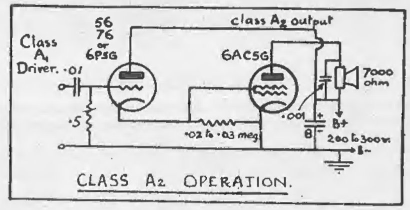
An ordinary Reinartz coil such as turned out by Crown or R.C.S. may be used or a coil can be wound as shown in the diagram. For the secondary, about 110 turns of 32 gauge enamelled or silk-covered wire are wound on a former one inch in diameter. Tappings are made at the fifth, tenth and twentieth turns and at the 90th turn. Over the start of the coil, or farther along on the tube, another winding, the aerial coil, of thirty turns (tapped at 10th turn) is wound. This gives us quite a wide variety of changes. For a former a bakelite tube or a waxed or shellacked cardboard tube may be used. A copper or aluminium can from an old 1930-32 coil makes an excellent shield.

UNPUBLISHED VALVE DATA

This Month: Class A2 Operation.

WHEN opportunity affords, we make a point of giving our readers something worthwhile in the way of valve data — something it is very difficult to get. After all, valve socket connections and standard ratings are obtainable from the various makers or their agents.

This month we show how a valve normally employed for Class B2 operation can be made to give Class A2 operation. Ordinary class A is really class A1, the suffix ( )which means no grid current) being generally omitted. It is not usually realised that **a single tube can go into the positive grid region without distortion!** There are snags, however. Either a coupling transformer must be used (to allow appreciable grid current) together with negative feedback to reduce the distortion or else special valves must be used. In this month's circuit we show the latter method. A low-mu triode of the 76 type is directly cathode coupled to the double-grid of a hi-mu triode. The coupling resistor is not critical and is there mainly to prevent current surges and blocking — it can even be removed once the valves are warmed up! Most of the current for the 76 cathode is obtained from the grid current of the output tube.



CLASS A2 OPERATION.

This pair of tubes may be used to replace an ordinary 6F6 or 42 output tube with improved tone. The output load in very uncritical, unlike most output systems. Even if the output load is doubled (as it is at a certain bass frequency and in the "highs") the power output changes by less than ½ db.

It is noteworthy that valves can (or **could!**) be obtained with both class A1 driver and class A2 output in the one bulb.

SHORT-WAVE COIL WINDING DATA.

The following table is a handy guide to short-wave coil construction and holds good for coil formers of from about three-quarter inch up to an inch and a quarter. Length of associated wiring will have an influence on the actual wave-length covered, but the table is accurate enough to be useful.

Wave-Range.	Aerial	Detector. R.F.	Grid.	Reaction.	Gauge
150 mmfd. Capacity—					
12 to 19 metres	3	3	3	3	16 enamel
19 to 39 metres	4	6	6	6	24 ,,
29 to 51 metres	8	15	15	9	24 ,,
45 to 84 metres	10	26	26	11	24 ,,
70 to 110 metres	10	33	33	12	24 ,,
100mmfd. Capacity—					
12 to 17.5 metres	3	3	3	3	16 ,,
17 to 26 metres	4	7	7	5	24 ,,
25 to 38 metres	6	10	10	7	24 ,,
37 to 55 metres	7	16	16	8	24 ,,
54 to 85 metres	8	25	25	10	24 ,,
84 to 115 metres	10	34	34	12	24 ,,
75mmfd. Capacity					
12 to 17 metres	3	3	3	3	16 ,,
17 to 24 metres	4	7	9	5	24 ,,
23 to 35 metres	5	11	11	7	24 ,,
34 to 51 metres	7	17	17	8	24 ,,
50 to 78 metres	10	26	26	10	24 ,,
77 to 100 metres	10	35	35	11	24 ,,
50mmfd. Capacity—					
12 to 16.5 metres	3	3	3	3	16 ,,
16 to 22 metres	4	6	6	5	24 ,,
21 to 32 metres	5	10	10	8	24 ,,
31 to 45 metres	6	16	16	10	24 ,,
44 to 65 metres	8	23	23	12	24 ,,
64 to 95 metres	10	36	36	12	24 ,,

How To Make A Ribbon-Type Microphone

THIS microphone, if properly constructed will give results equal to a purchased product. The construction is quite simple and is an ideal piece of apparatus to own. It can be used for professional work and also for home use. The cost is negligible.

The back plate consists of a piece of brass or copper of the dimensions shown and can be of any thickness from 1/8--in. upwards. The area covered by the ribbon is closely drilled with 1/16-in. or slightly larger holes. The front of the plate is then carefully polished or buffed to remove ragged edges and scratches.

The ribbon, consisting of tinfoil, is

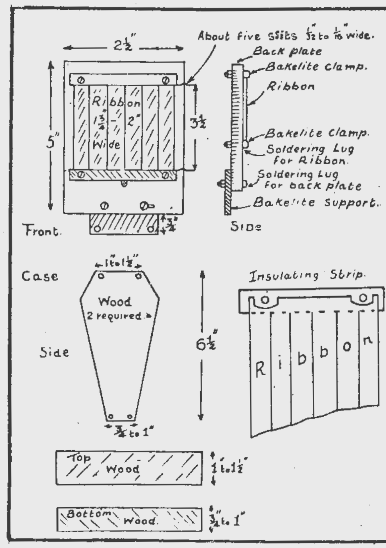
By
H. VERNON WHEATLEY.

2¼-in. wide and has approximately five slits about 1/32-in. to 1/16-in. wide, cut lengthwise for 3½-ins. The slits can be cut with a sharp razor blade, and should be fairly equally apart. Allow sufficient foil at each end to place under the bakelite clamps. These clamps can be made to suit the constructor and can be of any width up to ½-in. Personally, I made mine ¼-in. wide and 3/16-in. thick, and as long as the ribbon is wide.

Drill two holes at the top and bottom of the back plate, clear of the 1/16-in. holes, to accommodate the ribbon clamps. Drill the clamps to correspond with these holes.

Now we come to the most important part. Again examine the backplate for ragged edges and scratches, and make sure you have drilled the holes to bolt on the bakelite support at the bottom. If o.k., paint on the front of the plate, two or three coats of insulating varnish. Insuvarn is ideal for this purpose.

When thoroughly dry, the unit can be assembled. Cut two strips of thin empire cloth, very thin celluloid, medium weight brown paper, or, best of all, very thin mica, the size of your two bakelite clamps or just larger. Place these in position and lay your tinfoil ribbon in place. Carefully cut the ribbon to clear the clamping bolts at the top and bottom. Place the clamping strip in position at the top, and bolt. Carefully smooth the ribbon and put the bottom clamp in place. Insert a small strip of copper between the ribbon and clamp, allowing it to project. Bolt clamp, and the projecting piece of copper is your connection to the ribbon. Affix next your supporting bakelite bracket at the bottom. A solder lug under one of these bottom bracket holes makes your back plate connection. Make sure you scrape off any varnish that may be on the bolt.



Case Construction

The case may be constructed to individual design, a simple one being made as shown with wood of a suitable thickness. The bottom piece is made of thicker wood than the rest of the case, as it had to support two small brackets that are bolted to the bakelite support of the microphone unit. (Note.—Screw these brackets on to the bottom piece of wood before you assemble the case. You'll save yourself a lot of trouble!) Once the case is assembled, assemble the unit inside after you have soldered the necessary cable to the unit. Use a **shielded** cable. The front and back of the microphone case is then covered with wire mesh, perforated aluminium or zinc. Rob the family meat-safe if necessary. A coat of enamel finishes the job. A stand for the microphone is easy to think up, so I'll leave that to the constructor. The shielded cable is earthed.

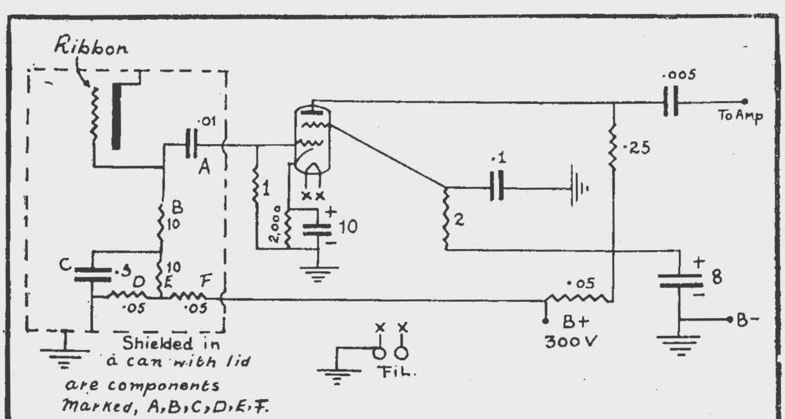
A pre-amplifier is shown below.

The power supply for this pre-amplifier can be taken from your amplifier or receiver. I, myself, used a separate supply, but this is unnecessary.

Finally, for close talking 150 to 350 volts is applied to the mike, and for speaking away, utilise 50 to 150 volts.

N.B.—The ribbon of the microphone doesn't have to touch the back plate, neither does it have to be far away from it.

—"N.Z. Radiogram."



Circuit of microphone unit and pre-amplifier stage.

V.T.V.M.

(Continued from page 6)

10,000 ohm and a 40,000 ohm resistor in series and feeding the voltage across the 10,000 ohm part to the V.T.-V.M. so that it gets one-fifth of the voltage across the meter.

This V.T.-V.M. we have here described is highly sensitive as even a millivolt produces a perceptible change. It makes an ideal detector device for any type of A.C. bridge and we hope to describe an A.C. bridge embodying such a device.

The particular instrument shown in the photograph is one built by students of the Physics School of Melbourne Technical College.

PICK-UP
(Continued from page 11)

rod forming a back extension of the tone arm, enabling small adjustments to be easily made.

Hum.

Due to the all-metal construction of the case, troubles from electrostatic pick-up are negligible. There is a certain amount of magnetic hum pick-up from power transformers, however, and, although not noticeable during playing on account of the low sensitivity and the high gain needed, this is rather troublesome to get rid of completely. Experiments with humbucking coils have not so far proved successful in reducing this to zero, but screening with Mumetal would probably be effective.

The response curve given by the author's pick-up is shown in Fig. 3. This is the actual output from a Decca EXP55 test record corrected below 250 c/s. for the constant amplitude characteristic. The region between 6,000 and 8,000 c/s and the torsional resonance were deduced from an H.M.V. gliding tone record, DB4037. The average output from normal orchestral records is of the order of 10 mV RMS, Although measurements above 8,000 c/s were impossible, it is believed that the treble resonance lies at about 15,000 c/s, and being used in conjunction with a speaker with an excellent top response, gives rise to excessive scratch. It has been found that most recordings are improved by a gradually falling characteristic in the treble, and this greatly reduces the effect of the treble resonance. In additions, full compensation in the bass is required.

In use, the pick-up gives a high degree of fidelity. Top response, as judged by the upper strings, is excellent, while double basses and organ pedal notes are reproduced at correct pitch, instead of an octave higher. A musical, but non-technical friend, who is also an organist, has discovered pedal notes on organ records which he has never heard before using a crystal pick-up. Due to the large gap, audible harmonic distortion is entirely absent.

There is only one fault: bad records do really sound awful. Perhaps this is not such a disadvantage, after all?

BROADCASTING SYSTEM ON BATTLESHIP

It is now revealed that the 35,000 ton battleship "Anson," which was recently announced to be at sea, took five years to build. The electrical equipment in the ship would serve to light a large town. There is a cinema, a room for the ship's band and an internal broadcasting system. Telephone exchanges serve some 500 telephones throughout the ship, and there are postal services with pneumatic transmission. Two and a half million rivets were used in building the ship.

REVIEW OF RADIO WORLD

NOT JUST YET

Some interesting views on the future of television were expressed recently by the well-known radio journalist, known as "Diallist," who writes in the English "Wireless World":—

"There is the other old stager about television in every home when peace is with us again. I do not doubt that there will be a huge increase in the number of privately owned television receivers, especially if television programmes become such that everybody wants to enjoy them. But frankly I cannot see the television set being taken, in the near future, out of the luxury class, as was possible with the wireless set at quite an early stage in its development. By the time that broadcasting had begun in this country it was possible to make a crystal receiver for a very modest outlay. But there is no equivalent for the crystal set in television, whose receiving equipment, so long, at any rate, as we work on present lines, must always require a cathode-ray tube and a comparatively large number of valves. Our manufacturers must have learnt a lot about the mass production of tubes and valves during the war, and no doubt all kinds of new machinery have been installed for the purpose, but I do not see prices coming down all that much. I would be inclined to put the lowest price for a sound-and-vision receiver with a small tube at about £25, and the public showed years ago that it was not attracted by small viewing screens. On the whole, we can feel fairly safe in prophesying that it will be some little time before the number of television sets in use is as great as the present number of wireless receivers — and the day of television in every home is still farther off than that.

REDUCED SURFACE LOSSES

It is well known that high frequencies travel on the surface of a conductor, and in certain short-wave apparatus the coils and some other components are silver-plated to ensure high conductivity which will not be marred by oxidation. In some cases experimenters have attempted to obtain the desired effects by using ordinary brass or copper components and polishing with a chromium "plater" or similar liquid artificial plating chemical. The majority of these chemicals are, however, mercury in solution, and although when first applied they may fulfil the desired purpose, there is a risk of deleterious chemical action at a later date which will be worse than the trouble which it is intended to overcome. A better plan is to clean the parts very thoroughly and then paint with clear lacquer or celluloid in solution to prevent oxidation.

MISUSE OF VALVES

With the growing use of valves in heavy engineering equipment and other "non-radio" applications, cases of failure are being reported from causes which could have been avoided if the responsible designer had realised that valves are not always miraculous fool-proof devices. Many are highly individualistic types whose idiosyncrasies must be studied and allowed for if the valves are to function reliably and without fuss.

To help newcomers to avoid the grosser errors which might result in valve failure, the British Radio Valve Manufacturers' Association has drawn up a code of practice covering such points as method of mounting, provision of ventilation, heater voltage regulation, heater-cathode insulation, control, screen and suppressor grid voltages and their method of application. Although most of the precautions indicated will be observed as a matter of course by radio designers, some may be new and there are a number of details, such as heater-cathode potential difference, maximum glass temperatures and permissible percentage heater voltage variation, the values of which may have slipped the memory.

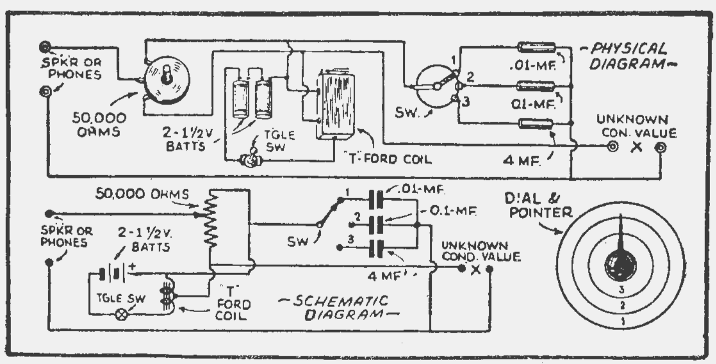
ELECTROENCEPHALOGRAPHY

From an editorial in the British journal "Electronic Engineering," we learn that the electroencephalogram was admitted as medico-legal evidence in a recent murder trial. Records of brain waves were examined by the jury and presumably aided them in reaching a verdict.

More to the point are two paragraphs supporting our own view with regard to the possibilities of employing radio equipment for the study of mental and nervous ailments. Mr. Parr, the editor of "Electronic Engineering," has this to say:—

"We are all fundamentally composed of the same kind of electrons and whether they move in conductors or in nervous tissue they are subject to the same laws. Already electrical analogies have been made to explain certain phenomena in the human organism. Is it too much to hope that a complete analogue of the nervous system could be evolved and with it the explanation of much that is still the subject of speculation?

"If the problems are attacked by the physiologist in close collaboration with the electron engineer it is probable that they will be solved in less time, and the viewing of many obscure phenomena from the electrical point of view may provide the clue that the physiologist is seeking."



CONDENSER TESTER

A portable condenser tester may be made from a few odds and ends found in most junk boxes. The circuit shown is a variation of the Wheatstone bridge. A pair of phones or a loud speaker are connected to the output jacks and a condenser of known value (between .01 and .1 mfd.) shunted across the input. The selector switch during this procedure should be set to position 1. The 50,000 ohm potentiometer should be adjusted for minimum sound in the speaker or phones. Condensers of known value are then placed across the input jacks and the potentiometer adjusted for minimum response for each. The first scale of the dial is calibrated by hand during this procedure, the minimum response point indicating the capacity of each known condenser. This calibration should be repeated with a series of known condensers for the second and third range and the corresponding scales on the dial calibrated.

To test an unknown condenser simply connect it across the input terminals and adjust the potentiometer and the selector switch until the sound is weakest, then read the value of the condenser from the calibration on the dial.

.."Radio and Television, U.S.A.

Shortwave Review

CONDUCTED BY

L. J. KEAST

NOTES FROM MY DIARY—

YES, WE HAVE NO BANANAS

Yes, and we have no Fiji broadcasts either. Just after conducting a series of tests and producing a splendid signal from 4.55 till 9 p.m. on 6.13 mc., VPD-2 faded out as quickly as it came. But I am told the withdrawal is only for a short period. I am sure their return will be welcome, particularly if they continue to relay the favourite American transcriptions.

Mr. Arthur Cushen, of Invercargill, writes me that he received a fine card from KGEI verifying his report on their 7.25 frequency. He says the card shows Transmitter House, and a new Box Antennae. Arthur's total of veris. must now nearly reach that of Flying Officer Ray Simpson.

Talking of KGEI reminds me they are back again on 15.53 mc., 19.57 m. I do not know their schedule, but when closing at noon it is given in full.

BY KILLARNEY'S . . .

I almost said, Lakes and Fells, but read on: No! all that timber you see at Killarney ,Queensland, is not for an American Military Hospital. That, together with those many coils of wire, those boxes of insulators are for the listening-post of Dr. Gaden, who, from the flat in the West (and later a flat in Brisbane) has moved to the hills of Killarney, and from 1700 feet above sea level will send to this magazine news of the Cubans, Central and South Americans and those other hard-to-getters.

AMERICAN NEWSLETTER

Prepared by Columbia Broadcasting System and read by Dave Hamilton, this is a nice start for the day. It is at present coming through very well on either WCRC 11.83 mc., 25.36 m., or WCBX 15.27 mc., 19.64 m. at 7 a.m. I prefer the former for signal strength and clarity.

NEW YEAR RESOLUTIONS

Notwithstanding all the good resolutions for what we trust will be Peace Year, I must complain of the very poor quality of the BBC Radio News Reel. I am not referring to the subject matter, but the processing. Sometimes almost half of it should have been scrapped as it is nigh impossible for even a regular listener to follow it. Sounds to me as though some substitute for the old record base is being used.

. . .

And while on the BBC, have you noticed the metronome that appears to be in the background when the 10 p.m. news is read?

A BREATH OF THE PAST

An air mail letter from Flying Officer Ray Simpson reached me on Christmas Eve. As usual very brief (only time he is verbiose is when sending a report overseas for verification), but it was great to hear from him. I am sure we all hope this year will see he and all other soldiers home, and for good.

SHOULD WE COMPLAIN?

And another soldier who was a great DX-er writes. I have not the least idea where he is, but Sgt. Raymond K. Clack, in a most interesting letter, gives some idea of listening conditions presumably under the sheltering palms. Amongst other things this is what he says, "Listening conditions here are terrific. It may not be so bad on frequencies above 7.5 mc., but below that one has to rely on VLQ and VLQ-2 for anything of entertainment value, although GRM, 7.12 mc., in the Pacific Service is not so bad at times.

"Noise level is terrific. Just try and take as a comparison the 49 metre band at its noisiest in Sydney and multiply that noise by three or four times and you'll have some idea of the noise level here on frequencies between 7.5 and 3.5 mc. Add to that a high atmospheric moisture content, which, by affecting coils, etc., causes a receiver to drift, and one has another difficulty with which to contend." Should WE complain?

ALL-WAVE ALL-WORLD DX CLUB

Application for Membership

The Secretary,
All-Wave All-World DX Club,
243 Elizabeth Street, Sydney.
Dear Sir,

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

Name ....

Address ....
(Please print both plainly) ....

....

My set is a ....

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

(Signed) ....

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

NEW STATIONS

KWIX, 'Frisco, 11.87 mc., 25.27m.: First heard December 2. Another outlet for the Associated Broadcasters and from opening at 6.30 p.m. when it joins its sister station, KWID, in French, puts in a very fine signal untily about 8.40. At that hour VUD- the new All India Radio Station in Delhi, switches on his carrier, sometimes a little earlier, and being on the same frequency it is a fight for best signal. Odds are in favour of KWIX and they can be generally copied till closing at 9.15. Report are asked for, so, you veri.-hunters, get busy.

AFHQ, Algiers, 18.025 mc., 16.64 m.: This further outlet for The United Nations Radio is mentioned by Mr. Matthews, of Perth. They open in good strength at 10.20 p.m.

AFHQ, Algiers, 11.883 mc., 25.24m: Mr. Ted Whiting (Radio & Hobbies) tells me of this one. Opens at 7.57 p.m. with anthems. A BBC relay is given at 8.15.

WRUA, Boston, 7575 kc., 39.6m.: At time of making this note I have not heard the new transmitter for the World Radio University. When listening to WRUA on 26.92 m. the other morning I heard the announcer say on closing at 7.30 they would re-open in fifteen minutes on 7575 kilocycles.—L.J.K.

VWY, Kirkee (India) 17.94 mc., 16.72m.: This is another new one submitted by Mr. Matthews, of Perth. He heard them at 10.30 p.m. calling the BBC.

(continued on page 22)

Shortwave Notes and Observations

AUSTRALIA

In the second transmission to the British Isles, VLI-2 has been replaced by VLI-8, 17.80 mc., 16.85 m. This is fortunate as it leaves the new KWIX in the clear for an additional 15 minutes, excepting that our friend VUD- in Delhi, puts his carrier on long before 8.45 p.m.—L.J.K.

VLG-2, 9.45 mc., 31.45m. closes at about 2.38 p.m. with "Star Spangled Banner" and "God Save the King."—L.J.K.

OCEANIA

New Caledonia

FK-8AA, Noumea, on 6.20 mc., 48.39 m., is still going great guns in the two schedules of an evening.—L.J.K.

FIJI

VPD-2, Suva, on both 25.22 and 48.94 m. seems to have closed; not heard since 29th November.—L.J.K.

AFRICA

Algeria

AFHQ, Algiers, 18.025 mc., 16.64 m. Good on opening at 10.20 p.m. and also later with BBC. (Matthews).

AFHQ, Algiers, 9.53 mc., 31.46 m. Heard at quite good level from 5 a.m. when news is broadcast, and until just before 6.15 a.m. (Cushen.)

Announces as "The United Nations Radio coming to you from Algiers."—L.J.K.)

AFHQ, Algiers, 11.883 mc., 25.24m. Opens at 7.57 p.m., relays BBC at 8.15 (Whiting).

Belgian Congo

RNB, Leopoldville, 9.78 mc., 30.66 m.: Terrific signal in afternoon (Gaden). Booming in here (Perth). Announces as either "Radio Diffusion Belge", or "Radio Nationale Belge." At 2.30 a.m. they rebroadcast a special "V. of A." programme in Afrikaans and English. Close at 3 and re-open at 4.15 a.m. in French (Nolan). (Best signal from RNB, in Sydney, is from opening at 4 till closing at 5.45 p.m., whilst around 7 a.m. till closing at 7.30 it is fair.—L.J.K.)

Have you heard the Kissantzi at 2.30 a.m.?—it's terrific here. (Matthews, Perth). (Yes, and it is good here also. —L.J.K.).

OPL, Leopoldville, 17.77 mc., 16.88 m., comes in well at 9.45 p.m. At 10 p.m. there is an announcement in Flemish and then in English, "This is Leopoldville directed to Africa and the Far East, on 17,770 kc., 16.88 m. Here is the news and war headlines." — L.J.K.

Egypt

Heard SUV, 10.05 mc., 29.84 m. from about 5.30 till 6.15 a.m. in Arabic. Strength of "Radio Cairo" is excellent (Nolan, Matthews).

Ethiopia

Heard Addis Ababa opening at 2.30 a.m. on 9.625 mc., 31.17 m. with, "This is Addis Ababa calling," then followed a musical programme (Nolan).

French Equatorial Africa

FZI, Brazzaville on 15.56 mc., is coming in at terrific strength at night now. They open at 10.15 in French. At 11.30 there is a programme in English until closing at 12.15 a.m. (Nolan, Matthews).

(Since December 15 they have been testing on 15.595 mc., 19.25 m. from 10.15 till 10.45 p.m.So far I have not heard them, but am told they were heard at 11.15. Another test they are making is from 4.30 till 5 p.m. on 11.97 m.c., 25.06 m. Noise and morse, here, makes listening very unpleasant.— —L.J.K.

Mr. Nolan, of Perth, reports Brazzaville as audible on 6.16 mc., 48.70 m. in French at 3 a.m.

Kenya

VQ7LO, Nairobi, 6.08 mc., 49.32 m., is excellent in early morning and on 10.73 mc., 29.96 m. is good (Nolan).

Portuguese East Africa

CR7BE, Lourenco Marques, 9.88 mc., 30.38 m. Good signal on opening at 5.30 a.m. (Nolan). Mr. Matthews reports CR7BE on 9865 m., opening at 2 a.m., one Monday night with a relay of "Command Performance."

AMERICA

U.S.A.

WLWO, C'nnati, 17.80 mc., 16.85 m.: News at 5 a.m., signal poor (Cushen).

KROJ, 'Frisco, 17.76 mc., 16.89 m. from noon till closing at 1 p.m., is not as good as it used to be. (Nolan, Perth). (Signal is actually improving over here.—L.J.K.)

KMI, 'Frisco, 17.09 mc., 17.50 m. Scheduled from 2—5 a.m. Is anyone hearing this station? Would appreciate prompt reply.—L.J.K.)

KKR, Bolinas, 15.46 m.c., 19.4 m.: This one I fancy at 1 (Gaden).

KWU, 'Frisco, 15.35 mc., 19.53 m.: My favourite (Gaden). Is as mercurial as the weather down here.—L.J.K.)

KGEI, 'Frisco, 15.33 mc., 19.57 m.: Heard on December 17 closing at noon. Jack Paul was giving station particulars and schedules, but noise was too bad to copy same.—L.J.K.

WRUS, Boston, 15.13 mc., 19.83 m.: Closes at 7.30 a.m. re-opening on 9.57 at 7.45.

I thought WRUA was call sign for 31.35 m., but with A's, L's, S's, W's, and WLW with L' and O's — OH, 'ELL.—L.J.K.

WLWO, C'nnati, 11.71 m.c., 25.62 m.: Good at 10 p.m. (Cushen).

WRUA, Boston, 11.14 mc., 26.92 m. Has been good for some time, has usual V of A programmes and news in English at 5, 6 and 7 a.m. (Cushen). Very fine signal (Gaden). (WRUA closes at 7.30 a.m. and re-opens as WRUA on 7575 kc., 39.6 m. at 7.45 a.m.—L.J.K.)

WRUA is heard from 11 p.m. and signal is fair at 12.30 a.m. (Matthews).

KES-3, 'Frisco, 10.62 mc., 28.25 m. Opens at 4 p.m. (Cushen). Carries same programme as KGEI till closing at 9.15 p.m.—L.J.K.)

KWIX, 'Frisco, 9.57 mc., 31.35 m. Good at 4 and 11 p.m. (Cushen).

KGEI, 'Frisco, 7.25 mc., 41.38 m.: Appears to be spoilt around late afternoon by the new BBC transmitter, GWI, on exactly the same frequency. GWI is directed to Europe and is on till about 8 p.m.—L.J.K.

WKTM, New York, 6.38 mc., 47.01 m.: Good at 6 p.m. (Cushen).

WGEO, Schenectady, 6.18 mc., 48.47 m.: Signs off at 6.15 p.m. (Cushen).

WCBX, New York, 6.17 mc., 48.62 m.: Good when signing at 6 p.m. (Cushen).

THE EAST

China

XGOY, Chungking, 6.13 mc., 48.92 m.: Good signal when giving overseas programme at 4.45 a.m. (Cushen).

XGOY has been heard on 15.20 mc., 19.73 m., testing for an American channel between 6 and 8 p.m. for a week. Signal was good, but modulation like that on 25.21 m., very poor.—L.J.K.

India

VUD-, 11.87 m.c., 25.27 m.: Heard in French at 9.45 p.m. and News in English at 11 p.m. (Matthews, Nolan).

VWY, Kirkee, 17.94 mc., 16.72 m.: Heard at 10.30 p.m. calling the BBC. (Matthews).

VWY, Kirkee, 9.045 mc., 33.16 m.: Reported in "The Broadcaster" as a new station heard around 9 a.m. (That would be 6 a.m. in W.A., I doubt if 33.16 would be audible here at 9 a.m. —L.J.K.

Great Britain

13 metre band. A letter from my friend, Ted Whiting, who conducts the Short Wave pages of "Radios and Hobbies", tells me he heard 3 transmitters on this band on December 13, and believed two of them to be BBC outlets. I have not caught any yet, and am afraid the band, like my Christmas Bush, is a little slow in colouring up.

GSF, 15.14 mc., 19.82 m.: Heard in General Overseas Service at 10.30 p.m. (Matthews).

(They open at 10 p.m. for Near and Middle East and East Africa.—L.J.K.)

GWC, 15.07 mc., 19.91 m.: All evening is the tops (Matthews).

GVX, 11.93 mc., 25.15 m.: Good at 9.25 p.m. (Nolan).

GWH, 11.80 mc., Heard at 9 p.m. in European Service (Cushen). Excellent at 9.45 in English —L.J.K.).

GVZ, 9.64 mc., 31.12 m. Great signals at 1 a.m. (Matthews).

GWU, 9.62 mc., 31.17 m.: English at 2 a.m. (Matthews).

GWJ, 9.53 mc., 31.48 m.: English at 2 a.m. (Matthews).

GSW, 7.23 mc., 41.49 m.: Home news at 4 a.m. (Cushen).

GWI, 7.25 mc., 41.38 m.: The blighter that puts KGEI out of step from 4 till 8.15 p.m.—L.J.K.

GSU, 7.26 mc., 41.32 m.: Used in Pacific service from 4.45 till 7.15 p.m. —L.J.K.

GRM, 7.12 mc., 42.13 m.: Same remarks as GSU.

GWF, 9.49 mc., 31.61 m.: Excellent in News for Clandestine Press at 9.45 p.m.—L.J.K.

GRU, 9.45 mc., 31.75 m.: Great signal at 1 a.m. in G.O.S. (Matthews).

U.S.S.R.

—, Moscow, 15.22 mc., 19.7. Very good when closing at 2.30 p.m. (Cushen).

—, Moscow, 8.94 mc., 33.54 m.: This new Russian heard at 10.20 p.m. Nice, clear and loud signal (Cushen).

MISCELLANEOUS

Iran

—, 8.11 mc., 36.99 m.: Heard around 4 a.m. in French. (Matthews).

Switzerland

The Swiss broadcasts on 6.34 mc., 47.28 m., can be heard at very good strength at 6 a.m. (Cushen). (Now only a fair signal at 6.30 and almost impossible to hear the news at 7.53—L.J.K.).

Sweden

SBO, Stockholm, 6.06 mc., 49.46 m.: Good at 8 a.m. (Matthews, Nolan).

Turkey

TAQ, Ankara, 15.195 mc., 19.75 m.: Splendid in Turkish at 11 p.m. (Nolan). Very good when closing at 11.15 p.m. (Matthews).

TAP, Ankara, 9.465 mc., 31.70 m.: Excellent from 2.30 a.m. (Matthews).

Madagascar

—, Antananarivo, 6.16 mc., 48.62 m.: Closes at 3 a.m. (Matthews).

Mexico

XEWW, Mexico City, 9.50 mc., 31.58 m.: Good signal when opening at 1 a.m. and good also at 10 a.m. (Matthews.) (Has been coming in here well, in the late afternoon, but is fading out now.—L.J.K.)

TOO LATE FOR CLASSIFICATION

EQB, Teheran, 6.155 mc., 48.74 m. These people advise by letter their schedule is 2.30—7.30 a.m. (Walker, W.A.)

RNB, Leopoldville, 9.785 mc., 30.66m., open at 2.30 a.m. with programme for South Africa. Definitely the strongest African I have heard (Walker, W.A.).

Great signal around 5 p.m. (Hallett).

WRUA, Boston, heard on two new channels, 9.57 closing at 10.30 a.m. on Sundays and on 7.565 opening at 10.45 a.m. (Walker, W.A.). (I have an idea now, correct call of 9.57 mc. is WRUS. Announcer the other morning was very hesitant when giving call-signs, but this is what I took him to mean.—L.J.K.)

FZI, Brazzaville. Good here on 25.06 m. in transmission to Madagascar in French from 3—4 a.m. (Hallett).

Algiers on 31.46 m. may be followed in relay of BBC calling Europe between 1 and 2 a.m. (Hallett).

Radio Algiers heard now on three frequencies in the morning: on 6.04 mc., 49.67 m. (very good); 8.96 mc., 33.48 m. (fair) and 9.54 mc., 31.46 m. (good at 5 and until 6.15 a.m. when WGEO blots them out. News in English at 5 a.m. from Algiers and V of A 6 a.m. (Cushen).

WCRC, New York, heard on 6.12 mc., 49.02 m., till closing at 5.45 p.m. (Cushen).

WCBX, New York, good on 6.17 mc., 48.62 m.; signs at 5.45 p.m. (Cushen).

WLWO, Cincinnati, News in English at 5 a.m. on 17.80 mc., 16.85 m. (Cushen).

WLWK, 6.08 mc., 49.34 m. Good till closing at 7.30 p.m. (Cushen).

KWIX heard now on 11.87 mc., 25.27 m. Very good, but interfered with by Delhi on same frequency from 8.45 p.m. (Walker, Cushen).

WRUA, Boston. Good on 26.92 m. in the morning, heard also at 10 p.m. (Cushen).

NEW STATIONS.

continued from page 20.

VWY, Kirkee, 9.045 mc., 33.16 m.: This has not been heard here yet, but is reported in "The Broadcaster" as audible at 9 a.m.

HER-, Berne, 18.45 mc., 16.26 m.: This is the frequency of the old League of Nations station, HBF. It was brought into use on December 18, for use in parallel with HER-5, 25.61 m., in the Australian service. Signal is only fair, reaching R4 Q3 on the occas--ions I listened. Schedule is Tuesdays and Saturdays from 6.30 till 8 p.m. with English on Tuesdays and the National languages on Saturdays.

British Mediterranean Station.: Have hesitated to mention this one before, but they have now apparently settled down to regular schedule and are to be heard on three frequencies at times, viz.: 9.67 mc., 31.02m.; 11.71 mc., 25.62 m.; 7.215 mc., 41.58 m.; Opens at 11 p.m. with musical note. 11.45 Italian. Midnight Yugoslavian. At 12.15 announces, "For Balkan Military Forces." Then goes into Roumanian. At 12.30. German. At 12.45 announces, "Next news in German at 19.30 Central European Time (5.30 a.m. Syd) on 31.02 and 41.58 m. Signal is very good on 31.02 m. The above remarks refer to 31.02 and 25.62 m. I am not sure of 41.58 m. schedule, but it opens at 5.30 a.m. in German.

(Mr. Cushen, N.Z., mentions Mediterranean Station heard on 9.90 mc., 30.30 m. from 5—5.30 a.m. and on 9.19 mc., 32.64 m from 4 pm).

AFHQ, Algiers, 6.04 mc., 49.67 m.: This one is reported by Mr. Lindsay Walker of Applecross, W.A., and Mr. Arthur Cushen of N.Z. Heard at 5 a.m. with news from Algiers and at 6 a.m. with "Voice of America" news at 6 a.m. Very good signal till closing at 10 a.m.

WCRC, New York, 6.12 mc., 49.02m.: Mr. Cushen reports hearing this one at 5.45 p.m.

GWJ, London, 9.53 mc., 31.48 m.: Heard irregularly for some time, but schedule is now 8—11.45 p.m.; midnight—1.30 a.m.

GWI, London, 7.25 mc., 41.38m.: This is a new one and is heard 5 a.m.—2 p.m.; 3.45—8.15 p.m.

GWK, London, 6.165 mc., 48.66m.: Another new BBC outlet. See schedule list.

GWH is call sign of 11.80 mc., 25.42 m.

And here are some new London transmitters that have been given a call sign, but whose schedules are not yet known:—

GWG, 15.06 mc., 19.92 m.
GWQ, 11.84 mc., 25.34 m.
GWW, 9.66 mc., 31.06 m. heard at 11.30 p.m.)
GWO, 9.62 mc., 31.17 m.
GWN, 7.28 mc., 41.21m.
GWL, 7.20 mc., 41.64 m.
GWM, 6.09 mc., 49.26 m.

Allied and Neutral Countries Short-Wave Schedules

These schedules which have been compiled from listeners' reports, my own observations, and the acknowledged help of "Globe Circler" and "Universalite" are believed to be correct at time of going to press, but are subject to change without notice. Readers will show a grateful consideration for others if they will notify me of any alterations. Please send reports to: L. J. Keast, 23 Honiton Ave. W., Carlingford. Urgent reports, 'phone Epping 2511.

Loggings are shown under "Short Wave Notes and Observations." Symbols: N—New stations; S—Change of Schedule; F—Change of frequency.

NOTE: S indicates change of schedule other than those affected by change of time system.

Call Sign	Location	Mc.	M.	Time: East. Australian Daylight
GRZ	London	21.64	13.86	10—12.15 am.
GSH	London	21.47 S	1397	9.45—2.30 am.
OPL	L'poldville	20.04 S	14.97	10.55—midnight.
—,	L'poldville	19.20	15.63	3.45—4.30 am; 5.30—5.45 am; 10.15—10.30 pm.
HBH	Berne	18.48	16.23	Tues & Sat 12.45 am—2.15 am
HER-	Berne	18.45 N	16.26	Tues. & Sats. 6.30—8 pm
GVO	London	18.08	16.59	2—3.15 am
AFHQ	Algiers	18.02 N	16.04	10.20 pm
GRQ	London	18.02	16.64	Midnight—2.15 am.
VWY	Kirkee	17.94 N	16.72	Around 10.30 pm.
GRP	London	17.87 S	16.79	9 pm—2.30 am; 2.45—4.15 am
EIRE	Athlone	17.84	16.82	11—12.30 am; 4.30—5 am; News 3.45 a m
WCDA	New York	17.83	16.83	12 am—5.30 am.
WCRC	New York	17.83	16.83	8.15—10.15 am
GSV	London	17.81 S	16.84	Not in use.
VLI-8	Sydney	17.80 N	16.85	8.30—9 pm
WLWO	Cincinnati	17.80	16.85	8.30—9.45 am; 12.15—6.30 am
GSG	London	17.79 S	16.86	9—9.30 pm; 2.15—3.45 am
WRCA	New York	17.78	16.87	12—3.45 om
OPL	L'poldville	17.79 S	16.88	10.55—m/n; 5.55—7.15 am.
KROJ	'Frisca	17.76	16.89	Noon—1 pm; News at noon.
WRUW	Boston	17.75	16.90	2—4.15 am
GVQ	London	17.73	16.92	6—8 pm; 12.30—2.30 am
LRA-5	B'nos Aires	17.72	16.93	Sats. 7.45—7.30 am
—,	Brazzaville	17.71	16.94	7.30—8 am
GRA,	London	17.71	16.94	7 pm—3.45 am; News 7 pm
GVP	London	17.70 N	16.95	8 pm—1 am
KMI	'Frisco	17.09 N	17.5	2—5 am
WCW	New York	15.85	18.93	4 am—8 am
—,	Moscow	15.75	19.05	10.40 pm —12.30 am
FZI	Brazzaville	15.56 N	19.28	Reported heard 10.15—11.15 pm
KKR	Bolinas	15.46 N	19.4	News and commentary 1—1.30 pm
GRD	London	15.45 S	19.43	2.30—3.45 am; 5—8 am
GWE,	London	15.43 S	19.44	10—11 pm
GWD	London	15.42 S	19.46	8.30—8.45 pm; 9—9.30 pm; 2.15—2.45 am.
GRE	London	15.37 F	19.51	6.45—8 pm; 11.15—2 am; 2.30—5 am.
KWU	'Frisco	15.35 S	19.53	2—5 am; 7.30—9.15 am; 10.45 am—12.30 pm
—	Masocw	15.35 N	19.54	9.15—11.20 pm. (English from 10.40)
WRUW/L	Boston	15.35	19.54	9 pm—4.15 am; 3.30—4.30 am
WGEA	Schenectady	15,33	19.57	8.30—9.45 am
KGEI	'Frisco	15.53	19.57	Closes at noon.
WGEO	Schenectady	15.33 S	19.57	10.15 pm—6.30 am
VLI-3	Sydney	15.32	19.58	8.30 pm—Midnight
GSP	London	15.31 S	19.60	4.45—6.15 am; 10.30 pm—1 am
KWID	'Frisco	15.29	19.62	4.30—Noon; 4—5.45 pm
VUD-3	Delhi	15.29 S	19.62	2.30—8.30 pm; News 2.30 and 6.
WCBX	New York	15.27	19.64	19 pm—7.45 am; 8—10.45 am
GSI	London	15.26	19.66	4.45—6.15 pm; 2.45—7 am
WLWK	Cincinnati	15.25	19.67	8.30—11.15 am; 11.30 pm—8.15 am.
VLG-6	Melbourne	15.23	19.69	11.45 am—12.20 pm; 1.40—1.50 pm (Sun. 1.15—1.50)
—	Moscow	15.22	19.70	8.15—8.40 am; 9.47—10.30 am; 12.15—12.40 pm; 10.40—11.20 pm

Call Sign	Location	Mc.	M.	Time: East. Australian Daylight
WBOS	Boston	15.21	19.72	11.15 pm—2 am; 2.15 am—3.45 pm
XGOY	Chungking	15.20	19.73	Heard testing with U.S.A. 6—8 pm
TAQ	Ankara	15.19	19.75	8.30—11.15 pm; 12.30 am—1.45 a.m.
KROJ,	'Frisco	15.19 S	19.75	7—11.45 am
WKRX	New York	15.19	19.75	6.30—8 am
XGOX	Chungking	15.18	19.76	Wed. only, 11—11.45 am
GSO	London	15.18	19.76	9.45—10 pm; 11.15—12.15 am; 2.30—2.45 am; 4.30—5 am
TGWA	Guatemala	15.17	19.78	4.45—5.55 am (Mon. till 9.15 am)
VLG-7	Melbourne	15.16	19.79	6—8.10 am (Sun. 6.45—8 am)
SBT	Stockholm	15.15	19.80	2—5.15 am. News 2.01 am
WNBI	New York	15.15	19.81	11 pm—8 am.
GSF	London	15.14 S	19.82	10 pm—1.45 am; 2—5.15 am
KGEI	'Frisco	15.13	19.83	4.15—5.15 am
WRUS	Boston	15.13 N	19.83	6—7.30 am.
HVJ	Vatican City	15.12	19.84	Irregular in afternoons
—	Moscow	15.11	19.85	8.15—8.40 am; 9.48—10.30 am; 12.15—12.40 pm; 2.15—2.40 pm; 10.30—11.20 pm
HVJ	Vatican City	15.09	19.87	See 19.84m.
GWC,	London	15.07 S	19.91	4.45—6.15 pm; 7—8.45 pm; 9 pm—12.45 am
GWG	London	15.06 N	19.92	No schedule.
WWV	Washington	15.00	20.00	See 10 m.c.
—	Moscow	13.42 N	22.35	Around 11.45 pm
WKRD	New York	12.96	23.13	11 pm—10.15 am
CNR	Rabat	12.83	23.38	10.30—11 pm
HCJB	Quito	12.45	24.11	7—8 am; 10.55 pm—midnight
—	Moscow	12.26	24.47	2 pm to 3 am
TFJ	Reykjavik	12.23	24.54	4.15—4.30 pm
—	Moscow	12.19	24.61	8.45—10.23 am; 11—11.50 am
—	Moscow	12.17	24.65	7—9 am; 3.40—4.45 pm; 5.45—6 pm; 8.30—9.50 pm; 12—12.15 pm; 1.30—1.45 am; 2.15—2.45 am
R. France	Algiers	12.12	24.75	3.30—5.30 am; 6—8.30 am; 8.45—9.15 om
ZNR	Aden	12.11	24.77	3.13—4.30 am
GRF	London	12.09	24.80	9 pm—3.45 am
GRV	London	12.04 S	24.92	News at 8 pm; America calls Europe 8.15 pm; 5—7 am
FZI	Brazzaville	11.97 S	25.06	5.45—8.30 am; 2—3 pm; 5—5.15 pm; 12.30—1.15 am
GVY	London	11.95	25.09	9 pm—2.45 am; News 10 pm, midnight and 2 am.
GVX	London	11.93	25.15	8 pm—1.30 am; 2.30—6 am; (Eng 8.15—8.45 pm; 12—12.30 am.
XGOY	Chungking	11.90 S	25.21	9—10.30 pm; 2.30—3.30 am.
VLG-9	Melbourne	11.90	25.21	Not in use
CXAIO	Montevideo	11.90	25.21	10.5 am—1.10 pm
WRCA	N.Y.	11.89	25.22	7—11.45 pm; 4—7.45 am; 8 am—2.30 pm
VPD-2	Suva	11.90 N	25.22	9.30—11 am
WKTM	New York	11.89	25.23	9.—11 am.
AFHQ	Algiers	11.88 N	25.24	7.57 pm
VLR-3	Melbourne	11.88 S	25.25	2—5.30 pm (Sun). 1—5.30 pm)
VLI-2	Sydney	11.87	25.27	5.55—6.25 pm
WBOS	Boston	11.87 S	25.27	9.15—11 pm; 6—8.15 am; 8.30 am—3 pm
VUD-,	Delhi	11.87 N	25.27	8.45—11.30 pm; News 8.46
KWIX	'Frisco	11.87 N	25.27	6.30—9.15 pm
HER-5	Berne	11.86	25.28	11.55—12.30 am
GSE	London	11.86 S	25.29	10 pm—6 am.
WGEA	Schenectady	11.84	25.33	11 pm—8.15 am
VLG-4	Melbourne	11.84 S	25.34	Noon—1.45 pm; 7.25—8.25 pm 8.30—9 pm; 9.15—10.45 pm
GWQ	London	11.80 N	25.42	8 pm—1.30 am; 2.30—5.45 am
VLW-3	Perth	11.83 S	25.36	9.30 om—12.45 pm; 2.30—9.15 pm; (Sun. 9.45 om—9.15 pm)
—	Moscow	11.83	25.36	3—3.45 pm; 4—5 pm; 10—10.30 pm; 12—12.4 am; 1.30—4.45 am.
WCRC	N.Y.	11.83 S	25.36	6.15—7.15 am
WCDA	N.Y.	11.83	25.36	No schedule
GSN	London	11.82	25.38	7—8.45 pm; 9—11 pm
XEBR	Hermosillo	11.82	25.38	12—4 pm
COGF	Matanzas	11.80	25.41	3.30—6 am
WRUL	Boston	11.79	25.45	4.30—9 am; 9.15—10.25 am; 10.30—5 pm

Call Sign	Location	Mc.	M.	Time: East. Australian Daylight
VUD-6	Delhi	11.79	25.45	8.45 pm—1 am; News 8.45
KGEI	'Frisco	11.79 S	25.43	8 am—3.45 pm
GVU	London	11.78 S	25.47	5—7 am
HP5G	Panama	11.78	25.47	12.15 pm—1.30 am; 3.45—7 am
VLR-8	Melbourne	11.76	25.51	6—10 am (Sun. 6.45 am—12.45 pm)
GSD	London	11.75 S	25.53	4.45—6.15 pm; 6.45—8.45 pm; 2.45—7 am; 7.45—11 am.
—,	Moscow	11.75	25.53	10.30—10.55 am.
GSB	London	11.75 S	25.53	3—3.45 pm.
HVJ	Vatican City	11.74	25.55	Mon. & Thurs: Calls Eng. 5 pm, Thurs & Sat calls Aust 6 pm.
COCY	Havana	11.73	25.56	12. pm—5.15 pm.
GVV,	London	11.73 S	25.58	9.45 pm—2.15 am; 2.30—7.30 am
WRUL,	Boston	11.73	25.58	10.15 am; 3—4 pm
OPL	L'poldville	11.72 N	25.60	10.55—m/n; 5.55—7.15 am.
HER-5	Berne	11.71	25.61	Daily: 5—8.45 am; Tues & Sat. 6.30—8 pm
YSM,	San Salvador	11.71	25.62	5—6 am.
VLG-3	Melbourne	11.71 S	25.62	4.55—5.40 pm; 5.55—6.25 pm; 6.30—6.50 pm.
WLWO	Cincinnati	11.71 S	25.62	6.45—8.15 am; 9.30 pm—midnight; News 10 and 11 pm.
Brit. Medit. Stn . . . —		11.71 N	25.62	11 pm—3 am
CXA-19	M'tevideo	11.70	25.63	10—11 pm; 8 am—2 pm
SBP	Motala	11.70 S	25.63	2—5.15 am; 8.20—8.40 am; 12 am—1 pm opens again at 10.05 pm
CBFY	Montreal	11.70	25.63	10.30 pm—2.30 pm
GVW	London	11.70	25.64	2.30—7 am
HP5A	Panama City	11.70	25.64	12—pm—4 am; 12.10 pm—4 pm
CE1170	Santiago	11.70	25.64	11pm—1 am
GRG	London	11.68 S	25.68	5—7 am; 11 pm—4 am.
—,	L'poldville	11.67 F	25.71	Now on 30.66 metres.
COK	Havana	11.62	25.83	3 am—2 pm (Mon. 4—10 am)
WRUA	Boston	11.14 S	26.92	11 pm—7.30 am.
CSW6	Lisbon	11.04 S	27.17	8.45—9.30 am.
KWV	San F'cisco	10.84 S	27.68	5—7.45 pm; 8—10 pm
VQ7LO	Nairobi	10.73	27.96	1.45—6 am
KES-3	Bolinas	10.62 S	28.25	4—9.15 pm
VLN-8	Sydney	10.52	28.51	Idle at present.
—	Moscow	10.44	28.72	7 pm—2.45 am (often news at 10.40 pm)
—	Moscow	10.23 N	29.33	5.15—6.50 pm; 10 pm—midnight
SUV	Cairo	10.05	29.84	5.30—6 am; 9.45—10.30 am
WWV	Washington	10.00 N	30.00	National Bureau of Standards frequency check, in speech on hour and half hour.
—	Brazzaville	9.98 S	30.06	5—6.20 am; 8—8.30 am 8.30—9.30 pm; 12.45—1.15 am
HCJB	Quito	9958 S	30.12	7—8 am; 10.55 pm—1 am
WRX	New York	9905	30.29	9 am—3 pm; 3.15—8 pm
WKRD	New York	9897	30.31	7.45—9.30 pm; 6—8 am.
WKRX	New York	9897	30.31	9—11.45 am.
KROJ,	'Frsco	9.89 S	30.31	1.15—6.45 pm; 7 pm—midnight; 2—5.15 am.
—	Moscow	9.88	30.34	Irregular, but often heard around 9.30 pm
CR7BE	L. Marques	9.88 S	30.38	5.30—7.30 am; News 6.50
EAQ	Madrid	9860 S	30.43	5—6 am; News 5.15
—	Moscow	9860	30.43	9—10.15 pm
COCM	Havana	9833	30.51	10.45 pm—4 pm
GRH	London	9825 S	30.53	8.15 am—1.15 pm; 4.45—8.45 pm; 1.45—2.15 am.
RNB	L'poldville	9.78 N	30.66	4—5.45 pm; 2.55—3.30 am
—	Moscow	9770	30.71	11—11.30 am.
WKLJ	New York	9750 S	30.77	6.30—9.30 am
T14NRH	Heredia	9740	30.80	11—12 pm (Wed, Fri, & Sun. 2.30—4.30 pm).
CSW-7	Lisbon	9735 S	30.82	6—9.30 am
XG0A	Chungking	9720	30.86	6—7 am; 10 pm—2 am; News 1 am
OAX4K	Lima	9715	30.88	9.30 am—3.20 pm
WRUW	Boston	9.70	30.93	5.45—10 am; 3—4 pm
FIQA	Tananarive	9700	30.93	1.30—2 am.
GRX	London	9690 S	30.96	News 8 pm; America calls Europe 8.15 pm.
TGWA	Guatemala	9685	30.96	12.50 pm—3.45 pm (Mon. 11 am—3.45 pm)
LRA-1	B'nos Aires	9688	30.96	2.30—5 am; 6.30—7.30 am; 7 am—1 pm
VLG-8	Melbourne	9.68	30.99	Idle at present.
XEQQ	Mexico City	9680	30.99	1 am—5.45 pm
VLW-5	Perth	9.68 S	30.99	9.30 pm—2.30 am
WNBI	New York	9.67 ..	31.02	8.15—5 pm
Brit. Medit. Stn . . . —		9.67 N	31.02	11 pm—3 am; 5 am—
VLQ-3	Brisbane	9.66	31.05	11.45 am—5.15 pm. (Sun. 11 am—5.15 pm).
GWW	London	9.66 N	31.06	Heard at 11.30 pm
LRX	B'nos Aires	9.66	31.06	9.30—10.; 11.30 pm —2.10 pm (Sundays 4 pm)
HVJ	Vatican City	9.66	31.06	3—5.30 am
WGEO	Schenectady	9.65	31.08	Not in use at present.
WCBX	New York	9.65	31.09	2.45—5 pm.
XGOY	Chungking	9.64 S	31.10	10.35 pm—2.40 am; News 1 and 2 am.
COX	Havana	9.64	31.12	3.50—3 pm
LRI	B'nos Aires	9.64	31.12	8.57—11 pm; 4.30—5.30 am; 6 am—2 pm
GVZ	London	9.64 S	31.12	7—8.45 am; 4.30—8 pm; 9 pm—2.15 am; 3—6 am
GWO	London	9.62 N	31.17	No schedule.
—	Addis Ababa	9.62	31.17	2.40—3.30 am
ZRL	Capetown	9.60	31.22	6.15 pm—1.30 am
HP5J	Panama City	9.60	31.23	11 pm—5.30 am; 12.30 am—2.30 pm; Sun. 12 pm—2 pm. Mon.
CE960	Santiago	9.60	31.24	10 am—3 pm.
GRY	London	9.60 S	31.25	4.30—8 am; 10—11 pm
—	Athlone	9.59	31.27	8.05—8.25 am; News 8.10 am
VUD-4	Delhi	9.59	31.28	9.30—12.35 am; 1.15—2 am; 3.30—5.30 am; News 11 pm 1.50 am and 5 am
WLWO	Cincinnati	9.59	31.30	10 am—3 pm
WLWK	Cincinnati	9.59	31.30	Idle
VLR	Melbourne	9.58	31.32	6.30—11.30 pm. daily
VLI-10	Sydney	9.58	31.32	Idle at present.
VLG	Melbourne	9.58	31.32	1.15—1.45 am (Eng. for India) 2—2.45 am (for Nth America
GSC	London	9.58 S	31.32	7.45 am—2.30 pm; 4—6.15 pm
WRUS	Boston	9.57 N	31.35	7.45 am
KWIX	'Frisco	9.57	31.35	11 am—3.45 pm; 4—5.45 pm; 10.30 pm—1 am.
KWID	'Frisco	9.57 S	31.35	6—9.15 pm; opens again 12.45 am
—	Khabarovsk	9.56 S	31.37	6.30—8.12 am; 8.40—9.45 am; 1—2.12 pm; 2.45—3.40 pm; 7—10.30 pm; 11.30 pm —1 am.
OAX4T	Lima	9.56	31.37	Midnight—1 pm
XETT	Mexico	9.55	31.39	Continuous
GWB	London	9.55 S	31.41	7.15—8.45 am; 5.10—5.30 pm 6.10—7 pm; 7.30—8.30 pm; 9.45—11 pm; 11.45 pm—12.45 am; 2.30—6.45 am.
WGEA	Schenectady	9.55	31.41	Not in use at present.
—	Moscow	9.54	31.43	10.40—11.20 pm; 1.15—1.30 am
VLG-2	Melbourne	9.54 S	31.45	4.10—4.40 pm; 11 pm—1 am; 2—2.45 m
AFHQ	Algiers	9.53	31.46	1.45—2 am; 3—9.30 am; News 6 am
SBU	Stockholm	9.53	31.47	8.20—8.35 am; 12 am—1 pm, News 8.20 and 12 am.
HER-4	Berne	9.53	31.47	See 25.61 metres.
WGEO	Schenectady	9.53	31.48	6.45—8.15 am; 8.30 am—10.30
GWJ	London	9.53 N	31.48	8—11.45 pm; m/n—1.30 am
ZRG	Joh'burg	9.52	31.50	6.30 pm—1.30 am
COCQ	Havana	9.51	31.53	11 am—2 pm; 9.20—12 pm
GSB	London	9.51 S	31.55	5.15 am—1.15 pm; 4—6.15 pm.
PRL-7	R de Janeiro	9.50	31.57	9 am—2 pm
XEWW	Mexico City	9.50	31.58	12.58—6.45 pm.
GWF	London	9.49	31.61	6 pm—1.30 am; 2.30—5.30 am
KRCA	'Frisco	9.49	31.61	4 pm—4 am
WCBX	New York	9.49	31.61	10.50 am—2.30 pm
—	Moscow	9.48	31.65	5—6 pm; 9.30 pm—1.45 am; 2.45—3.15 am.
TAP	Ankara	9.46	31.70	2—6.45 am; News 4 am. Talk at 7.15 am on Fridays.
GRU	London	9.45 S	31.75	4—7.30 am; 7.45—8.45 am; 4.30—8 pm; 9 pm—2.45 am
COCH	Havana	9.43	31.80	9.45 am—4.15 pm
—	Moscow	9.43	31.81	8—8.25 am; 3.15—3.45 pm; 4.30—5 pm.
GRI	London	9.41	31.88	3.45—9.30 am; 6—8.45 pm
FGA	Dakar	9.41	31.88	4—5.15 am
—	Moscow	9.39	31.95	10.30—12 pm; 2.30—3 am; 11 am—2 pm.
COBC	Havana	9.37	32.00	12 pm—4.15 pm.
OAX4J	Lima	9.34	32.12	10 am—5 pm; 12 pm—1 am; 4—7 am
LRS	B'nos Aires	9.32	32.19	9 am—1 pm; 11—12 pm; 5—5.30 am
COCX	Havana	9.27	32.26	11.45—4 pm.
COBQ	Havana	9.22 N	32.54	11 pm—12.15 pm
HC2ET	Guayaquil	9.19	32.64	11.30 pm—4.30 pm
CNIR1	Rabat	9.08	33.03	5—9.50 am; 5.30—5.50 pm; 10.30—12 pm.
VWY	Kirkee	9.04 N	33.16	Around 9 am.
—	Brazzaville	9.04 N	33.19	12.45—1 am; 5—6.15 am; 8—8.30 am; 8.30 pm—9.30 pm
COBZ	Havana	9.03	33.23	11.45 pm—3 pm
—	Kuibyshev	8.99	33.37	6.50—7 am.

Call Sign	Location	Mc.	M.	Time: East. Australian Daylight
AFHQ	Algiers	8.96 S	33.48	3—10 am; News 5 and 6
—	Moscow	8.94 N	33.54	Around 9.45 pm
KES-2	'Frisco	8.93	33.58	9.15 pm—4 am
—	Dakar	8.83	33.95	6.15—7.45 am; 6.30—6.50 pm; 11.15—12 pm.
COCQ	Havana	8.83	33.98	9.20 pm—3 15 pm
COCO	Havana	8.70	34.48	8.30 pm—4.30 pm
COJK	Camaguey	8.66	34.62	3.30—4.30 am; 7.30—10 am; 12—12.30 pm:
WOO4	New York	8.66	34.64	11 am—5 pm; 5.15—8 pm.
—	Kuibyshev	8.05	37.27	2—2.30 am; 3—5.15 am; 8.15 9.45 am
CNRI	Rabat	8.03	37.34	5—10.45 am; 4—6 pm
FXE	Beirut	8.02	37.41	Midnight—8 am.
YSD	San Salvador	7.89	38.00	11 am—2.30 pm
SUX	Cairo	7.86	38.15	4.30—5.30 am; 6.15—8.45 am
WKRD	New York	7.82	38.36	10.30—12.15 pm
WKRX	New York	7.82	38.36	8—11 pm.
WRUL	Boston	7.80	38.44	1.30—5 pm; 7—9 pm
WRUA	Boston	7.57 N	39.6	7.45 am.
WLWO	Cincinnati	7.57 S	39.6	3.30—5.30 pm
WKTS	New York	7.57	39.6	11 am—1 pm
—	Moscow	7.56	39.68	2—7.30 am; 9—10 am; 12.10—12.30 pm.
WDJ	New York	7.56	39.66	10.15 am—7 pm
KWY	'Frisco	7.56 S	39.66	11.30 pm—1.30 am
SU—	.. .. Cairo	7.50	40.00	2.30—4 am
YN2FT	Granada	7.49	40.05	11 am—2 pm
HER—	Berne	7.39	40.56	2.15—2.47 am
GRJ	London	7.32 S	41.01	5.30 am—2.30 pm; 3.45—6.15 pm
—	Moscow	7.30	41.10	3—10.30 am; 11—12 am; 2—4.45 pm; 5.30—6 pm
VUD-2	Delhi	7.29 S	41.15	8.45 pm—12.25 am; News 8.45 pm; Special news for 15 minutes at 5 am.
VLI-9	Sydney	7.28 S	41.21	Idle at present
GWN	.. .. London	7.28 N	41.21	No schedule
VUM-2	Madras	7.26	41.32	7—7.40 pm; 10.45—12.30 pm; 1.45—1.50 pm. News 11 pm and 1.45 am.
GSU	London	7.26 S	41.32	5—7.30 am; 8.15 am—3 pm; 4.45—7.15 pm; 10.45 pm—1 am
KGEI	'Frisco	7.25	41.38	2 pm—3.45 am
GWI	London	7.25 N	41.38	5 am—2 pm; 3.45—8.15 pm
VUB-2	Bombay	7.24	41.44	5.15—6.10 pm; 10.25—11.45 pm. News 6, 10.25 & 11 pm
VLQ	Brisbane	7.24	41.44	6—10 am.
KWID	'Frisco	7.23	41.49	9.30—4.05 am
GSW	London	7.23 S	41.49	6 am—2.30 pm; 3—6.15 pm
VLI-4	Sydney	7.22 S	41.55	12.35—1.45 am
VUC-2	Calcutta	7.21	41.61	Schedule unknown; News at M/n
VLQ-2	Brisbane.	7.21	41.58	5.30—11.30 pm
Brit. Medit. Stn . . . —		7.21 N	41.58	5 am—
—	Moscow	7.21	41.61	8.50—10.30 am
—	Madrid	7.20	41.63	7—10 am
GWL	London	7.20 N	41.64	No schedule.
YSY	San Salvador	7.20	41.65	11.30 am—3 pm
GRK	London	7.18	41.75	
XGOY	Chungking		41.80	9 pm—4 am; 5.30—8 am
—	Moscow	7.17	41.80	6.20—7.30 am; 8.15—10.55 am 11—11.30 pm; 2—5.30 am
GRT	London	7.15 S	41.96	1.45—3 pm
EAJ-9	Malaga	7.14	42.00	7—10.05 am
—	Ovideo	7.13	42.05	6—8.30 am
GRM	London	7.12 S	42.13	4.45—7.15 pm
EA9AA	Melilla	7.09	42.31	Heard around 8 am
GRS	.. .... London	7.06 S	42.46	3.30—9.45 am.
EAJ24	Cordoba	7.04	42.61	7.40—8 am
EAJ-3	Valencia	7.03	42.65	7—11 am
—	Ponto Delgada	7.02	42.74	6—7 am
WGEA	Schenectady	7.00	42.86	11 am—3 pm
FO8,AA	Papeete	6.98	42.95	Wed & Sat. 2.57—3.45 pm
—	Moscow	6.98	42.98	3 am—10.23 am; 11—11.30 am
YNOW	Managua	6.87	43.67	11 am—3.30 pm
KEL	.. .. .. Bolinas	6.86	43.7	8—8.25 pm
ZLT-7	Wellington	6.71	44.68	9 pm in news session only
TGWB	G'temola	6.54	45.87	10.30 am—4 pm

Call Sign	Location	Mc.	M.	Time: East. Australian Daylight
		6.38	47.01	6.15—8 pm
WKTM	New York	6.34 N	47.28	5—8.45 am; News 7.53
	Berne	6.32	47.47	5—8 am
SUP-2	Cairo	6.20	48.39	6.15—6.27 pm; 8—9 pm
FK8AA	Noumea	6.19	48.43	6.45—7.30 am; 1—3.45 pm
GRN	London	6.19	48.47	10.30—11.15 pm; M/n—2.35 am News 11 pm; 12.45 am; Special 15 mins at 5 am
VUD-2	Delhi			
		6.19	48.47	From 3—5 pm
XECC	Puebla	6.19 S	48.47	3.15—6.15 pm
WGEO	Schenectady	6.18	48.51	9.30—2 pm
LRM	Mendoza	6.18	48.54	6—11.45 am; 3.40—8.45 pm
GRO	London			
WCBX	New York	6.17	48.62	3—6 pm
—	Antananarivo	6.16	48.62	2—3 am
HER-3	Berne	6.16	48.66	See 47.28 metres
GWK	London	6.16 N	48.66	6 am—2 pm; 3.45—5.45 pm; 9.30 pm—1.30 am.
HJCD	Bogota	6.16	48.70	Around 3 pm
CBRX	Vancouver	6.16	48.70	12.30 am—5.30 pm
EQB	.. Teheran	6.15 S	48.74	2.30—7.30 am; News 3.45 and 6.15
GRW	London	6.15 S	48.78	4—7 am; 7.5 am—2.30 pm; 3—6.15 pm
WBOS	.. Boston	6.14	48.86	7—9 pm
XGOY	Chungking	6.13 S	48.92	10.35 pm—2.30 am; News 1 and 2 am. Also heard around 4.45 am
VPD-2	Suva	6.13 N	48.94	4.55—9 pm
GWA	London	6.12	48.98	7 am—1 pam; 2.45—7.30 pm
HP5H	Panama City	6.12	48.99	10 am—3 pm
XGOY	.. Chunking	6.12	49.02	10.35 pm—3.30 am
XEUZ	Mexico	6.12	49.02	Around 3—4 pm
WKTS	New York	6.12	49.02	5—7 pm
WCRC	New York	6.12 N	49.02	Heard closing at 5.45 pm
GSL	London	6.11 S	49.10	8.15 am—3.45 pm; 4.45—6.45 pm; 1.45—2.15 am.
CBFW	Montreal	6.09	49.25	10.30 pm—2.30 pm
GWM	London	6.09 N	49.26	No schedule.
ZNS-2	Nasau	6.09	49.25	12—12.15 pm; 4.45—5.15 am
VQ7LO,	Nairobi	6.08	49.32	3—6 am; News 3.15 am.
WLWK	Cincinnati	6.08	49.34	11.30 am—3 pm; 3.15—7.30 pm
CKFX	Vancouver	6.08	49.34	12.30 pm—5.30 pm
CFRX	Toronto	6.07	49.42	10 pm—4.30 pm
—	Moscow		49.42	7.30—8.30 pm
GRR	London	6.07	49.42	4.45 am—1 pm; 2.45—6.45 pm
SBO	Stockholm	6.06	49.46	Try around 8.30 am
WCDA	New York	6.06	49.50	10.30 am—5 pm
GSA	London	6.05 S	49.59	1—4.30 am.
XETW	Tampico	6.04	49.66	11 pm—5 pm
WRUW	Boston	6.04	49.66	3.15—7 pm
HP5B	Panama City	6.03	49.73	10 am—2 pm; 2.30 om—5 om
—	Moscow	6.03	49.73	10.40—11.19 pm
CJCX	Sydney (Nova Scotia)	6.01	49.92	10 pm—5.30 am; 9 am—2 pm
VUD-3	Delhi	6.01	49.92	11.25—12.a5 pm
GRB	London	6.01	49.92	3—4.30 pm
ZRH	Joh'burg	6.00	49.95	2.—8 am
CFCX	Montreal	6.00	49.96	11 pm—5 am; 9 am—3 pm
ZOY	Accra	6.00	49.96	9.30—10.15 pm; 3.15—6.15 am News 6 am
XEBT	Mexico City	6.00	50.00	2 am—4.30 pm
WKRD	New York	5.98	50.12	3.45—7.30 pm
VONH	St. John's	5.97	50.25	11.30 pm—5.30 am; 8—1235 pm; News 8.30 am
HVJ	Vatican City	5.96	50.26	5.30—7.45 am
ZRD	Durban	5.94	50.47	10.30—11.10 pm; 2—8 am
—	Khabarovsk	5.93	50.54	9 pm—1 am
—	Moscow	5.89	50.90	8 pm—7 am
—	Lisbon	5.85	51.19	4.45—8 am
VUB-2	Bombay	4.88	61.48	12—12.15 pm; 1 am 1.15 am; News Midnight
VUC-2	Calcutta	4.84	61.98	11—11.10 pm; midnight—12.10 pm; 1 am—2 am.
WWV	Washington	5.00 N	60.00	See 30 metres
VUC—	.. .. Colombo	4.90 N	61.2	10.30 pm—3.20 am. News midnight and 2 am.
GRC	London	2.92 N	102.9	10 am—3.45 pm

SHORTWAVE NOTES

(Continued from page 22)

Delhi on 11.87 mc spoilt at 8.45 p.m. when giving news by KWIX, but at 11 p.m. reaches R8 (Cushen). Reaches R9 here—L.J.K.

XGOX, Chungking, 15.20 mc., 19.73 m. Heard from 12.30—1.30 p.m. in programme to America. Announces, "This is the Chinese International Broadcasting Station XGOX, Chungking."—L.J.K.

SBP, Motala, 11.705 mc., 25.63 m. Opens at 10 p.m.—good signal—L.J.K.

AFHQ, Algiers, 11.883 mc., 25.24 m. Mr. Walker of W.A. says, "When closing on 49.67 m. at 10 a.m. announce "they will be back at 10.00 GMT (9 p.m. Syd.) on 25.2 m."

KWV, 'Frisco, 10.8 mc., 27.68 m. the 8—10 p.m. sched. is for Latin America (Cushen).

HCJB, Quito, 12.45 mc., 24.11 m. and 9.958 mc., 30.12m. Both open at 11 p.m.—L.J.K.

CSW-7, Lisbon, 9.735 mc., 30.82 m.: Have not heard in the morning for some time, but CSW-6, 27.17 m. was audible at 7.36 a.m. on Sunday, December 19.—L.J.K.

SPEEDY QUERY SERVICE

Conducted under the personal supervision of A. G. HULL

W.D. (Stockton) says: "Recently I asked what was an electron, and was told it was a minute negatively charged particle or possibly a portion of negative electricity. Well, what is an ATOM?"

A.—An atom is the smallest part of any of the 92 chemical elements that can be identified as such. An atom is composed of electrons, protons and possibly other particles, but its total charge is zero for there is an equal number of positive and negative charges. An atom is a grouping of electrons and protons (positively charged particles) which is reasonably stable, i.e., exists for an extended period of time. The simplest type of atom is that of hydrogen. A hydrogen atom consists of a single electron and a single proton, held together by electrostatic attraction. Possibly the electron revolves in an orbit around the proton much as a planet revolves around the sun.

J.T.P. (Ballarat) asks: "Are we likely to have television after the war, or will it always be in the future?"

A.—Unless some government department absolutely regulates television out of existence, we are almost certain to have it. When war broke out, there were 22 television transmission stations in America and other bodies had applied for transmitting licences, about a hundred of which were to have been granted. Television in other countries, at any rate, is certainly no longer in the future. Possibly the keen competition between the Du Mont and RCA system in America helped to stimulate progress. Television was in operation in England before the war, whilst on the continent there were not only television stations, but also a "wire" system of television coupled with a telephone line — people could phone and watch one another at the same time.

Recently a couple of television demonstration was held in Melbourne. Signals (from a picture of Abraham Lincoln) were generated by a phasmajector or ionoscope tube and sent by wire to a receiving outfit a few yards away. These demonstrations were witnessed by members of the I.R.E. (Aust.) and by members of the V.R.S.R.A. (Victorian Radio Servicemen and Retailers' Association).

REPLACEMENT GUIDE

Amalgamated Wireless Valve Co. Pty. Ltd., have announced the issue of a third edition of the Radiotron Replacement Guide. This Replacement Guide has already proved very popular since it gives detailed instructions for the replacement of a large number of types in short supply by other types in more plentiful supply. It is particularly intended for use by servicemen and those engaged in the repair and re-valving of radio receivers. The new edition covers 136 types in short supply, giving full details on the replacement of each type. Copies are available post paid at the price of 3d. per copy, provided that the enquiry is addressed to the company, Box 2516, G.P.O., Sydney.

W.T.S. (Gulgong) asks whether the issue containing the original circuit of the "Wonder One" is still available.

A.—Yes, this issue, the March, 1940, is still available from our back number department. We doubt, however, whether you will stand the slightest chance of getting the special coil kit for this set.

"Nipper" (Brisbane) writes: "I notice that the first valves in a set have a .1 mfd. bypass condenser while the last two have 25 mfd. condensers. Is the increase because the last valves handle more power?

A.—No. It is because the last valves handle more currents at "audio frequencies." These currents are alternating more slowly and a condenser offers more opposition to them. To make up for this, larger condensers are used.

At the input of a set, the "radio-frequency" currents from the aerial are alternating at the rate of about a million times a second, whilst at the output end the rate of alternation lies beween 30 and 7,000 times a second (depending upon the pitch of the note being heard in the speaker).

D.K. (Bayswater) has a 6-volt car radio and wants to operate it from a 12-volt supply.

A.—Although it is possible to run the radio with a resistor as you suggest it would not be a practical scheme. You would need to calculate the correct resistor after knowing the actual current drain of the job whilst in operation. Then you would need a resistor of this value and capable of carrying the current which will be drawn through it. We expect that it will work out as a massive resistor and rather difficult to obtain in these hard times. The power dissipated in the resistor will be completely lost, hence the inefficiency of the scheme. We would suggest that a more efficient scheme would be to arrange a clamp and lead from the battery so that you can draw off the voltage from three cells, thereby getting your correct 6-volts. Only a single wire will be required as the earth return can be used. The wire will need to be of fairly heavy gauge, as several amperes of current will be drawn through it and you don't want any excessive voltage drop in the wire.

M.V. (Goulburn) laments the passing of 175 kc. as an intermediate frequency and generally feels that radio design declined after '36.

A.—There is no doubt about the performance of the early superhets, which used 175 Kc., as an i.f. frequency. Even today these old supers can often hold their own with the more modern types, especially as regards selectivity and low noise level. The use of autodyne type of frequency changer was also a big help towards their performance in these respects. But we doubt if those who have had wide experience with both types of sets would really prefer the early superhets. In practice the extra selectivity was seldom of any practical value, yet tended to spoil the tone and make adjustments extra critical. Your views on the question of electrolytic condensers are interesting and we wouldn't be at all surprised if you were well supported in your statement that the wet electrolytics were a better job than some of the later dry type and semi-dry types. We are also forced to agree that the old triodes were more serviceable than some of the latest types of multi-element valves, especially in the battery-operated ranges.

Doubtless these points are appreciated by many technicians and when things get back to normal we can expect to see them acted upon accordingly.

L.B. (Perth) can get a 5Y3 but not an 80 for replacement in his set.

A.—It is only matter of fitting an octal socket, as the characteristics of the valves are otherwise similar. Socket connections were given in last month's issue.

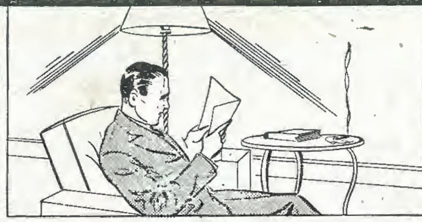
N.Z. 2

(Continued from page 13)

stations can be separated, but with a slight loss in signal strength. Should oscillation not be strong enough, either increase the turns on the reaction coil or, in the case of short-wave coils, move it nearer the grid coil. Remember, the valve is most sensitive when it is just not oscillating for phone and when it is just starting to oscillate for code stations. In a set such as this, using only a low B supply, it will help considerably if the 12-volt tapping is adjusted for best results, usually between 9 volts (to control fierce oscillation) and 16 volts (to assist weak oscillation.) It is also sometimes of great benefit to remove the earth connection from the set for short waves. With a little practice, proficiency in the operation of this set will be obtained and the operator well repaid. In conclusion, do not have your aerial too long, particularly on short waves, 75 feet being the maximum length for aerial and lead-in combined.

How John Stepped Ou

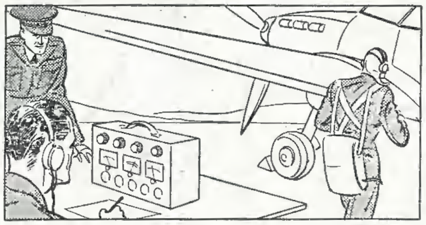
Not so very long ago, there was a young shop assistant named John, who wanted to do his best in the War effort. Being untrained, he did not know what do about it.



Until he heard about A.R.C. Radio Engineering training, and wrote for details of the course. He quickly saw the advantages of learning Radio Engineering, and started the A.R.C. course in his spare time.

John quickly learned enough to take a position at Radio Defence work, which was found for him by the College. This meant more money and good opportunities for advancement.

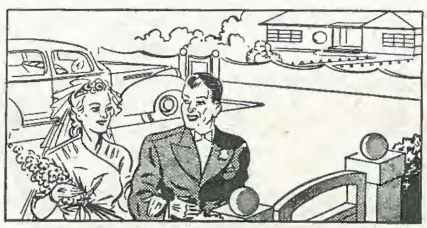
Had he wished at that time, he could have joined a Radio Unit in the Army at communications work, radio maintenance, or some other form of military radio work.



Or in the R.A.A.F. as a Radio Operator in air crew, or on the ground staff. Radio maintenance work, and radio location work, were also open to him.

Still on Defence Work, he carries on with his spare-time Radio training with the Australian Radio College. All the time making himself more and more proficient at Radio work.

Soon, by reason of his training, he is promoted to take control of his section of the work. This means another rise and prospects of even more promotion.



This extra money means wedding bells for John, and a home of his own. He can see the fulfilment of his highest ambitions quickly taking shape.

When his Radio Training is completed he will be ready to take up an executive Radio position. This may come during or after the end of the War. What is most important—HIS FUTURE IS ASSURED.

John stepped out of the rut, so can you. Men with some radio training are wanted urgently in Industry and all branches of the Fighting Forces. Learn Radio quickly and be equipped to help your country during this vital period. Peacetime will also find you ready to succeed in radio, to-day's fastest moving profession.

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