THE AUSTRALASIAN

Radio World

1/6

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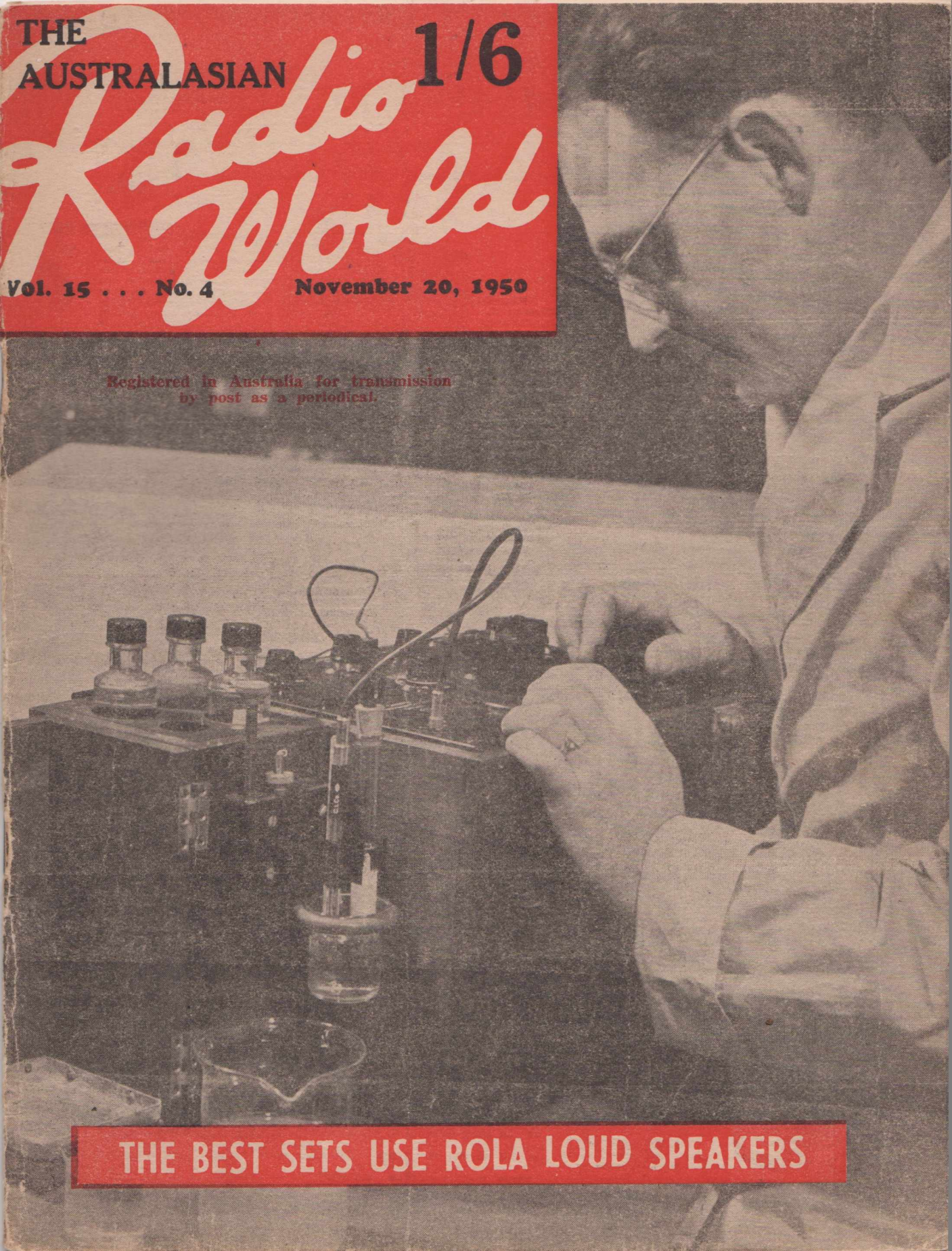

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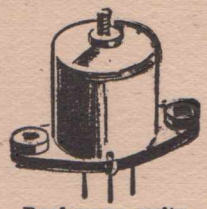

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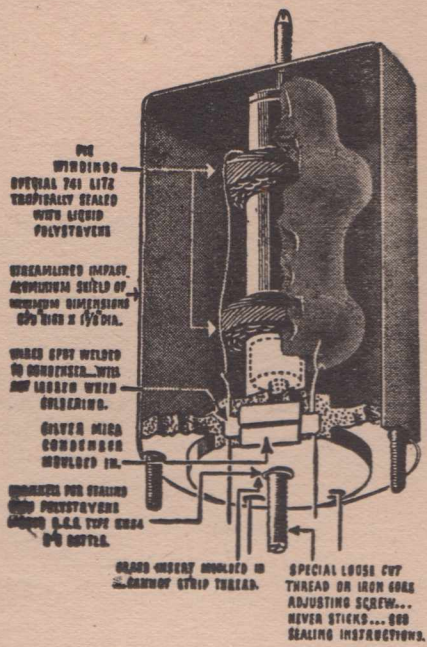

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THE AUSTRALASIAN

RADIO WORLD

DEVOTED ENTIRELY TO TECHNICAL RADIO

and incorporating

ALL-WAVE ALL-WORLD DX NEWS

Vol. 15 November, 1950 No. 4

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OUR COVER PICTURE . .

Modern manufacture of many types of electrical equipment calls for close liaison with the industrial chemist. Our picture shows one of the Rola laboratory staff conducting P. H. (acidity) tests on paper used for loud-speaker voice coils.

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Personal . . .

Here is the important announcement which I have been leading up to for some issues past.

As and from 1st December, "The Australasian Radio World" will be taken over and published by a new Company.

As I mentioned in a recent editorial, the publishing of Radio World has been a bit too much of a job for a one-man business, and I have long felt that I was not doing full justice to the wide circle of keen enthusiasts who have supported me.

The new Company will have it's headquarters in Sydney, with Mr. Lay. W. Cranch, A.M.I.R.E., M.W.I.A., as Managing Editor, well known as one of Australia's leading Radio Engineers.

With their greater facilities, including overseas tie-ups, the new Company will enable the production of bigger and brighter issues with a much wider appeal. ...

It is planned that the whole production will be more of a team job than it has been in the past, plus closer contact with the radio trade in the various capitals, so that every new development will be covered in detail as soon as it reaches the market.

The old features, will, to a large extent be retained, and many new ones added, including television, which will be given greater attention, especially the practical side, thus paving the way for the time when a thorough knowledge of this subject will be highly desirable. .....

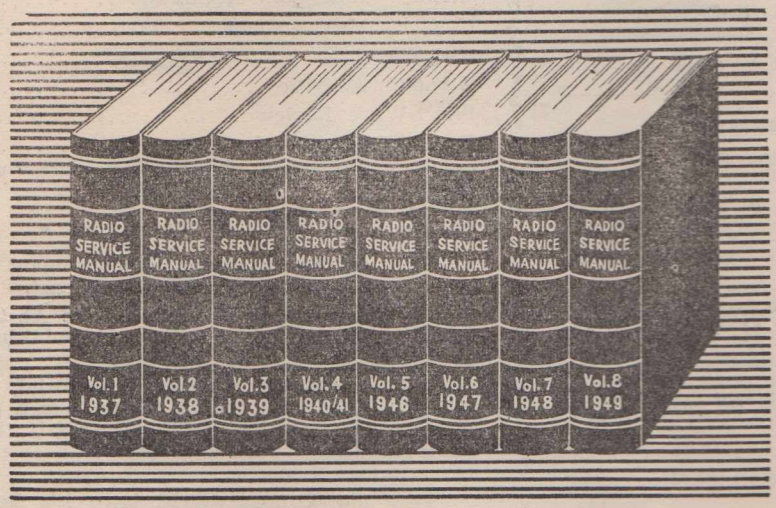
Please note the change of address—Room 302, 17 Bond St., Sydney.

This is not exactly a farewell, as I hope to continue, one way or another, a close association with the new Company.

—A. G. HULL

Containing the Circuits of All Commercial Receivers Manufactured during 1949.

VOLUME 8
1949 RADIO CIRCUITS



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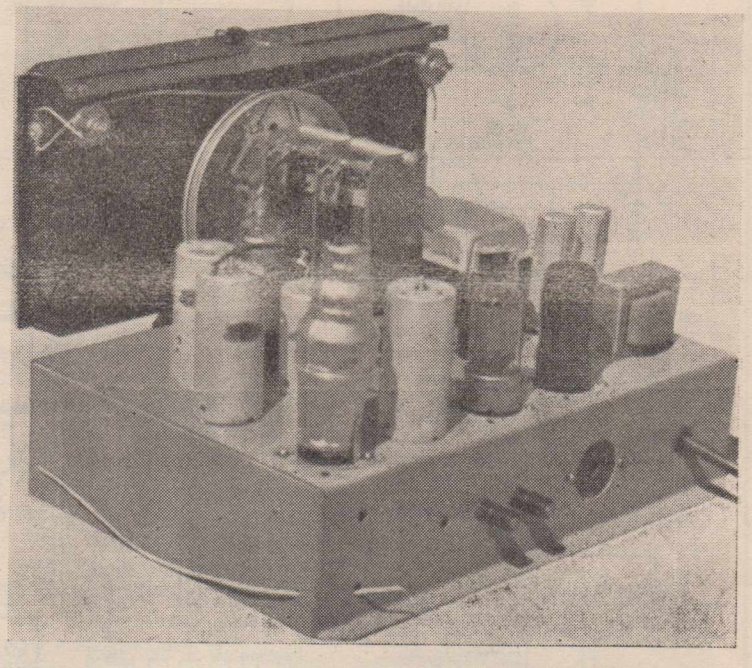
A Fine Radiogram

HERE is a simple, yet effective, circuit for a chassis which is suitable for a radiogram outfit, as it has excellent qualities as an amplifier for pick-up work, as well as good all-round performance as a broadcast receiver.

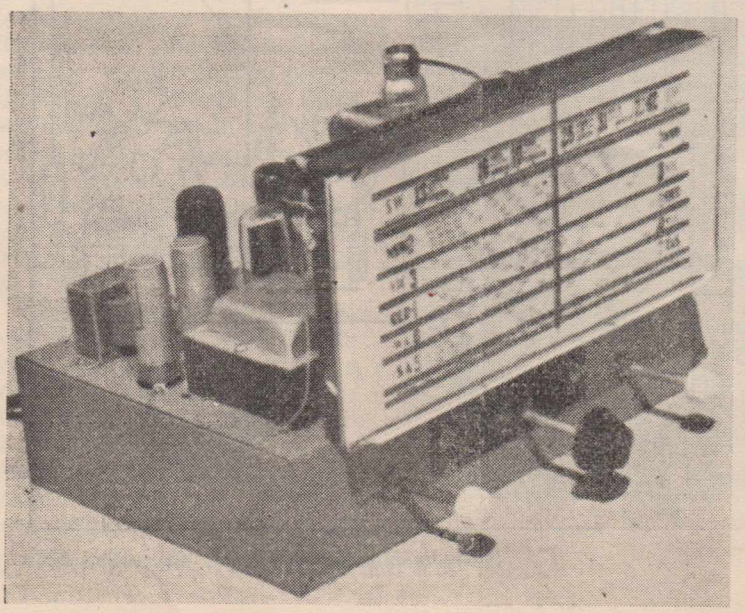
SOME time ago I built an amplifier from a circuit which I obtained from Collins Radio, Melbourne. It was not anything very unusual, just a single 6V6 in the output, but with a slightly different feedback arrangement. Apparently this arrangement was a most effective one, because

By
LES ANDERSON



the tone and power of the amplifier was exceptionally good, and, to my way of thinking, infinitely better than a great many simple sets and amplifiers that I have heard.

Wanting to build myself a good all-round, general-purpose set, I felt that I could not do better than retain the same audio end, so that the finished set would be equally suitable for radio or gramophone work. So I re-drew the circut of the amplifier, added a more or less standard type of superheterodyne tuner unit, and found that I had a complete circuit for a five-valve radiogram.



Working from this circuit I built up the chassis which is shown in the photographs herewith. Performance is right up to expectations and I have no hesitation in placing the fullest recommendation behind the circuit. Performance on the broadcast stations is fine, with ample range and selectivity, and with the same fine tone

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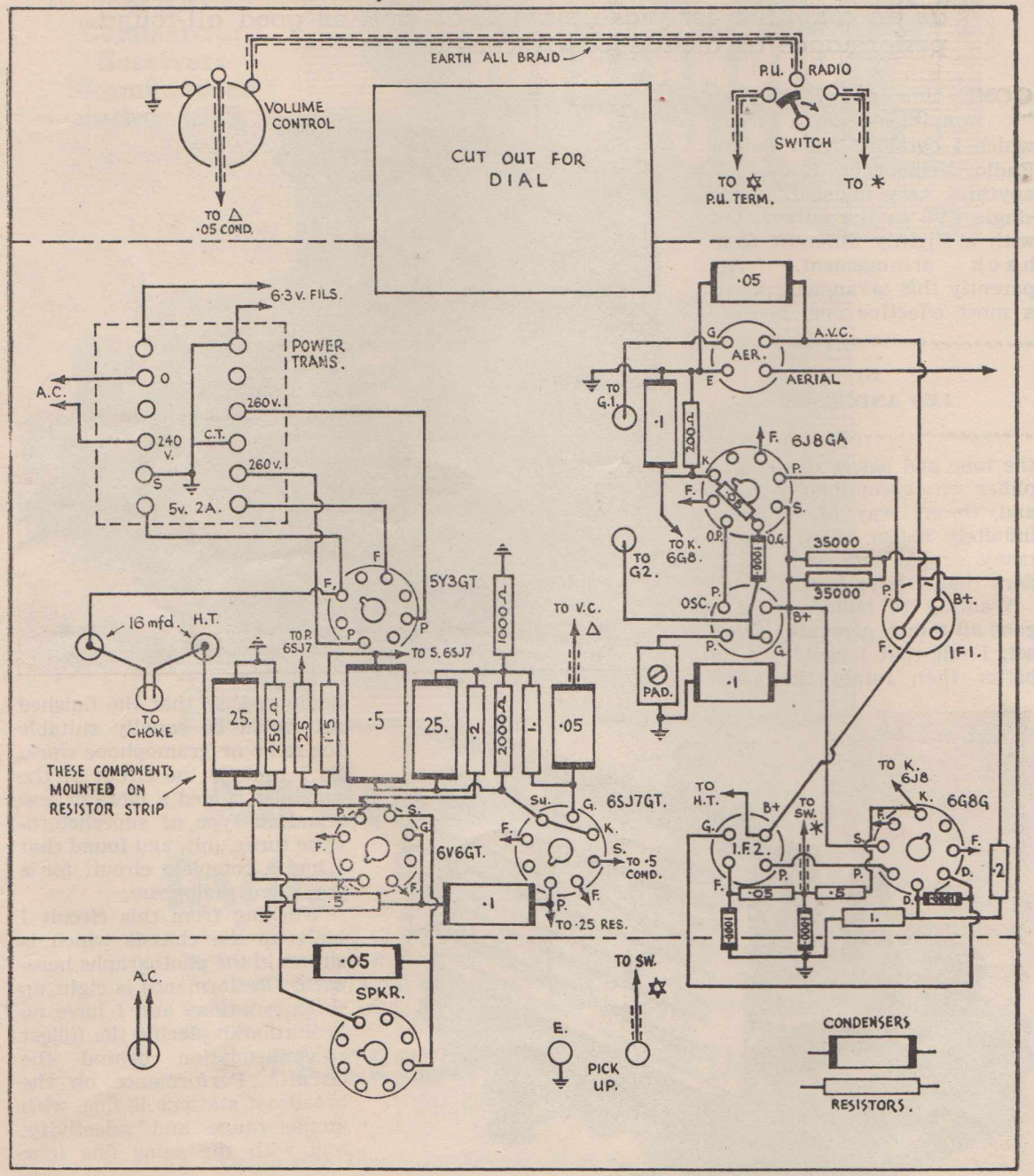
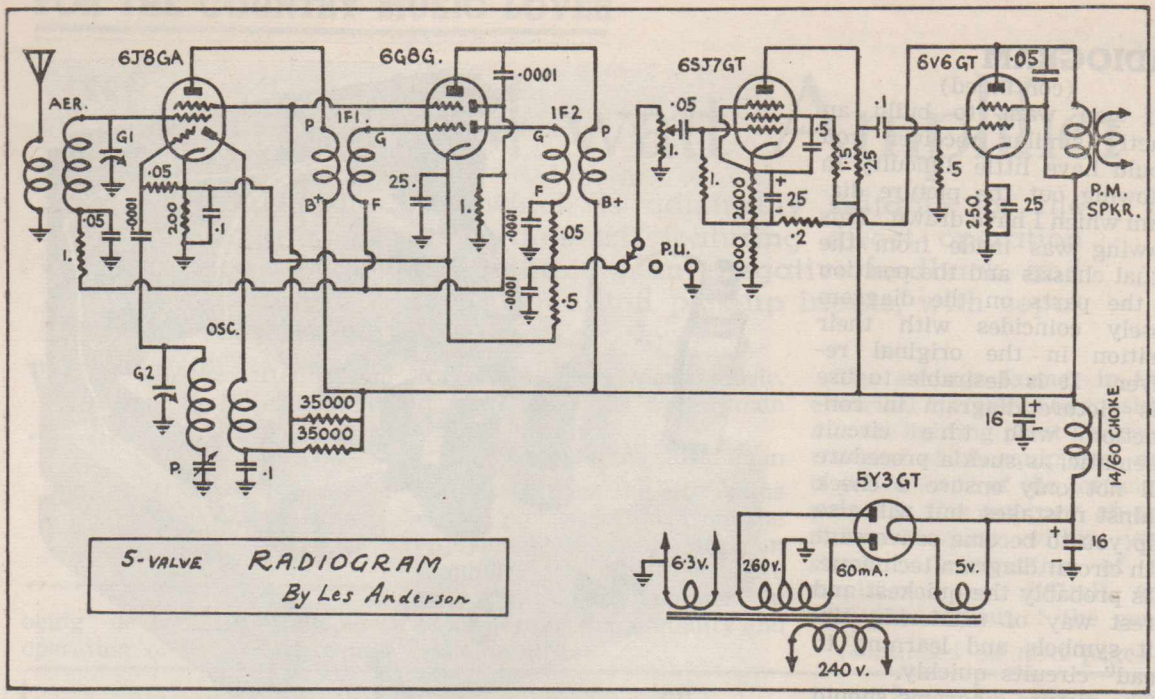
RADIOGRAM
(continued)

and power which is also obtained by using a gramophone pick-up.

Components

For the base I had no trouble in obtaining a standard type of chassis, with suitable holes cut for power transformer mounting and valve sockets. A standard type of power transformer was used, with a secondary rated to supply 285 volts at 100 milliamps. Actually the total drain of the set is considerably less than this, but I always think that it is a good plan to have a bit of current rating to spare. It allows the power transformer to run cooler, and the reserve of current is always there in case heavy passages of recordings are to be reproduced without





distortion.

To make sure that there would be no trouble with electrolytic filter condensers I made a point of obtaining a couple with 600-volt ratings.

For the coils I accepted the advice of the salesman who was serving me with the rest of the parts and took iron-cored coils in the "Q-plus" brand. These proved very effective and gave excellent performance in the finished set, with no trouble to get proper alignment. Doubtless there are suitable coils in the other popular brands, such as Aegis, R.C.S., and Vega. At one time or another I have heard good reports on all of these coils from my many pals who make up sets.

When selecting the coils it was necessary for me to decide what type of valve I would use for the converter. It seems that the high-gain types, such as the ECH35 and the X61M, give the best performance, while some builders prefer to use types 6BE6 and 6SA7 which need special coils, but I thought I would stick to the more or less standard type of converter as used in about 90% of the commercial sets of to-day, the 6J8GA.

Having been told that the best way to check the performance of a converter valve is by measuring the grid current, I was pleased to find that this varied over the band, as is normal, but kept within the limits of 200 to 400 micro-amperes (.2 to .4 of a milli-amp) as it should.

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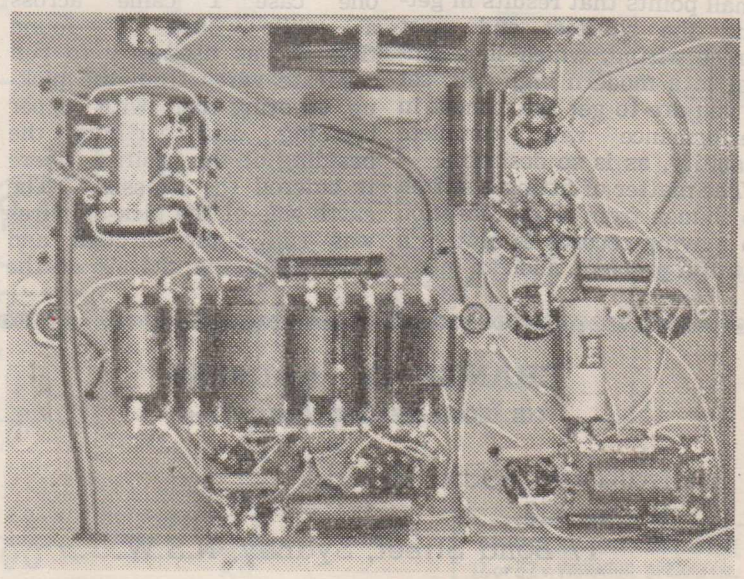
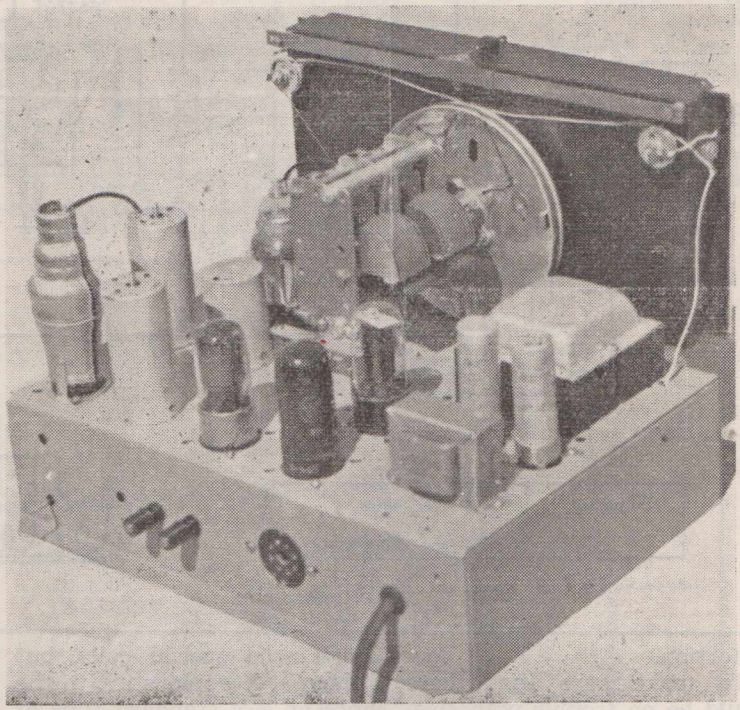


RADIOGRAM

(continued)

If you want to build an exactly similar receiver you should have little difficulty in following out the picture diagram which I have drawn. This drawing was made from the actual chassis and the position of the parts on the diagram closely coincides with their position in the original receiver. It is desirable to use this picture diagram in conjunction with the circuit schematic, as such a procedure will not only ensure a check against mistakes, but will also help you to become conversant with circuit diagram technique. It is probably the quickest and surest way of mastering circuit symbols and learning to "read" circuits quickly.



The picture diagrams should be watched carefully to check on the way in which the power transformer is mounted, so that the terminal strip is the right way round. It is also handy to follow to make sure that the valve sockets are the right way round, and the coils, too. It is attention to these small points that results in getting the shortest and most direct wiring, which is essential in a modern high-gain set if you are to get the utmost in performance with complete stability, as is so desirable.

The matter of fitting a switch to change from radio reception to playing records is always a bit of a problem, and can introduce hum and other worries if not carried out properly. I find that it is not too good to depend on the braid of the pick-up wires as the earth return for the pick-up. In one case I came across a while back I found that it was necessary to run separate wires from the pick-up, covering them with copper braiding, and earthing the braiding at the position where it entered the chassis. The earth side of the pick-up wires was run right through and earthed to the chassis at the same position as the bias resistor of the first audio valve.

Line Voltage

Proper performance of any set or amplifier is dependant largely on correct voltages throughout, but the line voltage in these hard times is seldom the 240 volts that it is supposed to be. If you can procure a meter it is a good idea to check the line voltage several times during the day to see how it stands. In many cases it will be found that the peak voltage will be 220 or even as low as 200 volts. In such cases it is desirable to apply the power leads to the 220 volt terminals on the power transformer.

The Speaker

Not being able to get the new Rola 12-OX speaker yet, I used a model 12-0, and found that it gave reproduction quite up to expectations when mounted in a solid cabinet with the baffle hole enlarged to suit the 12in. speaker.

"Farmer's 4-watt Amplifier

A SMALL amplifier which is admirably suitable for the country record enthusiast, featuring direct operation from the 32-volt home lighting plant, negative feedback, and has provision for microphone and pick-up inputs, with separate volume controls.

By
A. J. GARDNER
Assoc. I.R.E.
22 Queens Cres.
Mt. Lawley, W.A.

WITH all the attention in current radio publications being devoted to amplifiers operating off city A.C. mains, for playing home record music, it must make the countryman rather envious.

Just because the rural man is isolated from the city mains should not debar him from the enjoyment of possessing an amplifier, which will compare with an A.C. amplifier in power output, tonal quality and running costs.

The average farmer in this electrical age seems to consider a home lighting plant an essential part of his equipment, and if you are one of the fortunate people in this category, an amplifier is quite within your means. Construction of an amplifier is not difficult, and with the advent of the gene-

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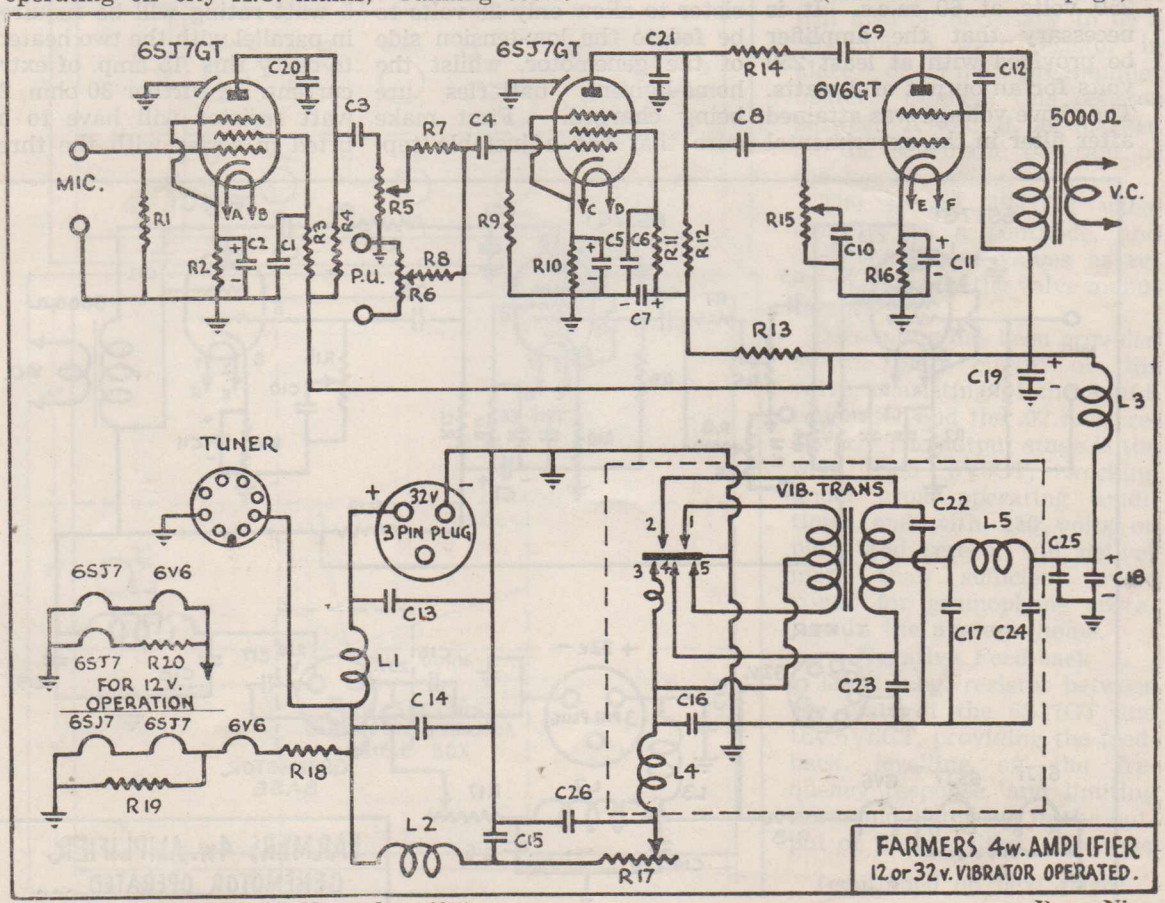


FARMERS

(continued)

motor type of power supply being available from disposals, at a fraction of their original cost, the power supply for the amplifier is ready made.

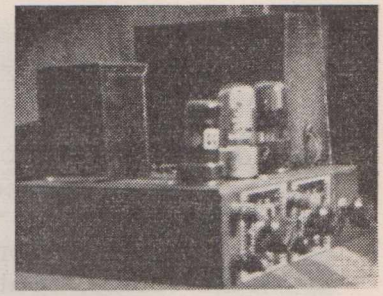
Genemotor

It has been found that genemotor operated equipment is much easier to get going, from a hash point of view, than the vibrator operated type. Filter circuits are not so critical, and as long as certain precautions are taken, the finished equipment should be quiet in operation, without much difficulty.

The type of genemotor used in the original amplifier had an input voltage of 28 volts at 1.1 amps., and an output of 250 volts at 60 m.c.s. It is necessary that the amplifier be provided with at least 250 volts for an output of 4 watts. The above voltage was attained after filter in the experimental amplifier. But it is necessary to use a H.T. filter choke with a D.C. resistance of 200 ohms, and capable of passing 60 ma.s of current. A lower voltage than 250 volts, will only bring about indifferent results, and lower volume.

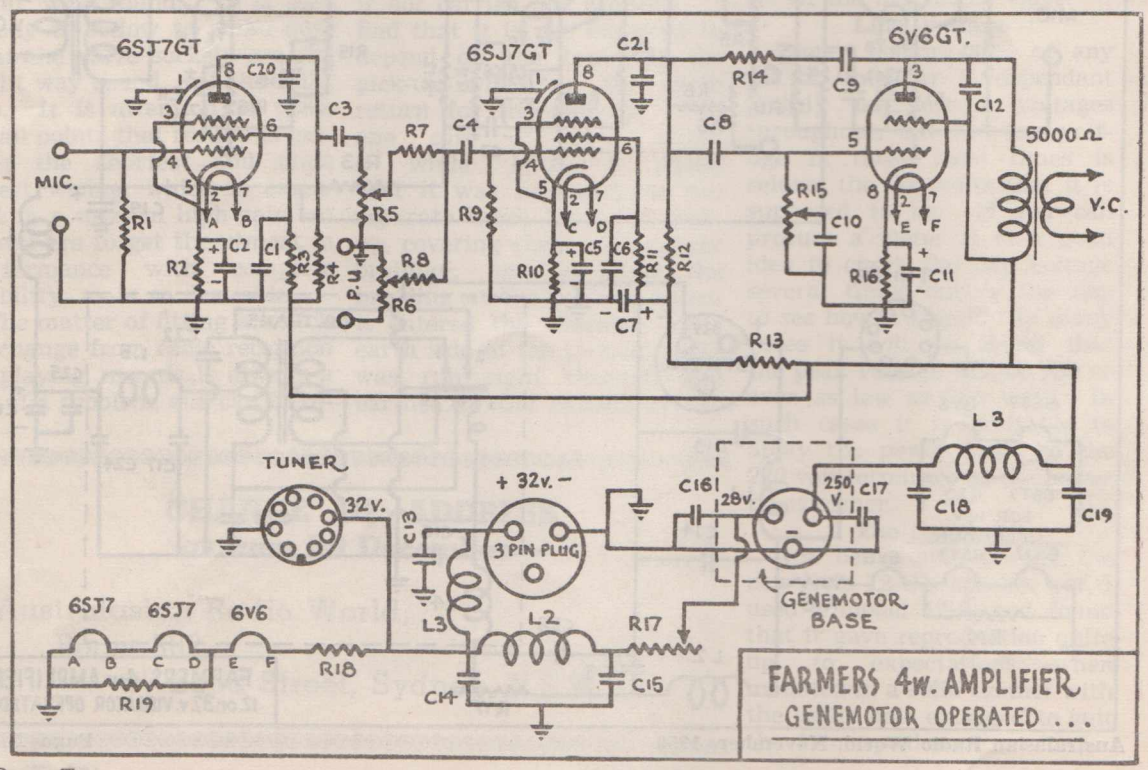
Plant Voltage

As 32 volt lighting plants vary in voltage, with generator not charging to same charging, between 32 to 40 volts, making it necessary to fit a resistor to control the input voltage to the genemotor. This voltage must be kept reasonably close to 28 volts, and it is suggested that a 15 ohm., 20 watt adjustable type of resistor be used. As this allows a control of around 14 volts at 1.1 amps. The idea is to adjust this resistor to allow only 28 volts to be fed to the low-tension side of the genemotor, whilst the home-lighting batteries are being charged. First make sure that the adjustable tapping on the resistor is set at maximum, and that 15 ohms of resistance will be in circuit, before switching on.



Heater Voltages

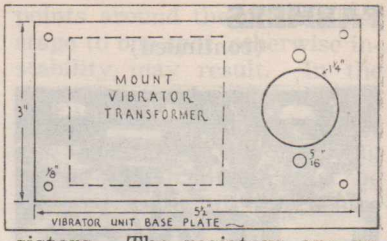
For operation off the 32 volt supply, it will be necessary to wire the valve heaters in series, As the 6V6GT require .45 amp. and the two 6SJ7GT's .3 amp. a resistor of 85 ohms, with a 5 watt rating will be required in parallel with the two heaters to carry this .15 amp. of extra current. A further 30 ohm, 20 watt resistor will have to be fitted in series with the three

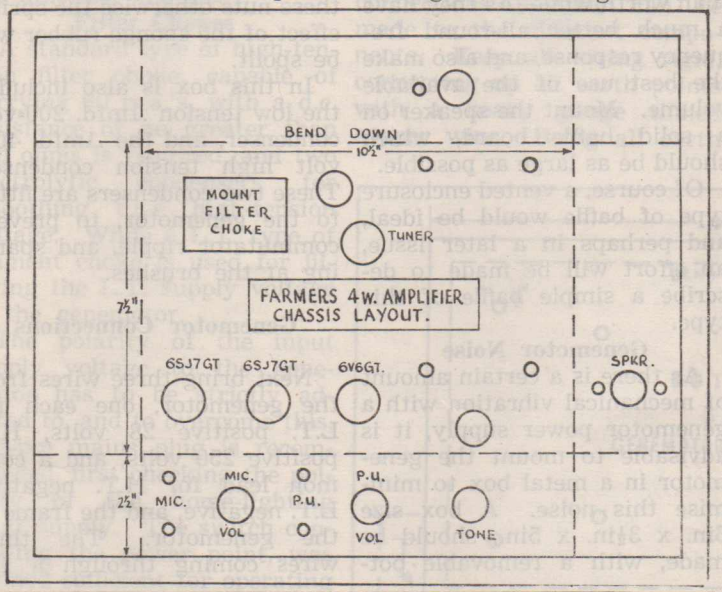


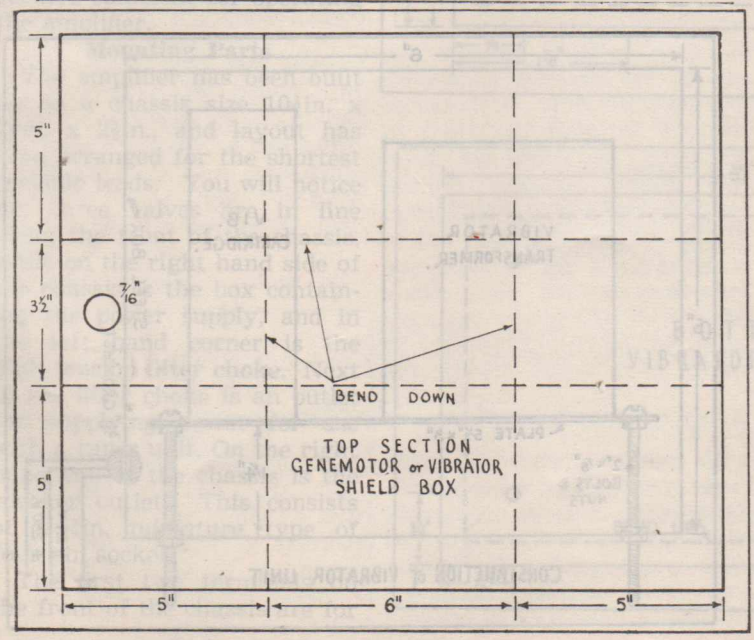
valves to allow for operation off the 32 volt supply. If your particular plant has an initial voltage of 36 volts, the above mentioned resistor will have to be increased to 35 ohms, 20 watts to create the required voltage drop.

Circuit Details

The circuit follows along conventional lines, consisting of a 6SJ7GT penthode pre-amplifier stage for microphone operation. Output from this stage is applied across a .5 meg. volume control, and then to the grid of a second 6SJ7GT. Provision has been made for an alternative source of signal from a second volume control, connected across the pick-up circuit for the microphone, and pick-up, the moving arm of each control is taken to the grid of the valve, through two .5 meg. fixed resistors. The resistors are required to minimise interaction between the two input circuits, permitting either the microphone or pick-up to be faded in or out, without affecting each other. Although the circuit is simple, it is quite effective, and also less complicated than providing a twin triode type of valve as a mixer stage.







If the preamplifier stage is not required it can be omitted and the pick-up volume control connected direct to the grid of the second 6SJ7GT valve. It will also be necessary to fit a 20 ohm, 5 watt resistor in place of the preamplifier heater. Connect this resistor between A and B, as marked on the schematic diagram of the heater wiring.

The second 6SJ7GT valve operates as a penthode, and uses component values as recommended by the valve manufacturers.

Decoupling has been provided in the plate circuit of this valve, consisting of the 8 mfd. condenser and the .02 meg. resistor. The output stage is the well tried 6V6GT, working under usual operating conditions, and with 250 volts on plate and screen, will deliver more than sufficient audio power for gramophone operation in the average home.

Negative Feed-back

The 1 meg. resistor between the plate of the 6SJ7GT and the 6V6GT, providing the feed-back, levelling off the frequency response, and limiting harmonic distortion in the output of the amplifier. However

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FARMERS
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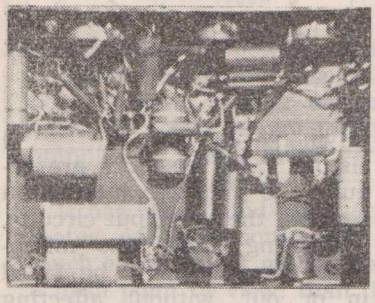


the degree of feed-back at low frequencies is reduced by the .002 mfd. condenser in the feed-back network, as this helps to increase the gain and gives a certain amount of bass boost. The 5 meg. potentiometer provided for the pick-up volume control is suitable for direct connection of most pick-ups. A lower value will be required for a magnetic type, somewhere around .05 meg., should be suitable. Of course, actually the value of this potentiometer will depend on the particular make of pick-up used. The manufacturers recommendations should be strictly followed in this regard to ensure maximum results.

A treble cut type of tone control is connected in the grid circuit of the output valve, and will be found to be quite effective on the high frequency response of the amplifier.

Output

The inclusion of the mixer circuit and negative feed-back makes certain demands on the maximum output of the amplifier. Although there should be sufficient for use with an ordinary magnetic or crystal pick-up, and a crystal microphone. If the overhaul gain is not sufficient for your particular purpose, just omit the 1 meg. resistor and the .002 mfd. condenser, which make up the feed-back circuit.

It cannot be stressed too strongly that for the amplifier to attain 4 watts output, it must be supplied with 250 volts on the plate and screen of the output valve. Also a modern type of 8 inch or larger permmag speaker must be used. A 12-inch speaker is actually the best buy. The small extra cost involved, between the smaller and larger speaker, is more than worth while. As they have a much better all-round frequency response, and also make the best use of the available volume. Mount the speaker on a solid baffle board, which should be as large as possible.

Of course, a vented enclosure type of baffle would be ideal, and perhaps in a later issue, an effort will be made to describe a simple baffle of this type.

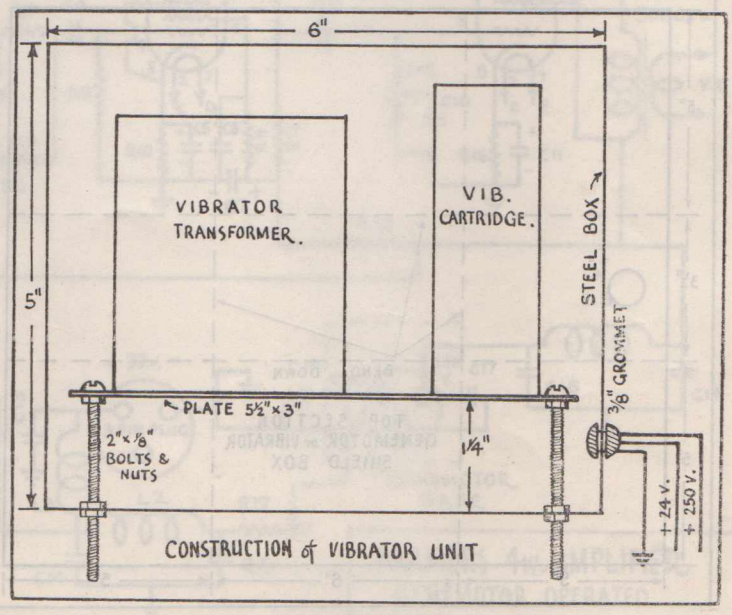
Genemotor Noise

As there is a certain amount of mechanical vibration with a genemotor power supply, it is advisable to mount the genemotor in a metal box to minimise this noise. A box size 6in. x 3½in. x 5in., should be made, with a removable bottom. The genemotor should be fitted to the bottom of the box, by four bolts size 1¾in. x ⅛in. Two pieces of ⅛in. sponge rubber being fitted on each bolt, to prevent this mechanical vibration from affecting the amplifier. The genemotor is then placed on the bolts, and also a ⅛in. rubber grommet stops the nut from coming undone. Do not over tighten these nuts otherwise the spring effect of the sponge rubber will be spoilt.

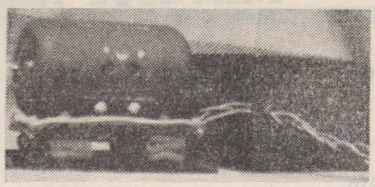
In this box is also included the low tension .1mfd. 200-volt condenser, and the .1mfd. 400-volt high tension condenser. These two condensers are fitted to the genemotor, to prevent commutator ripple, and sparking at the brushes.

Genemotor Connections

Next bring three wires from the genemotor, one each for L.T. positive 28 volts, H.T. positive 250 volts, and a common lead for H.T. negative, L.T. negative, and the frame of the genemotor. The three wires coming through a ⅜in.



CONSTRUCTION of VIBRATOR UNIT



hole in the end of the shield box, and being brought to a three tag terminal strip under the amplifier chassis.

Filter Chokes

A standard type of high-tension filter choke, capable of carrying 60 m.a.'s, with a d.c. resistance of no greater than 200 ohms is required, and two electrolytic condensers for smoothing the high-tension voltage. While a L.T. type of filament choke is used for filtering the L.T. supply voltage to the genemotor.

The polarity of the input supply voltage to the genemotor has to be strictly adhered to, and to overcome this, a 3-pin mains plug is recommended, first checking the polarity of the home-lighting plant supply. The switch controlling the power point, was deemed sufficient for operating the amplifier.

Mounting Parts

The amplifier has been built up on a chassis size 10½in. x 7½in. x 2½in., and layout has been arranged for the shortest possible leads. You will notice the three valves are in line along the front of the chassis, while on the right hand side of the chassis is the box containing the power supply, and in the left hand corner is the high tension filter choke. Next to the filter choke is an outlet for supplying power for use with a tuner unit. On the right hand end of the chassis is the speaker outlet. This consists of a ⅝in. miniature type of four pin socket.

The first two terminals on the front of the chassis are for microphone input, followed by the mike gain control, pick-up input, and volume control, with the tone control at the end.

A good idea of the layout can be gained from the photographs of the amplfier.

Important Points

Make sure that all valve sockets are the correct way around, so that the shortest connections possible can be made to the different components. Keep all wiring rigid, connecting up all earth points with a heavy gauge tinned copper wire. Bring all earth points around the preamplifier stage to one spot, otherwise instability may result. In the original amplifier no shielding of wires was found necessary. The two .5 meg. resistors going to the gain control, must be soldered right at the centre

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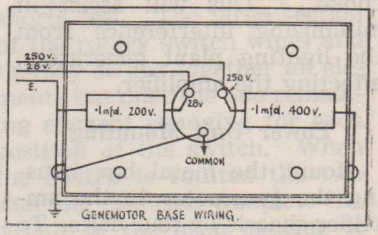

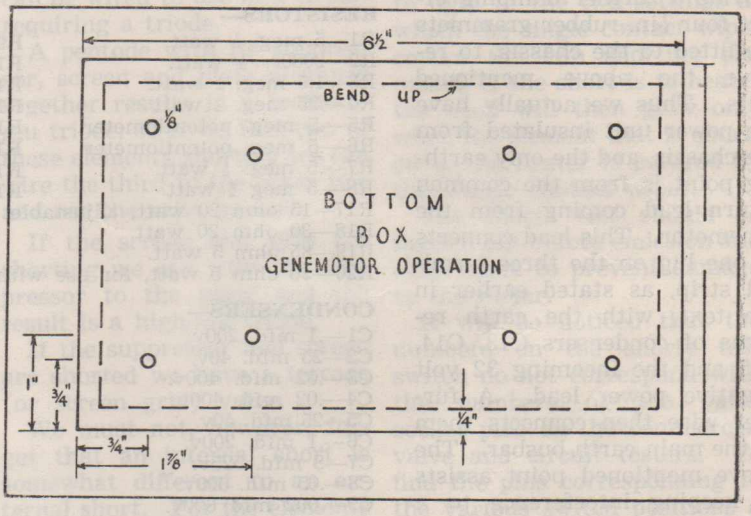

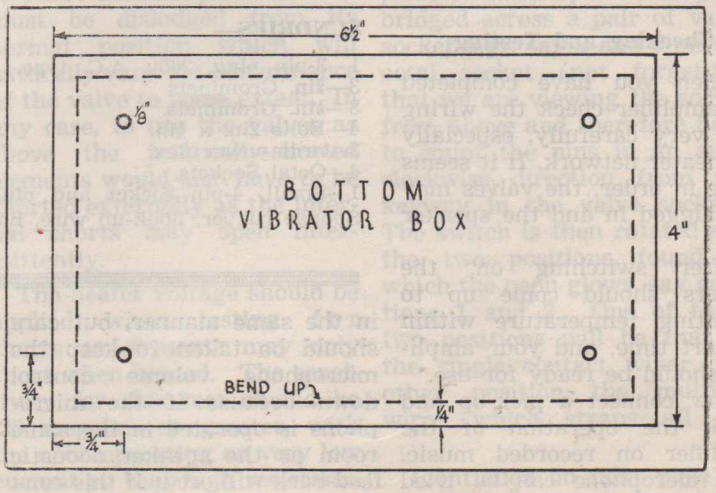

terminals to be fully effective.

Also place L.T. choke L1, as near as possible to where the power lead enters the chassis, bypassing it with a .5 mfd., 200 volt condenser right at the choke. This will assist in minimizing interference from the lighting plant generators, affecting the amplifier.

Power Unit Mounting

Mount the metal box housing the genemotor to the amplifier chassis by four bolts. To provide a further damping effect four ¼in. rubber grammets are fitted to the chassis, to receive the above mentioned bolts. Thus we actually have the power unit insulated from the chassis, and the only earthing point is from the common return lead coming from the genemotor. This lead connects to one lug on the three terminal strip, as stated earlier in the text, with the earth returns of condensers C13, C14, C15 and the incoming 32 volt negative power lead. A further wire then connects them to the main earth busbar. The above mentioned point assists in keeping interference to a low level.

Checking and Testing

When you have completed the amplifier check the wiring over very carefully, especially the heater network. If it seems to be in order, the valves may be plugged in and the speaker also.

After switching on, the heaters should come up to operating temperature within a short time, and your amplifier should be ready for use.

Now connect a pick-up and check the operation of the amplifier on recorded music. The microphone can be tried in the same manner, but care should be taken to keep the microphone volume control down because if the microphone is operated in the same room as the speaker acoustic feed-back will occur if this control is advanced to maximum.

You will find the amplifier gives excellent reproduction of recorded music, and is quite economical in operation, only requiring 1.5 amps. for the full output of 4 watts.

FARMERS' 4W AMPLIFIER GENEMOTOR OPERATION

Parts List

CHASSIS—Size 10½in. x 7½in. x 2½in.

METAL BOX—Size 6in. x 3½in. x 5in.

1—L3 High Tension filter choke, 60 ma.'s (resistance 200 r)
2—L.T. filament type chokes. L1 and L2.
4—Terminals, 2—Red, 2—Black.
2—Indicator plates
3—Pointer knobs
1—Genemotor, 28 volt 1.1A. input; 250 volt, 60 ma.'s.

SPEAKER—Perm-Mag. type, 8in. or larger, matching 5,000 ohms.

VALVES—2—6SJ7GT's, 1—6V6GT.

RESISTORS—

R1—5 meg. ½ watt.
R2—2000r. ½ watt.
R3—1.5 meg. 1 watt.
R4—.25 meg. ½ watt
R5—.5 meg. potentiometer.
R6—.5 meg. potentiometer
R7—.5 meg. ½ watt.
R8—.5 meg ½ watt.
R9—1 meg. ½ watt.
R10—2,000 ohm ½ watt.
R11—1.5 meg. 1 watt.
R12—.25 meg. ½ watt.
R13—.02 meg. 1 watt.
R14—1 meg. 1 watt.
R15—.5 meg. potentiometer
R16—250 ohm 3 watt.
R17—15 ohm 20 watt, adjustable.
R18—30 ohm 20 watt.
R19—85 ohm 5 watt.
R20—20 ohm 5 watt, for use without preamplifier.

CONDENSERS—

C1—.1 mfd. 200v.
C2—25 mfd. 40v.
C3—.02 mfd. 400v.
C4—.02 mfd. 400v.
C5—25 mfd. 40v.
C6—.1 mfd. 200v.
C7—8 mfd. 525v.
C8—.05 mfd. 600v.
C9—.002 mfd 600v.
C10—.004 mfd. 400v.
C11—25 mfd. 40v.
C12—.001 mfd 600v.
C13—.5 mfd. 200v.
C14—.25 mfd. 200v.
C15—.1 mfd. 200v.
C16—.1 mfd. 200v.
C17—.1 mfd. 400v.
C18—8 mfd. 525v.
C19—16 mfd. 525v.
C20 and C21—.0001 mfd. mica

SUNDRIES—

1—3-pin plug, 240v. A.C. type.
3—⅝in. Grommets.
8—¼in. Grommets.
4—Bolts 2in. x ¼in.
3 yards power flex.
4—Octal Sockets.
1—Small, 4-pin socket and plug.
Sponge rubber, hook-up wire, bolts and nuts ,terminal strips.

The Valve Checker

By
H. M. WATSON
89 Botting Street
Albert Park, S.A.

THE instrument, as its name implies, is to test the condition of valves.

A valve may be faulty due to any of the following reasons:—

Shorted electrodes
Open electrodes
Loss of Emission
Low Mutual Conductance
Grid Current
Heater Cathode leakage
Gas
Microphony

If we don't know just how our tester functions then half of its usefulness is wasted; on the other hand if we are familiar with its operation we can test the valves and then use them according to their merits.

For instance if a tester reveals a short or leakage from heater to cathode on say a 6V6, we could still use this valve by earthing the cathode and one leg of the heater winding and changing to back bias.

Then again we may have a diode pentode in which the diodes have given up the ghost, but what's to stop us using the pentode section? A lead from an element to a valve pin may have become unsoldered and can be repaired.

Shorts between other elements may not in all cases greatly affect the working of the valve. The valve may be a pentode wired as a triode, or can be wired to use in a circuit requiring a triode.

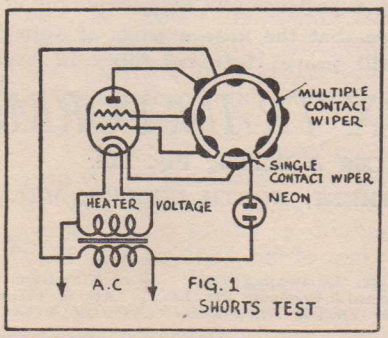

FIG. 1
SHORTS TEST

A pentode with its suppressor, screen and plate strapped together results in a medium-mu triode, so if we find two of these elements shorting we can wire the third to the other two and use the valve as such.

If the screen and grid are shorting we can wire the suppressor to the plate and the result is a high-mu triode.

If the suppressor and screen are shorted we have a tetrode (or screen grid) valve.

We must not, however, forget that an internal short is somewhat different to an external short. For the elements to short internally an element must be dislodged from its normal position which will naturally vary the performance of the valve to some extent. In any case, to use the valves as above the internally-shorted elements would also have to be shorted externally as the internal shorts may open intermittently.

The heater voltage should be applied when testing for shorts as elements may only short when heated. The sensitivity for this test should be .25 megohm or greater, with the neon operating on very low current so that high resistance shorts will also be detected.

Fig. 1 shows a set-up for a shorts test. The large section of the rotary switch wipes and thereby straps together all elements but one; the one remaining element changing for each position of the switch. When the switch is rotated the two shorting elements complete the circuit to the neon causing it to light at the two settings at which the single contact wiper covers the two shorting elements. If the short is to heater the neon will then glow only when the element that is shorted to the heater is covered by this single contact wiper.

The shorts test should be carried out before emission and other tests to prevent damage to the meter.

It will be noticed that the numbers on the shorts test switch do not correspond with the numbers of the valve socket pins on the commercial valve and circuit testers. To find the pins corresponding to the various switch positions a piece of hook-up wire may be bridged across a pair of valve socket legs, say 3 and 5 on the octal socket (not forgetting that we are viewing the socket from above and therefore have to count the pins in an anti-clockwise direction from the keyway in the valve socket.) The switch is then rotated and the two positions found at which the neon glows, say positions 1 and 2. One of these two positions will be that of the single contact wiper, the other position the multiple wiper which straps all the

(continued on next page)

CHECKER

(continued)

remaining valve socket legs together. The single contact wiper is the one we have to locate so with the shorts switch in position 1 we leave one end of our bridging wire in leg 3 and removing the other end from leg 5 to other legs see if the neon stays on. If it does, pin 3 corresponds to position 1 of the switch, if it doesn't then pin 5 must be the pin.

After the corresponding pins of the octal socket have been found for each switch position, the same procedure is repeated for all other sockets in the valve tester and a list drawn up. My particular tester lists as under:—

Connections to Selector Switch

Position 1—
- Pin 3 on 4, 5, 6 and 7 Pin Valves.
- Pin 4 on "P" type valves.
- Pin 5 on Octal and Octal Diode valves.
- Pin 6 on Octal rectifier valves.

Position 2—
- Pin 2 on 4, 5, 6 and 7 Pin valves.
- Pin 3 on Octal, Octal Diode and "P" type valves.
- Pin 4 on Octal Rectifier valve.

Position 5—
- Pin 2 on "P" type valves.
- Pin 4 on 5-Pin valves.
- Pin 5 on 6-Pin and Octal Rectifier valves.

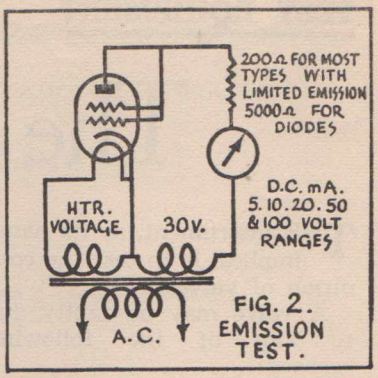

FIG. 2. EMISSION TEST.

- Pin 6 on 7-Pin valves.
- Pin 8 on Octal and Octal Diode valves.

Position 6—
- Pin 3 on Octal Rectifier type valves.

Pin 4 on 6-Pin, Octal and Octal Diode valves.

Pin 5 on 7-Pin valves.

Pin 6 on "P" Type valves.

Position 7—

Pin 4 on 7-Pin valves.

Pin 5 on "P" Type valves.

Pin 6 on Octal and Octal Diode valves.

Position 8—

Grid clips for all valves.

If we have something like this for reference we will also have a tester that, apart from detecting faulty valves, will give us a lead in locating the origin of the trouble. To take a typical example we test a 6V6 for shorts and find the neon lights with the switch in positions 1 and 6. We consult our list and find position 1 to be pin 5 and position 6 to be pin 4. From a valve data book we find these are the control grid and screen respectively. From this information it would appear that the 6V6 was not getting its plate voltage. No plate voltage and a heavy load thrown on the screen causing it to sag due to excessive heating. A possible cause for this short could be due to running the set without the speaker plugged in. In any case, we would make sure that voltage was present at pin 3 of the valve socket before replacing the 6V6.

An emission test (Fig. 2) shows the end of life of a valve. A valve's emission drops with age until the valve will no longer serve its purpose. This test is taken between the cathode and all other elements tied together, the average value of D.C. plate current being read on a milliameter. Gas ironized by the plate current may compensate for low emission as far as plate current reading is concerned thus giving a higher reading than that due to emission alone. If the valve is gassy, however, the emission reading would be lowered due to the emitting surface of the cathode being impaired. Valves only become gassy which have been greatly overloaded, the excessive heat causing small pores to open in the element metal and the overload impairs the cathode surface.

Mutual conductance (or grid shift) testers (Fig. 5) work on the principle of measuring a change in plate current for a given change of grid voltage with the same applied plate voltage. This type of tester is more complicated owing to the large number of meters or switches that have to go with same to ensure that the correct operating voltages are applied to each element of the valve under test. This test is the best for valves with a control grid whilst gridless valves such as rectifiers naturally cannot have this test applied so require an emission test.

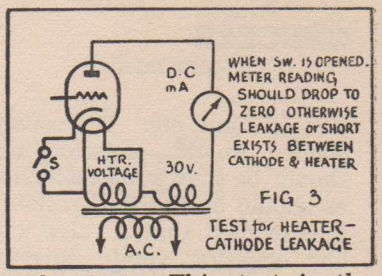

FIG 3

The emission test is the most popular for general usage and is marked for "end of life" only. It is not correct to give a percentage reading for a valve as often is done such as

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(continued)

50% efficient, etc. The voltage applied in the emission test should be kept reasonably low as should be the feed resistor; it is evident that a valve with low emission (plate current) will cause less drop across the feed resistor and, therefore, have a higher plate voltage applied than a valve of normal emission.

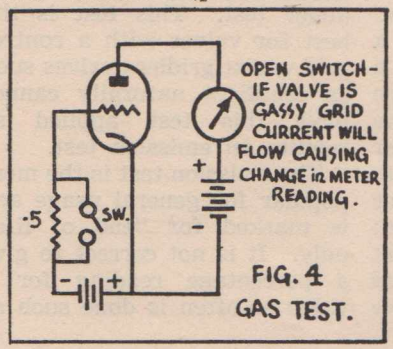

FIG. 4
GAS TEST.

The old method of testing valves with a set analyser had the disadvantage that long leads created oscillation resulting in false readings. In addition, one also had to have a knowledge of the particular circuit in which the valve was used before readings could be taken.

The Analyser was a means whereby the circuits normally terminating at a valve socket in a set were brought out to a similar valve socket in the Analyser. A volt-milliameter was used in conjunction with

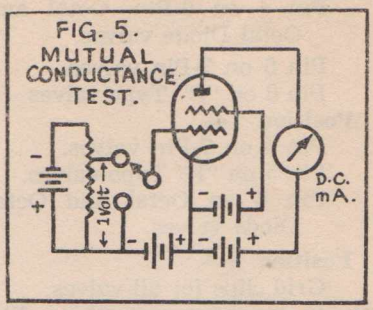

FIG. 5.

the Analyser whereby it could be switched to these various extended circuits for test purposes. The valve was removed from its socket in the set and plugged into the Analyser, the Analyser plug replacing the valve in the set.

Other methods of testing

(continued on page 34)

Tone Control Circuits

ALTHOUGH the discussion of inverse feedback would normally follow the article on audio amplifiers, I propose first to discuss briefly the subject of tone control, as this is often incorporated in the feedback circuit.

THE subject of tone itself has probably been the cause of more arguments among high fidelity (and, for that matter. not so high fidelity) enthusiasts than any other single radio topic.

By
W. S. LONDEY
Barkly Street
Sale, Victoria

This has become even more noticeable in recent years because better speakers are becoming available. Unfortunately these speakers show up many defects which were not reproduced by older speakers. However, the elimination of these defects simply meant the building of better amplifiers.

This in turn introduced another trouble, the limitations of pickups and recordings which necessitated the lopping of all frequencies above a certain value. As some recordings are better than others this top cut requires a manual control of some sort for best results.

In the case of radio broadcasts the lopping is done by the station for records but, in the case of studio broadcasts many higher frequencies are broadcast so a response as wide as possible (subject to the limits imposed by the selectivity of the receiver) is an advantage for local listening.

So far in this discussion the high frequency end of the audio spectrum only has been considered, but the low frequency portion is also important as this gives a "balance" to the overall tone if properly adjusted. Some readers will remember two articles on frequency range from the Jensen Radio Co., U.S.A., printed in "Radio World" in October, 1948, and March, 1949. Study of these shows that for a balanced tone one end of the audio spectrum should not be cut without the other being treated similarly.

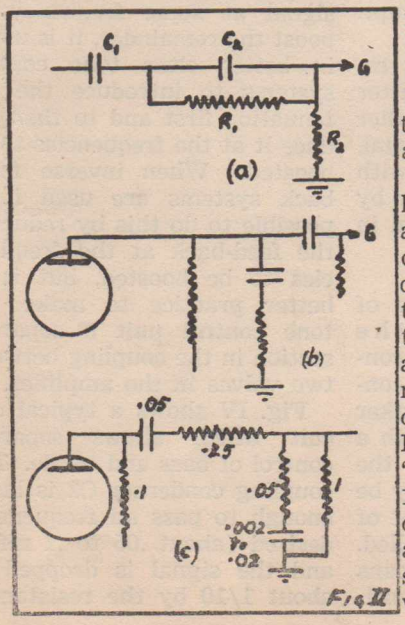

Fig. II

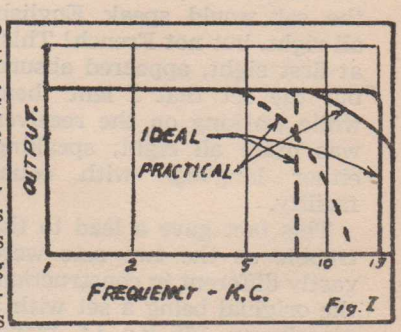

Fig. I

Another reason for some form of manual control is the variation in response from person to person with respect to frequency. Children and young people can generally hear frequencies much higher than can their elders and, in consequence, what may appear to have a balanced high and low frequency response to one may, to the other, appear to have the high (or low) frequencies unduly accentuated.

Although reproduction of as wide a band of frequencies as possible is to be preferred for the reproduction of music, a different set of conditions applies to speech reproduction. In this case, the intelligibility of the speech comes mainly from the higher frequencies and if the low frequency response is accentuated these may make the speech difficult to follow. If a radio receiver is very selective there will be some attenu-

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(continued)

ation of the high frequencies and if this is excessive the speech will appear boomy and, although apparently intelligible, will not be so in an unfamiliar language, or code. This was demonstrated to me a few years ago when I was called in to check a receiver used in a school for reception of foreign language broadcasts. The main complaint was that the set would speak English all right, but not French! This, at first sight, appeared absurd but the set that I lent them while working on the receiver was quite all right, speaking either language with equal facility.

This fact gave a lead to the trouble as the two sets were vastly different in construction, the original being a set with a preselector, 175 k.c. i.f. transformers and a 12-inch speaker, the other used 465 k.c. i.f.'s, one of which was single tuned, and a 6-inch speaker in a small cabinet. Trying the two side by side showed the difference in bass and h.f. response—the original gave solid bass and probably stopped reproducing at 3 or so k.c., while the other had much less bass and a fairly good h.f. response.

The trouble was overcome by the use of a very small coupling condenser between the detector and audio valves (a .0001 condenser was used) with a switch to allow normal response when required.

Summarising, then, it is evident that some form of control is necessary with respect to—

(a) High frequency cut off,
(b) Low frequency cut off,
(c) a rising or falling h.f. and l.f. response compared to the mean frequencies.

The first of these requirements is usually obtained by a condenser across the output or driver valve plate load. If the value is selected properly the condenser will have little effect below a certain frequency and then will cause a fairly rapid drop in response from that point. This is far from the ideal which is a level response to the cut off frequency and then complete attenuation. Fig. I illustrates the ideal and practical response curves.

Low frequency cut off is not usually necessary as the average speaker cuts off fairly effectively at 75 to 100 c.p.s.

Rising or falling h.f. response may be obtained by the use of resistance — condenser networks in the coupling circuits. Fig. IIa shows a simple circuit giving a rising response with frequency, C1 being the normal coupling condenser and C2 a small condenser having a high resistance in parallel with it (C2—20 to 250 mmfd.; R1—2 to 10 megohms), R2 being the normal grid resistance (½ to 1 meg.). A falling response is easily obtained as mentioned above but the addition of a series resistance may make the drop somewhat less abrupt. (Fig. IIb).

A falling low frequency response is a fairly simple matter as it only requires a smaller coupling condenser than usual, while a rising response with frequency reduction is given by a circuit of the type shown in Fig. IIc.

Tone Control Systems

The most common type of tone control system is the simple treble cut control consisting of a condenser connected across the speaker transformer, sometimes with a series resistance. Either the condenser or resistance may be variable so that the amount of attenuation may be controlled. Fig. III shows the usual means of control, IIIa showing a variable series resistance and IIIb change of capacity.

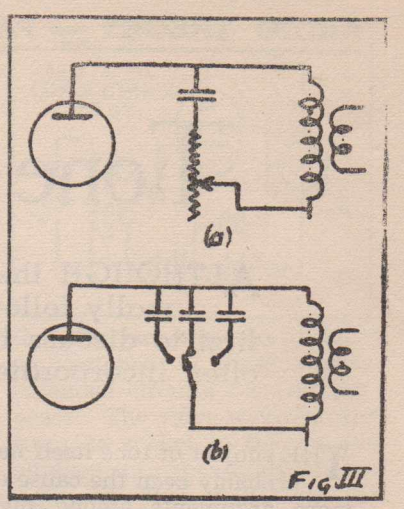

Fig III

These types of tone control cannot be used to control bass response or to give a rising treble response nor can they be used if inverse feed-back is employed on the output valve. In this case the control circuit must be placed at some point before the feed-back loop, usually in between two driver valves.

As all systems of tone control are loss type controls, that is, they operate by reducing the signal at some frequency to boost the remainder, it is usual in better class tone control systems to introduce the attenuation first and to then reduce it at the frequencies to be boosted. When inverse feed-back systems are used it is possible to do this by reducing the feed-back at the frequencies to be boosted, but it is better practice to make the tone control unit a separate section in the coupling between two valves in the amplifier.

Fig. IV shows a typical circuit which allows separate control of bass and treble. The coupling condenser C1 is large enough to pass all frequencies desired (about .05 to .1 mfd.) and the signal is dropped to about 1/10 by the resistances

R1 and R2 forming a voltage divider. This allows any desired frequency to be increased 10 times, which is a reasonable amount in most cases. The resistance R3 is necessary to allow bass and treble to be controlled independently.

Treble Control

To obtain a rising treble response, a small condenser (fig. IVb) is connected from A to D. As this has a low impedance at high frequencies the proportion of these frequencies reaching the grid will increase with frequency, up to a maximum of 10 times at a frequency when the impedance of the condenser C2 is negligible compared with R1. Values of C2 range from 10 to 50 mmfd.

A treble response falling off with frequency is obtained by connecting a condenser C3 of 20 to 500 mmfd. from D to earth as shown in fig. IVc. This gives quite a smooth drop in treble response.

Bass Control

Bass response is controlled by condensers inserted at B, fig. IVa. If the condenser is inserted between B and R2 as shown in fig. IVd, the bass response will rise at low frequencies because the impedance of the R2-C4 combination will increase at low frequencies so that B will not be 9/10 of the way from A to E but may be 1/2 or higher. Values for C4 may range from .01 to .1, the smaller values giving a greater bass boost. The high resistance R4 is necessary to maintain grid voltage. To obtain a falling response to lower frequencies the condenser is placed between R1 and B and is much smaller, .01 being about a maximum. This is shown in fig. IVe. This arrangement allows the bass and treble response to be varied more or less independently, although there will be some dependence at certain settings, and, in addition, the apparent signal level will remain approximately constant while the control is varied because the mid-frequencies are not affected much. A tone control of this type can only be switch-operated as the changes are obtained by capacity changes. If continuous control is desired it could be obtained by variable resistances in parallel with the condensers C4 and 5, or by making R1 a potentiometer and connecting C2 to its moving contact, all of which would make a very complex circuit. Ranges of values only have been given because it is preferable to adjust the values to individual preferences; for two reasons, firstly, individual ideas about tone and secondly, amplifiers and receivers vary considerably in frequency response, even when built to similar circuits but with different speakers or other parts.

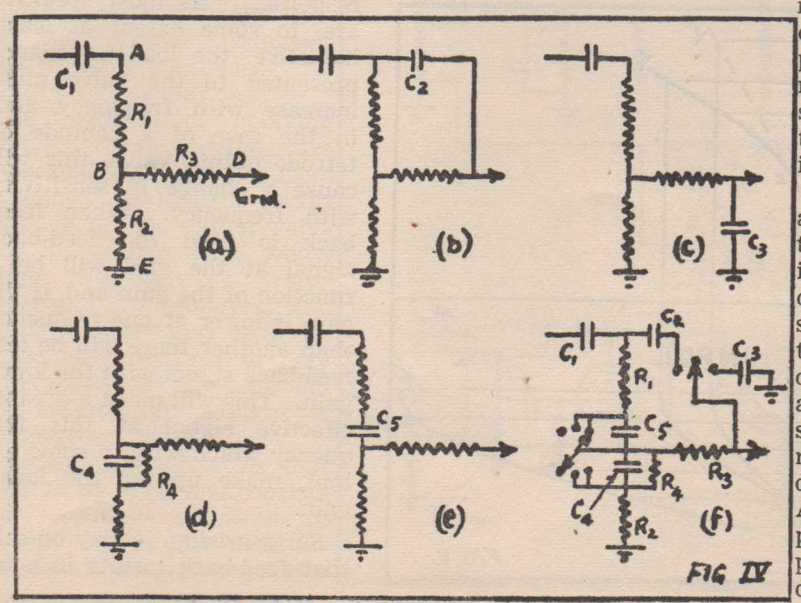

FIG IV

Inverse Feed-Back

With the possible exception of a few receivers which are built with one eye on the cost sheet and those where maximum gain is required, some form of inverse feed-back is used in most good receivers and amplifiers.

The principle of inverse feed-back is to return a proportion of the output signal to the grid of the output valve—or to some point before this, in such a manner that the gain of the amplifier is effectively reduced.

The simplest method of doing this is to omit the normal by-pass condenser from the cathode bias resistance, but this has the effect of greatly increasing the plate resistance of the valve and allows the output to rise considerably at the resonant frequency of the speaker with consequent accentuation of this frequency and increased hang-over effects.

The more usual system is to actually take a proportion of the output voltage and return it to the grid, but 180 degrees out of phase with the input signal. This has two important effects — firstly the frequency response is improved and the distortion reduced, and secondly, the speaker resonances are, to a large extent, damped much more effectively. As a consequence of the out of phase voltage the signal applied to the valve from the driving source must be in-

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(continued)

creased to obtain the same output, the amount of increase being dependent on the amount of feed-back. The increase ranges from 100% to 10 times, a good average being four times for a fairly good (not exceptional) amplifier. Ordinary radio receivers use a factor of about two, that is the input to the amplifier must be doubled for the same output.

The operation of the feed-back in reducing distortion may be explained thus:—

Consider an amplifier having a non-linear input-output curve such as XY in fig. V. Point N is the normal static condition of bias and plate current and only positive signal changes will be considered, these being represented by distances to the right along NM. The output voltages are measured along the vertical line NM¹ — not necessarily to the same scale as that along NM.

If a sine wave input OA is applied to the grid of the unit then the resultant output curve will be PQ which deviates considerably from the output of a linear amplifier (characteristic XY¹) which would be a sine curve OR. The curve PQ therefore represents a considerable amount of distortion in the output signal. However, if a portion of the output of the valve is returned to the grid out of phase with the input and the input increased to make up the loss in signal, considerable reduction in distortion may be obtained. Let the input be increased to three times its original peak voltage — curve OB and an amount OD of the output returned to the input, then the resultant curve of the input signal will be OC and the output curve PS. (The curve OD has the same shape as PS but is to a slightly different scale). The curve PS represents a considerable improvement over the original output curve PQ—a reduction in the amount of distortion. It is interesting to note the shape of the resultant input curve which is anything but a sine wave (shown dotted) as it contains correction components which tend to make up for the non-linearity of the amplifier.

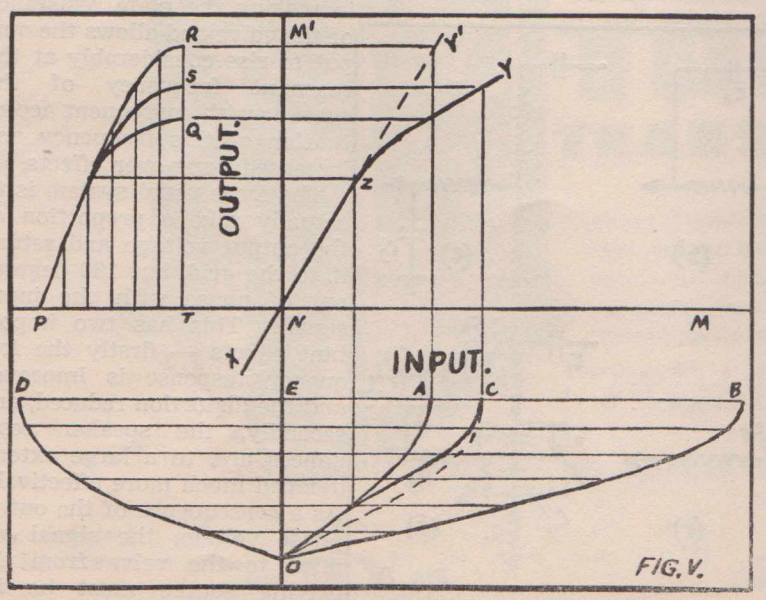


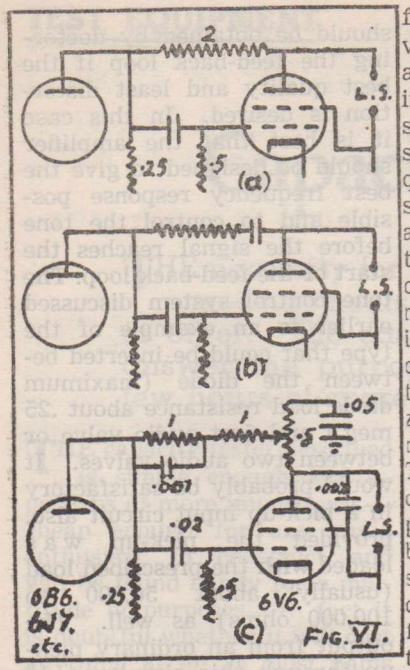
FIG. V.

Although only portion of the cycle is considered in the preceding discussion a little consideration will show that the same rules and effects would apply to negative portions of the input cycle. Increasing the amount of feed-back will make the output signal nearer to the original wave form as there will be more correction. However, the input signal must also be increased with the increase of feed-back, as the net input is the difference between the two.

For example, a 6V6 operating into a 5000 ohm load will show a peak plate voltage change of 150 volts for an input of 7.5 volts peak. Now, if 1/10 of this is returned to the grid as negative feed-back, this will be 15 volts and the grid input must be increased to 15 + 7.5 or 22.5 volts peak. Increasing the feed-back to 1/5 of the output would require the input to be increased to 37.5 volts peak but would greatly reduce the distortion.

There is another direction in which the application of negative feed-back is an advantage, however, and that is frequency response. As most speakers are, to some extent at least, inductive, the load impedance presented to the valve must increase with frequency and, in the case of a pentode or tetrode output valve, this will cause a change in sensitivity with frequency. When feed-back is used the feed-back signal at the grid will be a function of the gain and, if the gain is lower at one frequency than another there will be less feed-back signal with the lower gain. This will mean a greater effective signal at this frequency which will, to some extent, make up for the lower gain.

Summarising, it may be said that feed-back results in a re-



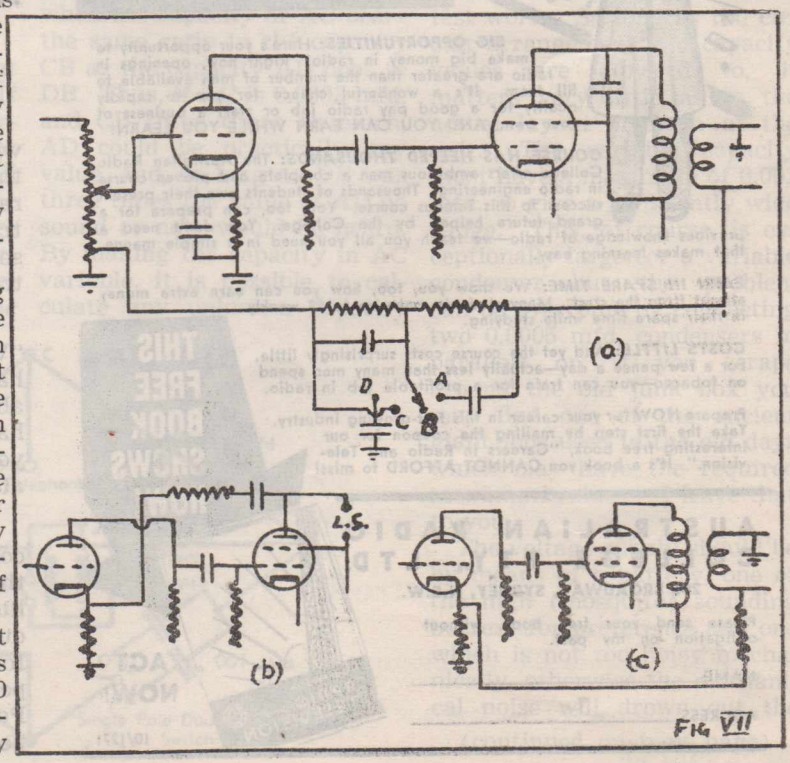
duction in distortion, improved frequency response, but requires an increase in input signal. The amount of feed-back that can be used depends on the circuit as the phase rotation which may be introduced due to the presence of coupling condensers, etc., may cause the feed-back to change from negative to positive at some frequency (usually outside the normal frequency range) with consequent instability and oscillation.

The methods of applying feed-back to an amplifier are almost unlimited, ranging from a simple feed-back circuit operating on the output valve alone, to arrangements which include the speaker transformer and several valves. The feed-back circuit may be linear in frequency response or may be arranged to give any desired attenuation or boost of certain frequencies.

The simplest circuit is that shown in fig. VIa, and consists of a resistance of about 10 times the driver plate load resistance connected directly from the plate of the power valve to the plate of the audio amplifier. Although this really improves the frequency response it appears to give a slight boost at the lower frequencies because it corrects for some of the losses due to inadequate transformer inductance. Fig. VIb gives the same circuit with a frequency discriminating feed-back loop. The introduction of a condenser causes the amount of feed-back to vary with frequency, being zero at low frequencies and a maximum at high frequencies. The effect may be modified by connecting a resistance in parallel with the condenser or by reducing the value of the series resistance. The third circuit illustrates how the effect may be made variable by the introduction of a potentiometer. In position "A" the circuit is similar to fig. VIb, but in position "B" the feed-back is largely lower frequencies, as the higher frequencies have been reduced by the .05 condenser and an apparent treble boost is obtained.

Feed-back over two stages is often used and two examples are shown in fig. VIIa and b. The first uses a tapped volume control and takes its signal from the speaker voice coil. The tap is only 250 ohms up to 1 meg. control and the feed-back loop contains a switched control to give "A" treble cut, "B" normal, and "C" slight bass cut for speech. The second shows a circuit in which the signal is returned to the cathode of the audio valve, the bias resistance being un-by-passed (or some part of it). This is the only way that feed-back from the plate of the output valve can be applied to the audio amplifier. These are only a few of many different arrangements used for applying inverse feed-back to the output stages of audio amplifiers.

(continued on next page)



THEORY
(continued)

Another important advantage of feed-back, particularly from the voice coil, is the improvement in speaker damping. Any movement of the voice coil which differs from the applied signal gives rise to induced voltages which are applied to the amplifier and reappear at the voice coil with such polarity as to oppose the tendency of the coil to deviate from its allotted movement. This results in improved transient response and less tendency of the speaker cone to carry on vibrating after a sudden impulse has passed.

It is not recommended that control of frequency response (tone control, as it is called) should be obtained by doctoring the feed-back loop if the best quality and least distortion is desired. In this case it is best that the amplifier should be designed to give the best frequency response possible and to control the tone before the signal reaches the start of the feed-back loop. The tone control system discussed earlier is an example of the type that could be inserted between the diode (maximum diode load resistance about .25 meg.) and first audio valve or between two audio valves. It would probably be satisfactory in a pick-up input circuit also, provided the pick-up was loaded with the prescribed load (usually about 50,000 to 100,000 ohms) as well. The output from an ordinary pick-up through this circuit would be very low, however, and an additional amplifier stage would probably be necessary.

"VEGA" COILS

This data is to acquaint you with certain facts concerning the background of "VEGA" radio components, which we trust will be helpful to you in selecting your Coil and I.F. transformer requirements.

During the last six months "VEGA" production capacity has been increased considerably, and they are now in the happy posiiton to despatch your requirements immediately.

All "VEGA" components are completely tropic-proofed and the windings use multi-strand litz wire with ferro-magnetic dust cores, specially designed for the purpose of increasing permeability and "Q", plus Polystyrene insulation where necessary.

Capacity Measurement

THE necessity for some simple form of apparatus for capacity measurements is felt by most enthusiasts at some time or other. The easily-constructed unit described here should answer the purpose. You can build and calibrate it in a few hours of spare time at quite a low cost.

THE capacity tester described is simple enough and — perhaps of more importance — cheap enough for any radio enthusiast to construct and will be found handy for a multitude of purposes. In fact it is doubtful whether it will cost anything at all as most hams will have the parts required in the good old junk box, or, perhaps in this case it would be better to say "spare parts box" as the components must be in good order.

How it Works

The action of the instrument is very easy to understand. If an alternating or similar intermittent potential such as that obtained from a vibrator coil or buzzer is applied across the points A and B of the bridge circuit shown in fig.1, the current may be considered to take two paths — one through the point C and the two condensers in this arm, and the other through D and the two condensers in that arm. It is possible by so arranging the values of the four condensers to obtain a condition when the potential at C is the same as that at D.

In this case current will not flow through the phones which are connected across this point and therefore no sound will be heard. This is actually secured when the capacity of AC bears the same ratio to the capacity CB as the capacity AD does to DB. Thus, if AC is 0.0003 mfd. and CB three times as much, AD could be practically any value, and, so long as DB was three times the value of AD no sound or note would be heard. By making the capacity in AC variable, it is possible to calculate any unknown capacity connected in AD provided AC has a suitably calibrated scale and the unknown value of the condenser under test is within the working range. The range of measurement available by tuning AC from zero to maximum will depend upon the choice of the value of DB.

The values shown in fig. 1 have been chosen by calculation and experiment to give two ranges of capacity measurement most useful for receiver test work. So long as the circuit arrangement and capacity values are adhered to, it matters very little as to the actual layout or form of the unit. The variable capacity must have a maximum of 0.001 mfd. to give a sufficiently wide range. This, of course, is exceptionally large for a variable condenser but the problem can be overcome by connecting two 0.0005 mfd. condensers in parallel; or, if you scrape around the old junk box you may find one of the ancient giant jobs used in the old days which may have the required maximum value — I leave that to you.

The voltage supply should be by means of a battery, one of the high (mosquito) sounding buzzers for preference and one which is not too noisy mechanically, otherwise the mechanical noise will drown out the

(continued on next page)

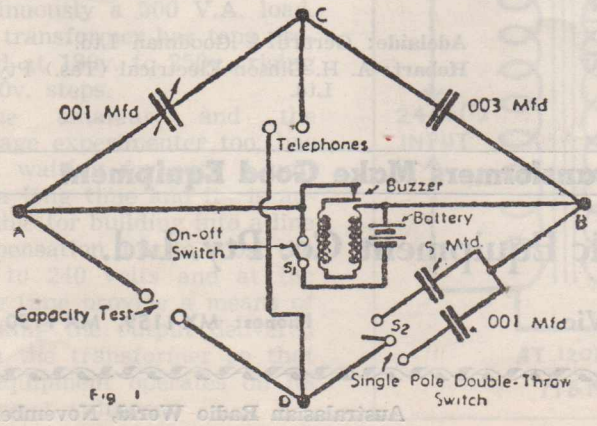


Fig. 1

TESTER

(continued)

note in the phones. If you have this trouble, the obvious remedy is to muffle the sound by covering the buzzer in a box or any other suitable method you can think of.

Calibration

Wiring and construction should present little difficulty since there is surprisingly little complication about the unit. It should be possible to assemble and complete the whole job within an hour or two, when the bridge is ready for work the scale must of course be calibrated on both ranges, and while this presents no difficulty, suitable condensers of known capacities must be available. For the first range, two, three or more condensers between 0.000 mfd. and 0.004 mfd. are required. These should be connected in turn to the "capacity test" terminals starting with the smallest capacity and increasing in steps. Switch on the buzzer and set the single-pole double-throw switch for the right range (the 0.001 mfd. in circuit for the lower range and the 0.5 mfd. for the higher) then tune the 0.001 mfd. variable condenser for minimum signal.

Each zero position obtained must be marked accordingly. For the second range, values between 0.1 and 2 mfds. are required. It should be noted that with three of four condensers practically the whole of the range may be covered by series and parallel connections. For example, a .0002 mfd. and a .0003 will give readings for

(continued on page 30)

★

CHANGE OF ADDRESS
as from 1st December
Australasian Radio World
Room 302
17 Bond St., Sydney, N.S.W.

★

THE ANSWER

SOLVING THE MAINS FLUCTUATION PROBLEM

By

J. A. HAMPEL

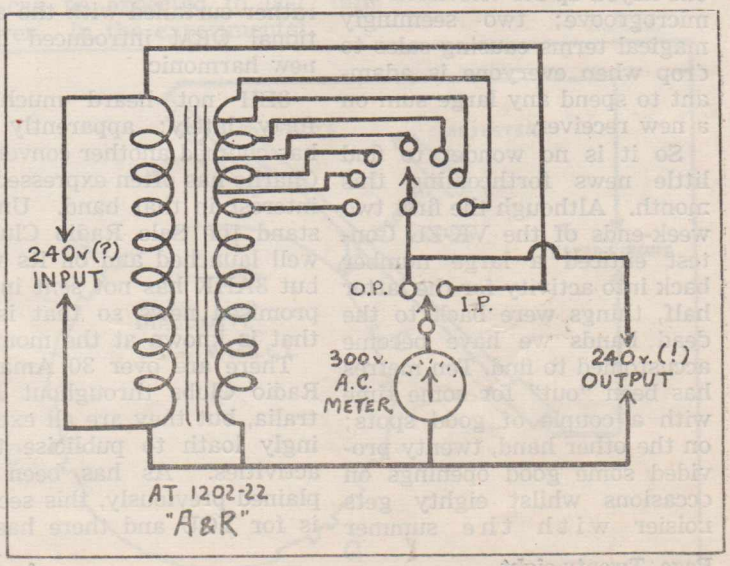
IN common with a great number of Amateurs the writer has been constantly handicapped in getting the most from the equipment in the shack due to the low value of the mains supply. With the voltage in many parts of the Adelaide suburbs down to 170 volts from an allegedly 210 volt line and some of the transformers available from interstate manufacturers having no compensating taps available, the recent announcement by A. & R. Electronic Equipment of their tapped auto-transformer has come at an opportune moment.

In all there are four different types available to handle anything from a soldering iron to the highest powered rig a VK could use. The most popular type for the average rig is the AT1202-22 which can handle continuously a 500 V.A. load. The transformer has taps provided at 180v. to 250v., rising in 10v. steps.

The amateur, and the average experimenter too, has been waiting for such a unit for a long time and it is admirable for building into a line compensation unit to boost the line to 240 volts and at the same time provide a means of checking the output delivered from the transformer so that all equipment operates on its correct voltages.

In the particular unit in question, a means of checking the incoming voltage against the outgoing voltage on load was provided by a d.p.d.t. switch in the meter leads. The circuit is really self-explanatory except to point out that the switch mentioned above should be something more robust than the usual radio toggle switch likely to be on hand in most junk boxes. There are several heavy-duty d.p.d.t. switches available by electrical manufacturers of household and industrial switches. Although a metal panel could be used, something like zelemite or bakelite or even masonite would be preferable. On this point a check should be made with the meter manufacturer to find out for what panel material the meter was originally calibrated as a change of thickness or material will almost certainly cause incorrect readings. If a new meter is being purchased for the job, the exact nature of the panel should be quoted, such as whether ferrous or non-ferrous, thickness etc.

Apart from the transmitter, the tapped transformer has many uses around the home. It is a great help if you want the best from a radio receiver or gramophone amplifier. It is also an advantage for use with the electric toaster if you like your toast done quickly and crisply. The housewife will appreciate its possibilities if she is having trouble to get the electric iron hot enough.



Amateur's Activities

Conducted by J. A. Hampel (VK5BJ)

WITH the present conditions very disheartening indeed, any news lately is good news because most stations have become temporarily dormant until things liven up again. These poor conditions, coupled with the rising prices of radio gear and the general apathy being shown by the manufacturers, have caused a frightening number to declare they are giving the grand old hobby away. Of course, it is difficult to gauge the interstate feeling, but in VK5, at least, Amateur Radio is losing some of its old stalwarts. Apparently this is a parallel to the present state existing in the general retail trade with everyone keyed up for television and microgroove; two seemingly magical terms causing sales to drop when everyone is adamant to spend any large sum on a new receiver.

So it is no wonder to find little news forthcoming this month. Although the first two week-ends of the VK-ZL Contest enticed a large number back into activity for the latter half, things were back to the dead bands we have become accustomed to find. Ten metres has been "out" for some time with a couple of good spots; on the other hand, twenty provided some good openings on occasions whilst eighty gets noisier with the summer approaching and forty is still the pick of the bands at present, although even more overcrowded with new arrivals.

Next month, a report on the Northern Net (S.A.) Field Day at Kulpara will be to hand and, who knows, it might be possible to sneak up on some of the hand-picked locations and catch some of the humorous situations, always present at such an outing, with a camera. Brian, 5CO, tells me he is trying to buy panchromatic make-up for the occasion! More power to the Northern Net and anyone else who organises such field days as WIA-fostered outings are now things of the past.

Old-timer 5AI recently made a comeback with a small rig and, just to prove he could still work 'em, Ted managed 17 countries on 20 metre c.w. in the first week's operating. Ted's time in the shack now is rather curtailed with the additional QRM introduced by a new harmonic.

3BH not heard much on forty lately; apparently 144 has claimed another convert as Charlie has often expressed his interest in that band. Understand the Sale Radio Club is well launched and on its way, but 3AHK has not sent in the promised news so that is all that is known at the moment.

There are over 30 Amateur Radio Clubs throughout Australia, but they are all exceedingly loath to publicise their activities. As has been explained previously, this section is for YOU and there has always been space available for the Clubs who like to submit notes on their activities. Peter, G3GPZ, has been heard on 5EN's rig for a short while and revels in the opportunity to work with 100 watts as he is limited to 25 watts back home. Things in England must be tougher in a lot of ways. Ex-5AJ, Dr. Ross Adey, had quite a time persuading the authorities to allow him a permit. After writing to the W.I.A. to enlist their aid in the matter, he is now signing G3GPC on 20 metres and very anxious to contact VK's. 2XN has given away the dynamic mike in favour of the trusty crystal type and reports no hum troubles now. Bill uses an 803 in the final running the full 100 watts with 830B's as modulators. Still nothing heard of Nobby, 5GY, who is having hum troubles. Also in the "steel town" Whyalla is 5CE with ideas of rebuilding soon. He intends to visit the city shacks soon to get some ideas on the subject.

The doubts about using the high-gain type tubes in VFO's have been debunked by 5FJ who uses an EF50 and 6AC7 buffer in his new job. With these tubes careful layout and short leads, very short leads, are half the battle but don't try to put them in a 50 kcs. I.F. channel as one chap did!

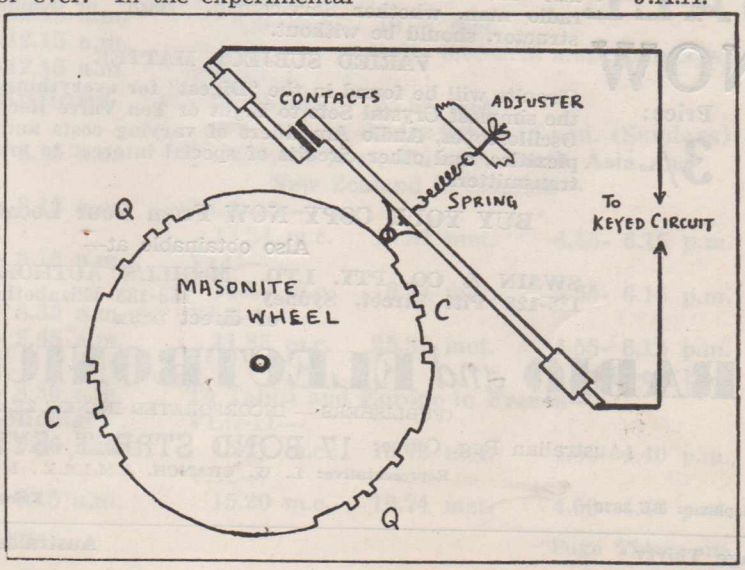
As I said earlier, the poor conditions have meant a dearth of news so why not drop a line now to Box 1589M, G.P.O., Adelaide, by the seventh of each month.

An Automatic "CQ'er"

For the stations on the V.H.F. bands, some means of providing an automatic identifying signal is an essential for any serious work on these bands. With an auto-sender, transmission periods can be continuous with listening breaks timed at convenient intervals. To provide the penetrating type of signal needed, MCW should be used but it must be remembered that it is still the carrier which must be broken up and not merely the audio tone impressed on it. Although some chaps do go to the extra trouble of adding an extra tube functioning as the audio oscillator there are several simple means of achieving positive feed-back within the modulator and merely providing a switch to restore the audio stages to normal. A little of the signal from the plate of one tube is fed through a 1:1 audio transformer back to its grid, or, if there are enough tubes in the speech amplifier, the out of phase voltage is applied to the grid of an earlier stage. The amount of feedback and the frequency of the resultant note is then adjusted by a condenser and resistor in series with the feedback loop.

There are several ideas to simulate keying and the idea shown here is one that has been tried out and found to be satisfactory. There is no wear on the disc with the type of contacts used so that the discs used can be expected to last for ever. In the experimental model a piece of masonite eight inches in diameter was used and the circumference of a wheel this size permits almost any combination of call with call sign of the station. The disc shown in the diagram which is self-explanatory is cut to key "CQ CQ". The contacts are leaves from an old relay whilst the motor is an old horn motor which runs very slowly with only three volts applied to it. Since the speed of the disc in r.p.m. is approximately equal to the number of words per minute a low-geared motor must be used unless you are a real speed merchant! Possibly other ideas such as perforated tape with a contact completing the circuit through the spacings will suggest themselves but the disc idea described here is the easiest to construct and maintain.

—J.A.H.



DX Station Addresses:

CZ2AC — Rosetta Nonsini, Vocolo teatro Ristori 10, Verona, Italy (operates in Monaco).
PZ1RM—Box 118, Paramaribo, Surinam, Dutch Guinea.
KZ5ES — Box 337, Diabolo Heights, Canal Zone.
PZ1AL — Box 226, Surinam, Dutch Guinea.
TG9AD—Box 299, Guatemala City.
AC3SS — Gantok, Sikkim, via Calcutta.
MD2PJ—Box 66, Tripoli, North Africa.
ZS3B — Port Tsumeb, British S.W. Africa.
ZK1BC — c/o. Civil Aviation Branch, Rarotonga, Cook Islands.
VT1RF—c/o. Kuwait Oil Coy., Kuwait, Persian Gulf.

TESTER

(continued)

the individual values and also for .0005 mfd. when joined in parallel. Two .5 mfd. condensers will give .25, .5 and 1 mfd. readings and so on. The scale may be calibrated directly, that is, the actual capacity values written on the scale, or, alternatively, a scale divided into degrees can be used and the readings plotted in the form of a graph. The first method is somewhat simpler and quicker to read, while the second method enables intermediate values to be estimated from the curves plotted with three or four points. Where the first method is used it is a good idea to make the scale pointer double ended, in which case, one half of the circle may be used for the lower range, and the opposite half for the higher range thus avoiding confusion between the two sets of figures.

Well, there it is; go ahead and try it. Even if it does not have the high degree of accuracy obtainable from the more elaborate capacity measuring instruments (which it is not claimed to have) it will serve most of the ordinary purposes. For instance, I am often asked what the capacity of a particular variable condenser would be with so many fixed, and so many moving, plates. Such a question is difficult to answer correctly unless exact measurements of area, spacing etc., are known, from which to make the necessary calculations. With a simple unit, like the one described here, the answer can be obtained in a few minutes, not only as regards the maximum capacity obtainable, but also the minimum, which is of great importance when designing a set of coils to cover a certain range of frequencies. Not only this, but a few minutes checking will show the capacity at any setting.

Short-wave Review

Conducted by L. J. KEAST

VOICE OF AMERICA

West Coast Stations and Honolulu

	m.c.	met.	
KCBR-2	21.74	13.81	7.45 a.m.- 8.00 a.m.
			8.30 a.m.-10.00 a.m.
KRCA-1	21.46	13.97	10.00 a.m.- 1.00 p.m.
KRCA-3	17.83	16.82	7.00 p.m.-12.15 a.m.
HON-1	17.80	16.85	5.15 p.m.- 6.45 p.m.
KCBR-3	17.77	16.88	7.45 a.m.- 8.00 a.m.
			8.30 a.m.-10.00 a.m.
KCBR-2	17.77	16.88	11.15 a.m.- 5.30 p.m.
KWID-1	17.76	16.89	10.00 a.m.- 1.00 p.m.
HON-2	15.33	19.57	7.00 p.m.-12.15 a.m.
KCBR-3	15.31	19.60	11.15 a.m.- 5.30 p.m.
			5.45 p.m.-12.15 a.m.
KRCA-3	15.25	19.68	3.30 p.m.- 6.30 p.m.
KCBR-3	15.21	19.73	3.30 p.m.- 6.00 p.m.
KRCA-1	15.13	19.82	5.15 p.m.- 6.45 p.m.
KCBR-1	15.13	19.82	7.00 p.m.-12.15 a.m.
KGEI-1	15.105	19.86	3.30 p.m.- 5.45 p.m.
KWID-1	11.90	25.21	3.30 p.m.- 9.30 p.m.
KWID-2	11.86	25.29	11.15 a.m.-12.15 a.m.
HON-1	11.79	25.44	7.00 p.m.-12.15 a.m.
KGEI-2	11.73	25.58	3.30 p.m.- 5.45 p.m.
			7.00 p.m.-12.15 a.m.
KCBR-2	9.70	30.93	5.45 p.m.-12.15 a.m.
KGEI-1	9.67	31.02	6.00 p.m.-12.15 a.m.
KRCA-2	9.65	31.09	5.15 p.m.- 6.45 p.m.
			7.00 p.m.-12.15 a.m.
KWID-1	9.57	31.35	10.00 p.m.-12.15 a.m.
KRCA-1	9.515	31.55	7.00 p.m.-12.15 a.m.

U.S. International Relay Stations

MUNICH - 3—		
6.08 m.c.	49.34 met.	1.45- 8.15 a.m.
MUNICH - 4—		
7.25 m.c.	41.38 met.	1.45- 8.15 a.m.
MUNICH - 2—		
9.54 m.c.	31.45 met.	1.45- 8.15 a.m.
MUNICH - 1—		
11.87 m.c.	25.27 met.	4.00- 8.30 a.m.
15.28 m.c.	19.63 met.	2.00- 3.45 a.m.
TANGIER - 1—		
6.06 m.c.	49.50 met.	8.00- 8.30 a.m.
7.214 m.c.	41.60 met.	11.00-Midnight
9.68 m.c.	30.99 met.	6.00- 7.00 a.m.
TANGIER - 2—		
11.79 m.c.	25.44 met.	6.00- 8.15 a.m.
TANGIER - 1—		
15.21 m.c.	19.73 met.	3.15- 6.00 a.m.
		7.00- 7.30 a.m.
TANGIER - 2—		
15.25 m.c.	19.68 met.	2.00- 6.00 a.m.
MANILA - 3—		
6.12 m.c.	49.02 met.	7.00 p.m.-
		1.45 a.m.
		8.30-11.00 a.m.
MANILA - 1—		
11.89 m.c.	25.23 met.	7.00 p.m.-
		1.45 a.m.
		7.45- 8.00 a.m.
		8.30-11.00 a.m.
MANILA - 2—		
15.25 m.c.	19.68 met.	5.15- 6.00 p.m.
		7.00 p.m.-
		1.45 a.m.
		7.45- 8.00 a.m.
		8.30-11.00 a.m.
MANILA - 1—		
17.76 m.c.	16.89 met.	5.15- 6.45 p.m.
MANILA - 3—		
17.78 m.c.	16.87 met.	5.15- 6.35 p.m.
MANILA - 2—		
21.57 m.c.	13.90 met.	6.35- 6.45 p.m.

RADIO AUSTRALIA

To British Isles and Europe in English—

VLC—
15.20 m.c. 19.74 met.
Daily 6.00-9.15 a.m. (Sundays)

VLA-4—
11.85 m.c. 25.32 met.
Daily 6.00-9.15 a.m. (Sundays)

To British Isles, Europe, South Asia and New Zealand in English—

VLA-10—		
17.84 m.c.	16.82 met.	4.55- 6.15 p.m.
VLC—		
15.20 m.c.	19.74 met.	4.55- 6.15 p.m.
VLB-4—		
11.85 m.c.	25.32 met.	4.55- 6.15 p.m.
		Daily ex. Sat.

To Tahiti and Europe in French—

VLG-11—		
15.21 m.c.	19.72 met.	4.00- 4.40 p.m.
VLC—		
15.20 m.c.	19.74 met.	4.00- 4.40 p.m.

VLA-4—
11.85 m.c. 25.32 met. Midnight-2.15 a.m.
To New Caledonia in French—
VLG-10—
11.76 m.c. 25.51 met. 5.45- 6.45 p.m.

NEW STATIONS

WESTERN GERMANY

"RADIO FREE EUROPE"—
6.135 m.c. 48.90 met.
According to "Sweden Calling" this is a new station, American directed to Eastern Europe from 3.00- 9.00 a.m.

CANADIAN BROADCASTING CORPORATION

INTERNATIONAL SERVICE — PACIFIC TRANSMISSION

CHOL, MONTREAL—
11.72 m.c. 25.60 met.
CKLO, MONTREAL—
9.63 m.c. 31.15 met.
Until 29th October, commencing time for Sunday Transmissions will be—
3.40 p.m. in Eastern Australia
5.40 p.m. in New Zealand and Fiji
After that date will revert to usual hour of 6.40 p.m. and 8.40 p.m., respectively.
Programme as usual will be for 1 hour and 30 minutes.
The alteration which was first noticed on 17th Sept., has been brought about by a compulsory overhaul of telegraph lines to the transmitter.

OCEANIA

NEW ZEALAND

ZL8, WELLINGTON—
9.62 m.c. 31.19 met. 4.00- 6.45 a.m.
5.00- 9.30 p.m.
ZL3, WELLINGTON—
11.78 m.c. 25.46 met. 4.00- 6.45 a.m.
5.00- 9.30 p.m.
ZL-10, WELLINGTON—
15.22 m.c. 19.72 met. 7.00 a.m.-
4.45 p.m.
ZL4, WELLINGTON—
15.28 m.c. 19.64 met. 7.00 a.m.-
4.45 p.m.

INDONESIA

——, MADIUM—
4.16 m.c. 72.11 met. 12.30- 2.00 a.m.
This is a new station (Cushen).
RADIO NATIONAL, DJAKARTA—
15.15 m.c. 19.80 met.
In English 9.00-10.00 p.m.
1.00- 2.00 a.m.
11.77 m.c. 25.48 met.
In English 1.00- 2.00 a.m.
11.785 m.c. 25.45 met.
In English 1.00- 2.00 a.m.
5.00- 6.00 a.m.
Mail Bag Session 5.30 a.m.

THE EAST

MALAYA

RADIO SINGAPORE—
15.30 m.c. 19.60 met. 7.15 p.m.-
2.30 a.m.
Also in parallel—
11.88 m.c. 25.25 met.
6.175 m.c. 48.58 met.
RADIO SINGAPORE—
9.69 m.c. 30.96 met. 9.30 p.m.-
2.30 a.m.

CEYLON

RADIO SEAC, COLOMBO—
15.12 m.c. 19.84 met. 6.25 p.m.-
3.05 a.m.
Also on: 17.73 m.c. 16.92 met.
and 21.62 m.c. 13.87 met.

CHINA

PEKIN—
10.26 m.c. 29.23 met. 6.30 p.m.-
1.30 a.m.
Also on: 15.06 m.c. 19.92 met.

INDIA

RADIO PAKISTAN—
9.645 m.c. 31.11 met.
Broadcasts programme in English 11.30 a.m.-
12.15 p.m.
11.00-11.15 p.m.
11.57 m.c. 25.92 met.
English 11.30 a.m.-
12.15 p.m.
9.00- 9.10 a.m.
15.335 m.c. 19.55 met.
English 11.00-11.15 p.m.
15.27 m.c. 19.66 met.
English 3.10- 3.20 a.m.
4.10- 4.20 a.m.
11.885 m.c. 25.24 met.
English 4.10- 4.20 a.m.
11.845 m.c. 25.33 met.
English 9.00- 9.10 a.m.

ISRAEL

KOL, ISRAEL—
9.61 m.c. 31.22 met. 2.00- 7.45 a.m.
Heard till 4.00 a.m. when it becomes jammed by Russia on same frequency.
According to "Sweden Calling" have been heard testing on—
9.95 m.c. 30.13 met.
4X4VA, TEL AVIV—
12.25 m.c. 24.50 met. 3.40- 5.00 a.m.
Off the air since February, 1949. Is now back again. Also on—
6.726 m.c. 40.46 met.

AFRICA

BELGIAN CONGO

OTC-2, LEOPOLDVILLE—
9.767 m.c. 30.72 met.
American Hit Tunes on
Sundays at .. .. .. 9.00 a.m.

SENEGAL

RADIO DAKAR—
15.34 m.c. 19.55 met. 5.00 a.m.
English lady-announcer heard again.

EUROPE

CZECHOSLOVAKIA

OLR-5B, PRAGUE—
15.32 m.c. 19.58 met.
News in English at noon.

FRANCE

PARIS—
6.145 m.c. 48.84 met. 3.45- 4.45 a.m.
La Radio Diffusion Francaise
Also on: 6.20 m.c. 48.4 met.

GREECE

GAFR, KAVALA—
7.65 m.c. 39.11 met.
The Greek Armed Forces Radio Station
operates daily .. .. 3.00- 6.00 a.m.
8.30-11.00 p.m.

HUNGARY

RADIO BUDAPEST—
9.82 m.c. 30.55 met. 3.00- 9.30 a.m.
Also in parallel on—
11.91 m.c. 25.19 met.
(Have apparently dropped
6.247 m.c. 48.08 met.)

ITALY

HVJ, VATICAN CITY—
15.095 m.c. 19.87 met.
English broadcasts at 1.00 a.m. and 4.15 a.m.
11.74 m.c. 25.55 met.
In parallel with 19.87 at 1.00-4.15 a.m.
9.66 m.c. 31.06 met.
In parallel with 19.87 and 25.55 at 1.00 a.m. and 4.15 a.m. News summary to India, Ceylon, and South Africa on Wednesdays at 1.30 a.m.

RADIO ITALIANA, ROME—
15.12 m.c. 19.84 met. 4.20- 4.40 a.m.
Gives special service in Swedish.
Also on—
11.81 m.c. 25.40 met. and
6.01 m.c. 49.92 met.

SPAIN

RADIO NACIONAL DE ESPANA, MADRID
9.368 m.c. 32.02 met. 6.15- 6.45 a.m.
In English 9.00- 9.40 a.m.

EAJ-3, VALENCIA—
7.037 m.c. 42.63 met.
Radio Mediterranean gives lessons in English from 5.40 a.m. on Wednesdays and Saturdays.

PORTUGAL

EMISORA NACIONAL, LISBON—
15.015 m.c. 19.86 met.
Is heard here .. .. .. 1.00- 3.00 a.m.
Has moved from 15.16 m.c. 19.79 met.

POLAND

POLSKIE RADIO, WARSAW—
9.525 m.c. 31.49 met.
English 3.15- 3.45 a.m.
6.215 m.c. 48.25 met.
English 3.15- 3.45 a.m.
and 4.00- 4.30 a.m.

MISCELLANEOUS

TRINIDAD

VP4RD, PORT OF SPAIN—
11.81 m.c. 25.40 met. 9.15-10.00 a.m.
(Sweden Calling)
9.625 m.c. 31.17 met. 8.00 p.m.-
4.00 a.m.
6.00 a.m.-
1.00 p.m.

SYRIA

DAMASCUS—
9.59 m.c. 31.28 met.
12.00 m.c. 25.00 met.

FRENCH CAMEROONS

FIA6, DOUALA—
7.287 m.c. 41.19 met. 3.30- 6.30 a.m.

GREECE

RADIO ATHENS—
7.30 m.c. 41.10 met. 3.00- 4.35 a.m.
5.00- 7.45 a.m.
9.607 m.c. 31.23 met. 5.00- 5.45 p.m.
8.00- 9.30 p.m.
15.345 m.c. 19.53 met. 1.15- 2.15 a.m.
8.30- 9.30 a.m.

IRELAND

RADIO EIREANN, ATHLONE—
17.84 m.c. 16.82 met. 3.30- 3.45 a.m.
News in English for Domestic Service.

IRAN

EPB, TEHERAN—
15.10 m.c. 19.87 met. 5.00- 7.00 a.m.

SCANDINAVIA

DENMARK

OZU, COPENHAGEN—
7.26 m.c. 41.32 met. 3.40- 8.30 a.m.
Special programme directed
to Faroe Isles .. .. 11.30-11.50 p.m.

OZF, COPENHAGEN—
9.52 m.c. 31.51 met. Noon- 1.30 p.m.

OZH, COPENHAGEN—
15.165 m.c. 19.78 met.

Speedy Query Service

P.L.K. (Enfield) asks about coils for the 6BE6.

A.—The coil which is designed for the 6J8 is most unlikely to be suitable for the 6BE6. If a special 6BE6 coil is not available in the brand which you mention we think that the best bet would be the coil designed for the 6SA7, which is similar to the 6BE6 in many respects.

★

P.G. (Clifton Hill) is interested in "Hamlet Junior" amplifier.

A.—Yes, we still feel that this is one of the finest amplifiers for all-round use with a crystal pick-up such as the Tecnico FL48. It is quite in order to use two separate power transformers, one rated about 285 volts at 60 milliamps, and the other rated anything from 400 to 600 volts at currents from 150 to 200 milliamps. Power output is largely governed by the voltage used on the plates of the output valves, but even with only 400 volts it is ample to fully load the Goodmans speaker you mention. The FL48 is not a wide-range pick-up of the same style as some of the pick-ups which need pre-amplifier stages and bass compensation, but it is possible to obtain quite shrill high notes from it when playing the jazz records you mention. Even it it is an illusion of true brass tone, it is quite an effective illusion.

★

H.P. (Mosman) asks about radio control units for model aeroplanes.

A.—Yes, there is a representative in Australia for the "E.D." products. It is the Aeronautical Supply Company of Victoria Street, Melbourne. We understand that they have the complete outfits in stock ready for immediate delivery. It is possible to get complete control over the model. There is nothing to worry about regarding the licence position. We suggest you write Aeronautical Supply for the further details you mention, as we do not happen to have these on hand.

★

V.S. (Mildura) asks about an article on getting hi-fi results from crystal pick-ups.

A.—The issue would be that for February, 1948. It is available from our Back Dates dept.

★

S.S. (Ivanhoe) asks about the new "crystal" detectors.

A.—Yes, these are available now at a more reasonable price, about 8/6 each, we fancy. Stocks are available at J. H. Magrath & Co., 208 Little Lonsdale Street. The units are quite O.K. for use in ordinary crystal sets in place of the original crystal and cat's whisker. They can also be used in all-electric sets to do the same job as normally done by the diode section of a detector valve.

CHECKER

(continued from page 18)

valves are by substituting a valve of good condition and by using a Signal Tracer. This latter method has a lot in its favour as it tests the valve under its normal operating conditions and when all is said and done that is what is required. It is not much consolation to know that a valve gives a good reading on an emission test if it is gassy or has some other fault the tester will not reveal and will not function satisfactorily in its set. However, the tracer is not without its drawbacks. If a valve preceding the detector is tested by means of the signal tracer, the A.V.C. action will lessen due to poor emission in the valve; this will tend to keep the output at its normal value. A weak signal should therefore be selected when checking r.f. or i.f. amplifier valves by means of the Signal Tracer. Then again we cannot test valves with a Signal Tracer if the owner of a set just hands us five or six valves to test, without the set. This, in any case, is bad practice. Suppose, for instance, we find a faulty valve by checking it in the Valve Tester, the customer buys another one and all is well; or is it? Nobody has gone to any trouble to see what caused the valve to sell out. Maybe it's just old age or maybe not. If it's not, then replacing it hasn't rectified the cause of the trouble and the new valve may quickly follow its predecessor to the rubbish bin.

Microphonic valves will often operate satisfactorily in another circuit the complaint being due to acoustic feedback. The position of the valve in relation to its surroundings, particularly the loudspeaker and cabinet, has a large bearing on this effect. This is due to the valve being most sensitive to microphonics at a particular frequency which frequency is more pronounced at the position the valve is mounted.

Figures 3 and 4 are self-explanatory and show tests for heater-Cathode leakage and gas respectively.

NEWS! NEWS!

VEGA RADIO PRODUCTS

SPECIAL MAIL ORDER DEPT.

We announce the formation of a special Mail Order Department, and now at last you can obtain your Coil and I.F. Transformer requirements direct from specialists, who are equipped to give you prompt deliveries, and assist you with your technical problems.

Ample stocks are available of "VEGA" Super Quality I.F. Transformers and Coils (as used by leading Receiver Manufacturers), and we commend you to use this service, by selecting your requirements from our Catalogue list of Components.

Help us to help you by placing your order NOW, and include Postal Notes, Money Order or Cheque (plus exchange and postage) to cover cost. Sorry—postage stamps or C.O.D. orders are not acceptable.

MANUFACTURERS, DEALERS, SERVICEMEN—Usual Trade Discounts available to those justly entitled to same.

"VEGA" I.F. TRANSFORMERS

V.I.F. 5—Std. No. 1: 455 Kc. Hi-gain and Selectivity Iron-cored, 13/9.

V.I.F. 6—Std. No. 2: 455Kc. Hi-gain and Selectivity Iron-cored, 13/9.

V.I.F. 11—No. 1: 455 Kc.) For 2 stage I.F. Lo-gain Iron-) channel use. cored, 13/9.)

V.I.F.12—No. 2: 455 Kc.) 2 x V.I.F.11 and Lo-gain Iron-) 1 x V.I.F.12. cored, 13/9.)

V.I.F. 14—Mini., No. 1: 455Kc. Hi-gain, iron-clad and cored, 13/9.

V.I.F. 15—Mini., No. 2: 455Kc. Hi-gain, iron-clad and cored, 13/9.

V.I.F. 28—Mini., No. 1: 455Kc. Suitable for 6BE6 series tubes. Ironclad and cored, 13/9.

V.I.F. 29—Mini., No. 2: 455Kc. Suitable for 6BE6 series tubes. Ironclad and cored, 13/9.
(Can size: 1¾in. x ¾in. sq.)

"VEGA" BROADCAST COILS

V.C. 1—Std. B/C Aer.: "H" or "AWA" Gang. Iron-cored, 8/9.

V.C. 2—Std. B/C R.F.: "H" or "AWA" Gang. Iron-cored, 8/9.

V.C. 3—Std. B/C Osc.: "H" or "AWA" Gang (Pad. 430 mmf). Iron-cored, 8/9.

V.C. 9—Reinartz with Hi-"Z" Pri., long/short taps. Iron-cored, 8/9.

V.C. 19—Mini. B/C Aer. Ironclad and cored, 8/9.

V.C. 19C—Mini B/C Aer. (Car Radio type-tap Sec.). Ironclad and cored, 9/6.

V.C. 20—Mini. B/C R.F. Ironclad and cored, 8/9.

V.C. 20C—Mini. B/C R.F. (Car Radio type-tap Sec.), Ironclad and cored, 9/6.

V.C. 21—Mini. B/C Osc. ECH33, 35, 6K8, 1R5, X61m. (Pad-430 mmf.). Iron-cored, 8/9.

V.C. 22—Mini. B/C Osc., 6A8, IA7G, 1C7G (Pad-430 mmf). Iron-cored, 8/9.

V.C. 23—Mini. B/C Osc., 6J8 (Pad-430 mmf.) Iron-cored, 8/9.

V.C. 24—Mini. B/C Osc. (Tap. Sec.), 6BE6, 6SA7 (Pad-430 mmf). Iron-cored, 8/9.

V.L. 2—Mini. Loop Aerial (with Pri. for ext. Aer/Earth), 5¼ x 4 in. Oval, 8/9.

V.K. 4C—Car Radio Mini. Kit (Aer., R.F., Osc., 2 x I.F.'s and "Hash" Coil), 57/6.

"VEGA" SHORT-WAVE COILS

V.C.H. 1—S/W Aer. Iron Cored, 13-42 metres (7-22mc), 3/11.

V.C.H. 2—S/W R.F., Iron Cored 13-42 metres (7-22mc), 3/11.

V.C.H. 3—S/W Osc. Iron Cored 13-42 metres (Pad: O.005mf), 3/11.

V.C.H. 4—S/W Aer. Iron Cored 16-50 metres (6-18mc.), 3/11.

V.C.H. 5—S/W R.F. Iron Cored 16-50 metres (6-18mc.), 3/11.

V.C.H. 6—S/W Osc. Iron Cored 16-50 metres (Pad: O.005mf), 3/11.

CRANCH Products & Trading Co.

17 BOND STREET, SYDNEY, N.S.W.

Telegrams: "CRANLAY" Sydney. **Phones: BU3879, BW7746.**

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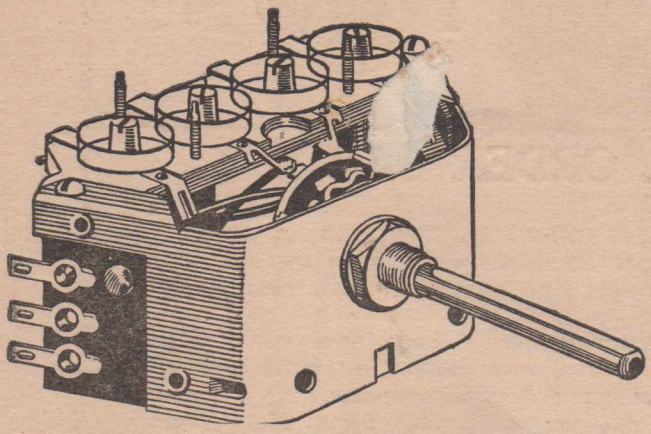

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The single stage unit illustrated at left is approximately life size. Available for 16-50m. Only on S.W. band.

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- Spherotuned coils on all four bands
- Fits snugly between dial spindle and volume control

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Both Units are available in the following types

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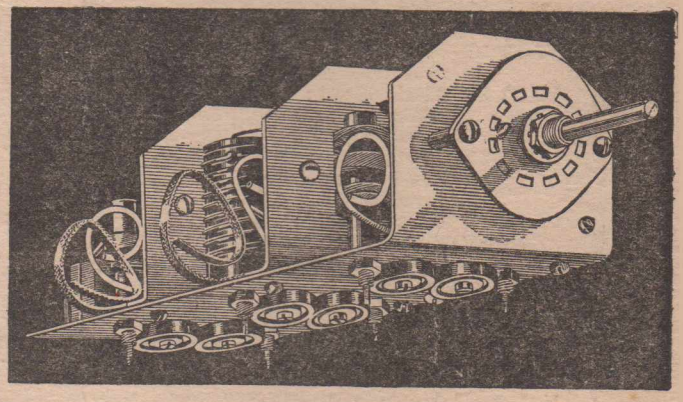

"Q PLUS"

SPECIFICATIONS

B/CAST BAND COVERAGE
550—1630—KCS—"H"
Gang or Dial

SHORT WAVE COVERAGE
13-Y2M or 16-50M
Please specify when ordering

Spherotuned coils on all bands.
Spare contacts for gramo. position

This newly released bracket gave better than 1UV sensitivity on B/C band and slightly less on S/WAVE band.

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