"Service"

A DIGEST OF ELECTRONIC NEWS AND VIEWS

THIS magazine is designed to present students with current news and information affecting the field of Electronics. Articles dealing with general business subjects, which in many cases the student finds necessary for his complete success, will also be included. To enable readers to obtain original articles, details of the origin of any condensed matter will be quoted.

This month it has been found necessary to increase the number of pages, and to devote the major portion of the magazine to a description of a 3 valve triple wave receiver. This is something quite new to our pages, and will undoubtedly interest both Australian and Overseas students. Students will notice that of late months considerable space has been used for "How to Build" articles. This was due to the impossibility of featuring this type of article during, and immediately after the War, plus the huge enquiry made by students for articles of this nature. With time, and as the needs of all sections of our readers are catered for, the frequency of "How to Build" articles will diminish to some extent.

JULY, 1947

WHAT TO LOOK FOR IN THIS ISSUE

This monthly publication is produced by the
AUSTRALIAN RADIO COLLEGE PTY. LTD., 206 Broadway, N.S.W.

THE MAN WHO IS UNBEATABLE

Many an ambitious young man wonders—"What are great men really like? Are they a special class of supermen? Have they always a power that other men do not possess?"

So far as I have seen, and I have made it a point all my life to know and study great men, they are different in only one thing—they have a big task that they set out to do, and they keep on at it in spite of everything.

They are unbeatable. This seems to be the one quality that they all have in common.

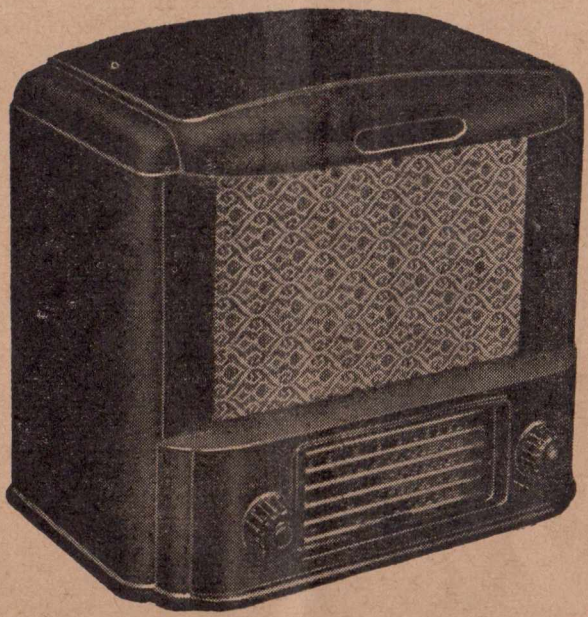
Some are well-educated. Others have had no school education at all. Some are refined and some are uncouth. Some are sympathetic and some are ruthless. Some are public-minded, and some are sheer egotists.

All are self-centred, in the sense that they do not allow themselves to be pushed about. No great man is ever a drifter. No one is ever a day-by-day detailist, if I may invent a new word. A man who climbs to the top does not wander sideways, as the crowd pushes him. He keeps on trudging up.

In a word, the great man is one who has determined to be great in some one thing, and who does not care how hard he works, as long as he is moving in the direction that he wants to go.—Herbert N. Casson.

STUDENT D. F. WHITE, who is office manager of Bland Radio Ltd., of Coromandel Place, Adelaide, S.A., advises that his firm has vacancies for lads under 19 years of age. Any South Australian students who are interested should address their enquiries direct to Mr. White.

BUILD YOUR OWN!



THE TROPICAL TRIPLE THREE

A triple wave radio receiver designed for loudspeaker and headphone reception, with specially simplified building instructions.

HOW TO BUILD A 3-VALVE TRIPLE WAVE RECEIVER

Specially Suited to the Tropics

Although this triple wave three-valve receiver is designed expressly to represent the simplest possible practical receiver for operation in tropical areas, it is also admirably suited to Australian conditions. Particularly is this so where reception not only from the ordinary broadcasting stations operating in the broadcast band is required, but where, on account of tropical conditions and atmospherics, reception is desired from overseas short-wave stations to augment listening on the ordinary broadcast band.

The above requirements have been met by a design covering three-wave bands, the first extending from 550 to 1,800 kilocycles and embracing the ordinary broadcast band, the second extending from 3 to 9.5 megacycles and covering short-wave broadcasting stations operating in the South Eastern Asiatic area, also high-powered long range short-wave stations operating from Australia and the third band covering the more conventional short-wave range from 7.5 to 23.5 megacycles. The receiver is designed to operate from alternating power mains at frequencies between 40 and 60 cycles and at voltages between 200 and 260 volts.

To facilitate reception of overseas short-wave stations, terminals are provided for the connection of headphones (note that headphones are **not** supplied), but normally reception is obtained by means of the 5-inch loud-speaker supplied with the kit. The complete receiver is housed in an attractive moulded plastic cabinet and portion of the more intricate wiring is completed so that any radio enthusiast can complete construction of the kit with an absolute assurance of success.

UNPACKING

In order to facilitate transport, the kit is supplied in two parcels. One comprises the receiver chassis, with most of the components already mounted in their correct positions, screwed into the moulded plastic cabinet.

The second parcel comprises the loud-speaker, valves, power flex and other small components needed to complete the construction of the receiver.

To facilitate checking parts contained in this second parcel, a detailed list is set out below:—

1 only 5" loud-speaker with transformer.
3 yards of power flex.
1 6SJ7GT valve.
1 6V6GT valve.
1 5Y3GT valve.
1 8 mfd tubular electrolytic condenser.
2 .0001 mfd mica condensers.
2 1 megohm 1 watt resistors.
1 50,000 ohm 1 watt resistor.
1 .05 mfd tubular condenser.
1 .1 megohm 1 watt resistor.
1 .02 mfd tubular condenser.
1 500 ohm 1 watt resistor.
1 soldering iron.
1 coil of solder.

To complete the construction of the receiver it will be necessary to remove the chassis from its moulded cabinet. To do this the four screws attaching the feet to the bottom of the cabinet should be removed and also the two small screws recessed in small holes in the control knobs should be loosened by means of a fine screwdriver. These knobs, after the screws have been loosened, may be pulled forward, off the control shafts, and the receiver chassis is then free to be removed from the rear of the moulded cabinet.

PRINCIPLE OF OPERATION OF THE RECEIVER

Before proceeding with the actual constructional work you should carefully examine the various parts mounted on the receiver chassis, and endeavour to associate them with the components shown in the photographs and on the circuit diagram.

To facilitate the association of the various parts on the receiver with their position on the circuit diagram and with their performance during the operation of the receiver, we will outline the function of the various parts comprising the set, and indicate not only their position in the actual receiver but their position on the circuit diagram shown in Figure 1.

Signals transmitted from a broadcasting station comprise a high frequency carrier wave, the strength of which is varied in accordance with the pulsations of sound being broadcast. The sounds in the broadcasting station studio

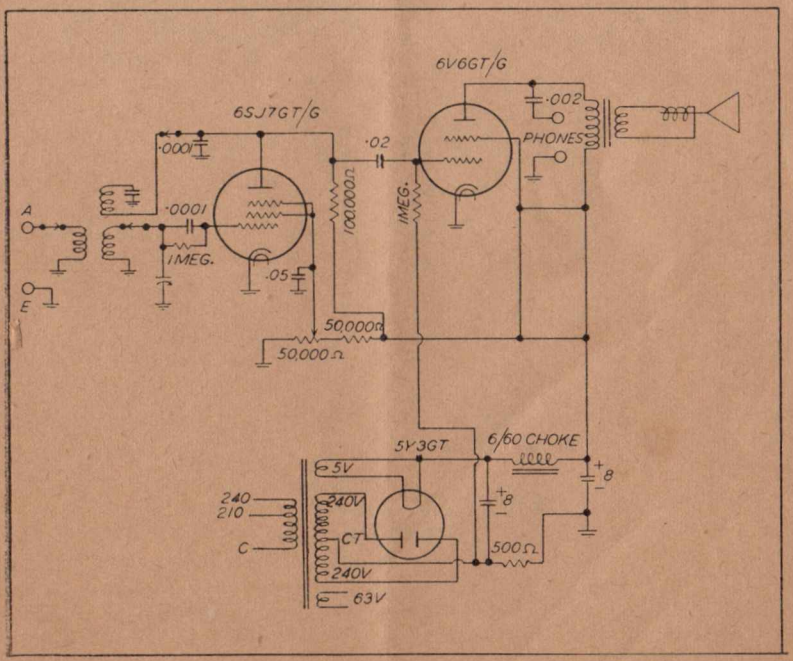


Fig. 1

are converted by a microphone into electric pulsations, which extend over a range of frequencies corresponding to the pitch of the original sound. Bass notes represent a low frequency of relatively few cycles per second, and treble notes represent high frequencies extending up to several thousand cycles per second. These frequencies are known as "audio" frequencies. In the transmitter, the audio frequencies are made to control the strength of the carrier wave, which is a much higher frequency signal employed because of its ability to travel through many miles of space. The carrier frequency, modulated by the program, is applied to the transmitting aerial and produces electro-magnetic waves in the air surrounding the transmitting aerial, these waves travelling out into space at a speed of 186,000 miles per second.

The waves from the radio transmitter are intercepted by a receiving aerial and earth system and generate a very small voltage difference between the receiving aerial and earth. The strength of this voltage is normally only a few thousandths of a volt and may even only be a few millionths of a volt from stations at a great distance. These voltages from the receiving aerial and earth system are applied to the aerial and earth terminals of the receiver, and so are brought to the three position switch which guides the current into the appropriate tuning coil for the frequency of the station to be received.

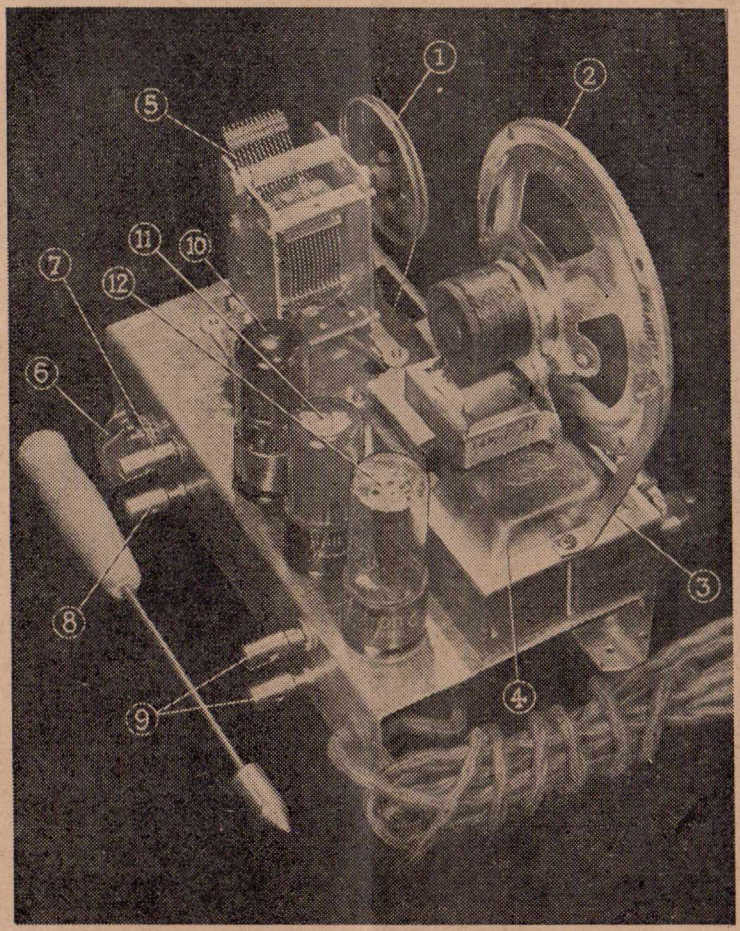
It is impossible to design one tuning coil which will cover the full range of broadcasting station frequencies likely to be experienced and consequently, three separate coils are provided. The appropriate one may be selected by means of the three position switch mounted on the back of the chassis.

Each of the coils in turn comprises three separate windings. One winding is connected by the switch to the aerial and earth terminals to receive the incoming current from the aerial system. The second winding, which comprises a larger number of turns, is tuned by means of the tuning condenser to respond to the required transmitter frequency, and to reject unwanted stations. The third winding is known as a reaction coil and helps considerably in increasing the sensitivity of the receiver to weak signals. The function of this winding will be explained in more detail later.

Although three separate tuning coils are provided, only one is indicated on the circuit diagram of Figure 1. To attempt to show the complex action of the switch, together with the three coils, would make the circuit too involved, and consequently, we have simply indicated the one coil with its three separate windings in the circuit. The dots and arrows on the wires extending from the coil in Figure 1 indicate the points at which the switch sections operate and change the wiring of the set from one coil to another.

The tuning condenser which operates in conjunction with the coils, to select the required station, is mounted on top of the receiver. Its action is controlled by means of the tuning dial.

With the switch on the rear of the set turned to position A and the tuning condenser plates fully engaged the receiver will tune to broadcasting stations transmitting with a frequency of 550 kilocycles. As the tuning condenser plates are gradually moved out of mesh, by rotation of the tuning control knob,



(1) Dial Drum and Cord.

(2) Speaker.

(3) Speaker mounting bracket.

(4) Power Transformer.

(5) Tuning Condenser.

(6) Wave change switch.

(7) Aerial Terminal.

(8) Earth Terminal.

(9) Headphone Terminals.

(10) Headphone Terminals.

(10) 6SJ7GT—Valve.

(11) 6V6GT—Valve.

(12) 5Y3GT—Valve.

the receiver will respond to stations of higher and higher frequency until, with the tuning condenser plates fully out of mesh it will respond to stations with a frequency of 1,800 kilocycles.

To receive stations with still higher carrier frequencies, it is necessary to turn the switch to position B or C to substitute the high frequency coils for the one normally used.

The wiring of the coils to the switch, and to the tuning condenser, is already completed when you receive your kit, to prevent any possibility of an error occuring in the wiring of the coils or switch. **You will observe that the coil wires are in some cases extremely thin, and consequently, care must be exercised to avoid breaking these fine wires in completing construction of the receiver.**

Signals selected by the tuning coil and condenser are fed out from the switch by means of the long wire connecting the switch to the upper right hand lug on the long panel to which you are to attach the resistors and condensers.

The first two parts to be fitted in place on the resistor panel are a small condenser marked .0001 and a resistor with a brown body, green band and black coloured end. This resistor has a value of one megohm and is used in conjunction with the condenser to feed signals from the tuning coil to the grid of the first valve in the receiver. This valve, a type 6SJ7GT, fits in the valve socket nearest to the tuning condenser, and receives its signals after they have passed through the condenser and resistor just mentioned, by means of the wire connecting its socket to the lower right hand lug on the resistor panel.

SOLDERING INSTRUCTIONS

The only practical method of attaching the resistor and condenser to the resistor panel is by means of soldering them in place. For this reason a soldering iron and some solder is included with the kit of parts.

Prior to using the soldering iron it must be heated in a flame until it is **almost** red-hot. The pointed end should then be cleaned with a file or a piece of sandpaper or similar abrasive material until it is bright and shining, and then immediately, while the iron is still hot, solder should be applied to it until it runs and forms a silvery coating over the pointed end. This process is known as "tinning" the iron and must be undertaken before the iron can be used for making any soldered joints.

Before attempting to solder the resistor and condenser into position, you should hold them in place with your fingers and then cut off any excess lengths of wire extending from them. Next, carefully examine the wires and see that they are bright and shining. If they are not perfectly clean it is necessary to clean them until they do shine brightly by means of sandpaper or by scraping them with some sharp object, such as the blade of a knife. They may then be held in position, the heated soldering iron touched on the solder until a small drop of solder adheres to the iron. This drop of solder may then be lifted on the hot iron to the radio set and deposited on the wire and solder lug. The soldering iron should be left in contact with the wire long enough for the wire to become hot and for the drop of molten solder to flow freely from

the iron on to the wire and thence from the wire on to the solder lug.

In heating the iron prior to undertaking any soldering, it is important that the iron be made hot enough for the solder adhering to it to be quite molten, yet the iron must on no account be made red-hot or it will become dirty and black at its pointed end, and then will fail to solder satisfactorily. If by any chance the iron is accidentally overheated, so that it becomes blackened, it will be necessary to file the surface bright and clean again, and then to quickly apply some of the solder to again complete the tin coating.

If you have had no previous experience in the use of a soldering iron, it would be quite a good idea to have some practice by soldering together the extreme ends of the wires from some of the resistors and condensers prior to cutting them to the right length. In all cases you will find that there is more wire protruding from the ends of the components than you will actually need, therefore, it does not matter to practice, by soldering together the ends of some of these component parts. After you have finished your practice you may easily melt the soldered joints with the hot iron and proceed to fit the parts into their place in the receiver.

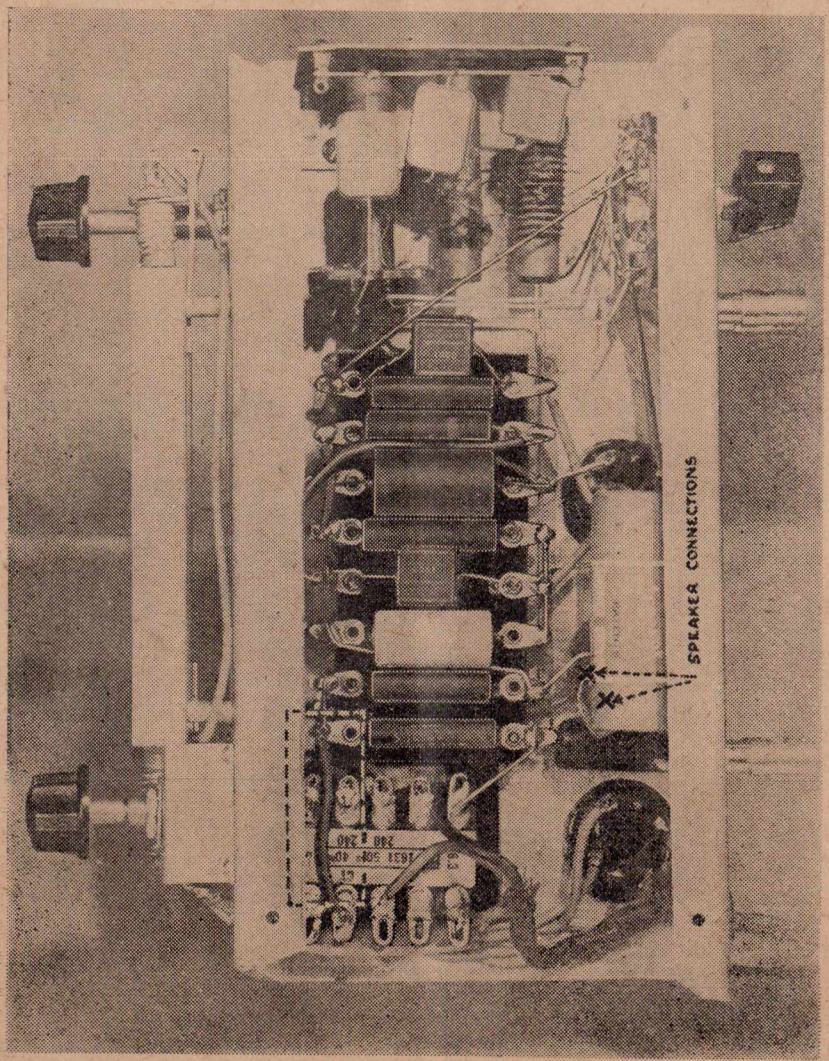
There are two most important rules which must always be observed when soldering. One is that both parts to be joined must be thoroughly clean and shining. The slightest film of grease, tarnish or corrosion will prevent the solder from "wetting" the wires, and will result in an unsatisfactory joint. The second rule is that the hot iron must be left in contact with the joint long enough for the drop of molten solder, which is picked up on the point of the iron, to flow from the iron down over both surfaces to be soldered together and to spread over both before the iron is removed. If you remove the iron too quickly the solder will not stick to the surface, and consequently will peel off at a later date.

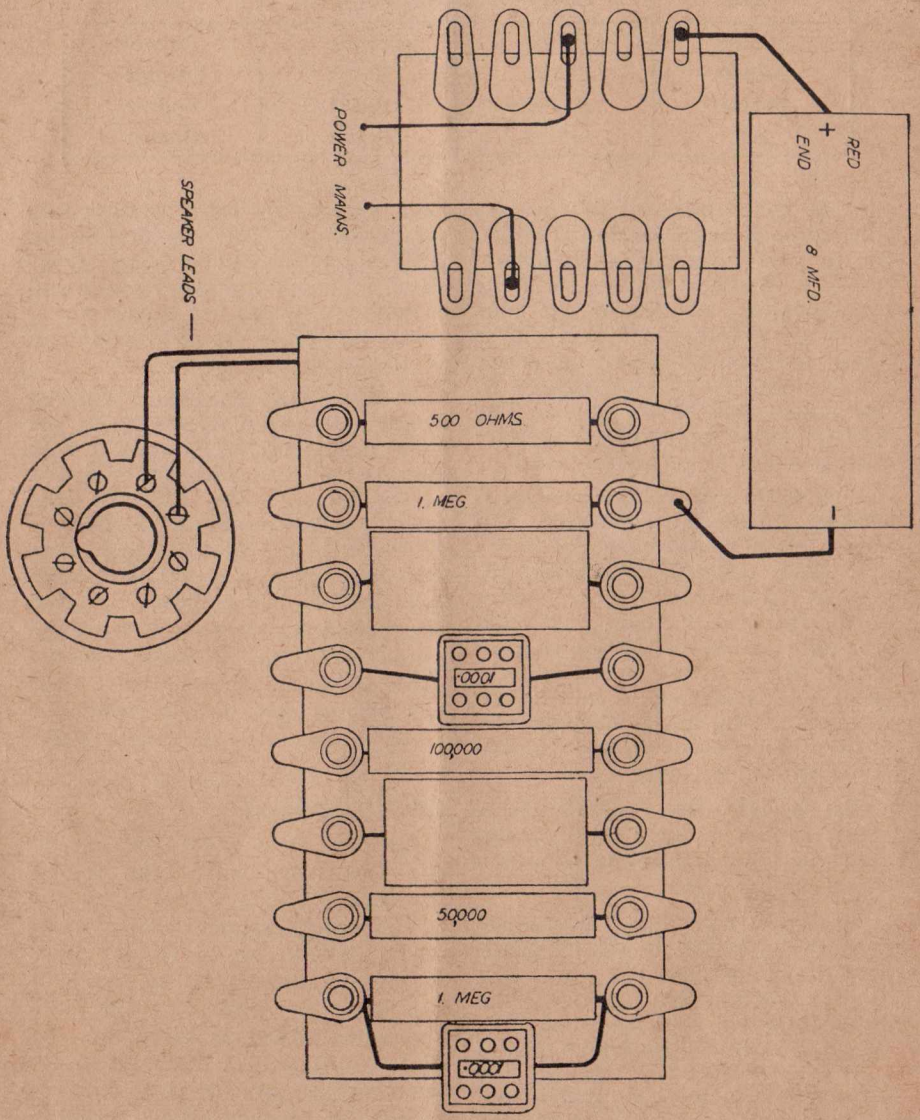
DETECTOR VALVE

Having now soldered in the first parts so that the signal may pass through them to the grid of the first valve, we may follow the signals a little further through the receiver.

The action of the 6SJ7GT valve is to take in the high frequency carrier wave from the broadcasting station, and act upon this carrier wave in such a way that it gives out, from its plate, shown at the top of the valve symbol in the cir-suit diagram, not the radio frequency carrier wave, but the audio frequency program voltage.

In order that the 6SJ7GT may operate, it is necessary for the plate of the valve and also for its screen grid, to receive some voltage from the power supply unit which is drawn at the bottom of the circuit diagram. This voltage passes through the resistor marked 100,000 to the plate of the valve, and also through another resistor marked 50,000 to a volume control also marked 50,000, and then from this volume control to the screen grid of the valve. The purpose of the volume control, which is fitted to the front of the chassis, so that the control shaft protrudes through a


SPEAKER CONNECTIONS


POWER MAINS
SPEAKER LEADS
RED
+
END
8 MFD.
-
500 OHMS
1. MEG
.0001
100,000
50,000
1. MEG
.0001

RESISTOR COLOUR CODE

Value	Body	End	Dot
1 Meg	Brown	Black	Green
50,000	Green	Black	Orange
100,000	Brown	Black	Yellow
500	Green	Black	Brown

hole in the cabinet, is to regulate the degree of amplification provided by the first valve, and consequently the loudness of sounds from the loud-speaker. As the volume control knob is rotated an arm moves along the resistor unit and varies the amount of voltage applied to the screen grid of the valve. The sliding arm is indicated on the circuit diagram by an arrow-head.

The 50,000 ohm volume control is already mounted in position and wired when you receive the chassis. It is necessary, however, for you to fit the 50,000 ohm resistor across the second pair of lugs from the right hand end of the resistor panel. When fitting this resistor in place and soldering it to the two lugs, be careful not to dislodge any of the other wires already joining on to the solder lugs.

The 50,000 ohm resistor has a green coloured body, an orange coloured band encircling it and a black coloured end.

When you have fitted the resistor into the circuit it will be possible for current from the power unit to pass through this resistor to the volume control, and then from the volume control to the screen grid of the valve. However, before the valve will work properly it is necessary also to connect a condenser with a value of .05 mf to the screen grid to allow any signals in the screen grid circuit, where they are not desired, to pass through the condenser to the metal chassis. This condenser will be easily recognised amongst the other parts and is soldered across the third pair of solder lugs from the right hand end of the resistor panel.

In order that the signal current changes in the plate circuit of the first valve may be converted into signals voltages ready for the grid of the second valve, a 100,000 ohm resistor must be included in the line between the plate of the first valve and the power unit. This 100,000 ohm resistor has a brown coloured body with a yellow coloured band encircling it and a black coloured end. It should be soldered across the fourth pair of lugs from the right hand end of the resistor panel.

REGENERATION

Although the main purpose of the first valve is to take in the modulated carrier wave and give out the audio frequency programme alone, quite a lot of carrier wave voltage is present at the plate of this first valve. Some of this radio frequency energy is sent from the plate connection of the valve socket back through the switch to the "reaction" or "regeneration" winding on the particular coil in use. The purpose of this coil is to take some of the carrier frequency from the

plate of the valve and feed it back into the grid circuit again. The energy is sent back from the reaction coil to the grid coil by means of magnetic lines of force which couple the two, and this energy fed back into the grid circuit adds to that of the signal being received, thus making the signal a little stronger than it would otherwise be.

The extent of this regeneration has been carefully controlled by selecting for each of the three coils a separate condenser which is soldered immediately above the coil when you receive the set. These condensers, in conjunction with the setting of the volume control on the front panel, permit the actual amount of regeneration to be controlled until the receiver sensitivity is at a maximum, and this is normally just before the set starts "squealing" when tuning in stations.

The amount of radio frequency energy present at the plate of the 6SJ7GT is a little more than is required for regeneration purposes, and, consequently, a second .0001 mfd condenser is to be connected from the plate of this valve across to the chassis to allow the excess energy to pass through it to the chassis. This condenser has to be soldered across the fifth pair of solder lugs from the right hand end of the resistor panel.

AUDIO FREQUENCY AMPLIFIER

The audio frequency signals developed at the plate of the first valve are applied to the grid of the second valve through a .02 mf condenser. This condenser is to be soldered in position across the next pair of lugs on the resistor panel. The grid of the second valve also has to receive a negative bias voltage from the power supply unit, and this voltage is applied through a 1 megohm resistor, which has a brown body, a green band and a black end, this resistor to be soldered across the next vacant pair of solder lugs on the resistor panel.

The negative grid bias voltage is generated in the power supply unit by means of a 500 ohm resistor drawn near the bottom of the circuit diagram. This resistor will have a green body, brown coloured band and a black coloured end. It should be mounted on the last pair of solder lugs at the extreme left hand end of the resistor panel.

After current has passed through each of the valves in the receiver it will flow from their cathode to the chassis, then from the chassis from right to left through the 500 ohm resistor, as shown in Figure 1, on its way back to the power transformer. Passing through this resistor it will produce a negative voltage at the left hand end of this resistor, and this is the negative bias voltage applied from the 500 ohm resistor up through the 1 megohm resistor to the grid of the second valve.

The purpose of the second valve is to amplify the signals in order that they may be strong enough to drive the loud-speaker. The second valve will multiply the signals applied to its grid approximately 18 times.

Before mounting the loud-speaker in position we will complete the underneath wiring of the chassis.

The only other component you have not yet mounted in place is the tubular electrolytic condenser marked 8 mfd. This condenser is shown in dotted lines in the photograph so that it does not obscure the position of the 500 ohm resistor at the left hand end of the resistor

panel. After mounting all the other parts in place on the panel, you can then lay the 8 mfd condenser in the position indicated by the dotted lines. A most important point to consider, however, is that one end of this condenser is coloured red and the other is a shiny metal colour. It is absolutely essential that the red coloured end is towards the left hand end of the chassis. The wire from the red coloured end of the condenser is simply bent underneath it, and connects to the top left hand solder lug on the power transformer. Wire from the shiny metal end of the condenser is bent down and underneath and connects to the second lug from the left hand end at the top edge of the resistor panel. This is the upper lug to which the 1 megohm resistor is soldered.

POWER CORD

The power cord should be passed through the hole provided near the left hand end of the chassis and a knot tied in the cord, about 5" from one end, to prevent the cord pulling back through the hole. The two halves of the flex should be split apart from one another for about an inch or two from the end and a small amount of the insulation material carefully removed from the wires by means of a sharp knife or razor blade. Only about ¼" of each wire should be bared. Before attempting to solder the flex to the power transformer you should transfer a blob of molten solder, by means of the hot soldering iron to the ends of the stranded wire. Leave the soldering iron in contact with the wire for five or ten seconds until the molten solder has run freely on to the strands. This should be done to each of the wires comprising the flex. You may now solder one of the wires from the flex on to the second bottom solder lug on the right hand side of the power transformer. This solder lug has a red nought beside it.

In districts where the power mains voltage is between 225 and 260 volts, the other wire from the flex should be soldered on to the third solder lug from the bottom on the left hand side of the power transformer board. This lug is marked with a red 240. In districts where the power mains voltage is between 190 and 225 volts, the second wire from the flex should instead connect to the second lug from the bottom on the left hand side of the board, i.e. the one marked 210 in red. Be very careful to see that the solder covers all strands of the flex and that no strands are extending outwards and touching any of the solder lugs other than the one to which they should be attached. If even one strand of flex joins across two of the solder lugs it may damage the power transformer or apply a dangerous voltage to the frame of the receiver.

LOUD-SPEAKER

The loud-speaker may now be mounted into position by bolting it to the two brackets protruding up from on top of the power transformer. The two wires from the loud-speaker transformer are passed down through the hole provided near the front edge of the chassis, and then pass underneath the left hand end of the resistor panel to the centre valve socket. These two wires connect to the two solder lugs marked with an X on the photograph. These two lugs are not altogether clear in the photograph, but may be easily located because one of them has a

wire from the red end of the 8 mfd condenser near the back of the receiver, connecting to it whilst the other has one end of a small .005 mfd condenser connecting to it.

All that now remains to complete the construction of the receiver itself is to fit the valves in their sockets. Be careful to see that the valves are inserted in the correct position, i.e. the 6SJ7GT near the tuning condenser, the 6V6GT in the centre and the 5Y3GT near the power transformer.

AERIAL AND EARTH

A simple receiver such as this, which contains only three valves, naturally requires a fairly efficient aerial and earth system if it is to give entirely satisfactory results. For the aerial, it is desirable to use a length of wire about 50 feet long mounted as high as possible above the earth's surface. For the best results this wire should be strung between two poles, or two trees, or perhaps a portion of a house and a tree or pole, so that it is about 15 to 20 feet high. An even greater height will result in still better reception, but you should certainly endeavour to have the aerial at least 10 feet high. The aerial wire itself should be carefully insulated from the supports to which it is attached by means of porcelain insulators. It is desirable to use two of these at each end as one may easily be rendered ineffective in tropical areas due to moisture condensation.

A good quality insulated wire should be soldered to the aerial and used to carry the signals down to the receiver's aerial terminal. A second length of insulated wire should be used to connect the earth terminal on the receiver chassis to an effective earth connection. This earth connection may be a metal water pipe extending down into the ground or a length of metal piping or rod driven three or four feet down into the ground. It will be almost impossible to solder the earth wire to the metal pipe or rod and consequently the most practical form of connection will be a strip of metal to which the wire is soldered, the metal strip in turn formed in the shape of a clamp around the pipe, the two ends being held together by a bolt and nut. The pipe should be filed or scraped clean at the point where the earth wire or metal clip is fastened around it.

TUNING

We are now ready to test the receiver, but before inserting the power flex in a power outlet, make certain that the power supply is at a voltage between 190 and 260 volts, and that it is alternating power (A.C.) and not direct current (D.C.). If the receiver is plugged into a direct current power point the power transformer will be burnt out and ruined.

The frequency of an alternating current power supply must be between 40 and 60 cycles per second. In most areas the power supply has a frequency of 50 cycles, and this is quite satisfactory.

Having ascertained that the power is alternating voltage you may switch on and watch to see that the valve heaters light up. The filaments in the 5Y3GT will light up first of all and you should watch this valve very carefully to see that there are no blue sparks and that the two large pieces of black metal in it do not become red hot. The only red hot objects in this valve should be the two thin filament wires, one inside each of the large black metal plates.

The other two valves will not light up very brightly, but after a period of about 15 seconds they should have a distinct red glow in them.

If all seems well set the switch on the back of the chassis to A, turn the volume control about two-thirds of the way around, and then rotate the tuning dial slowly, listening for any sounds from the speaker.

As the dial is rotated you will probably hear some shrill whistles. Each whistle indicates the presence of signals from a broadcasting station. Once you hear a whistle, you should gradually turn back the volume control, in an anti-clockwise direction, until the whistle ceases. When the whistle ceases, you should then hear the programme from the station quite clearly. If the volume control is turned further in an anti-clockwise direction, the loudness of the signals will be diminished. The loudest signals are obtained when the volume control is turned on, in a clockwise direction to a point just before the whistle commences.

The range of the receiver for broadcast signals will depend mainly upon the aerial and earth system with which it is used, and also to some degree on the nature of the country surrounding the point at which the receiver is operated. The range will be greatest in fairly open country, especially near the coast. Rugged mountain country or country which is thickly covered with trees or undergrowth, will reduce the range of the receiver somewhat. However, an average figure would be about 20 or 30 miles, i.e. the receiver should be capable of picking up quite distinct signals at loud-speaker strength from broadcasting stations situated less than about 20 miles away.

When the switch is turned to position B or C, for the reception of short-wave stations, the actual loudness of sounds from the loud-speaker may not be as great as is the case with the switch set at position A. However, the range of the receiver will be much greater, and it may be possible, at certain times of the day or night, to receive stations hundreds or even thousands of miles away.

Because of the fact that the volume may not be as great when using coils B or C, a pair of terminals is fitted to the back of the chassis to which headphones may be connected. If you find that the loudness of sound is not sufficiently great from the loud-speaker then you can connect a pair of headphones to the terminals marked "phones" and this will materially increase the range of your receiver.

The dial is marked with three bands of numbers, which indicate the frequency to which the receiver will respond. For instance, with the switch turned to position A, the receiver will respond to frequencies between 550 kilocycles and 1,800 kilocycles. If you know the frequency of some local broadcasting station you will soon be able to locate its position on the tuning dial by merely turning the dial until the pointer corresponds to this figure on the tuning scale. The same will apply with bands B and C.

A false strip is provided along the bottom of the tuning dial upon which you may scratch the call signs of any station to enable you to tune them in readily at any time. You will find that if you scratch the surface of the dial on this false strip the light from the small lamp will show through and indicate any call sign markings you may scratch on the surface.

Before despatch to you, the receiver is partially wired and tested in such a way that provided you fit the component parts correctly into their positions the receiver should work without any trouble. If by any chance you find, when you have completed constructing the receiver that you cannot obtain any reception from it then the first step is to carefuily check over the wiring and compare the work you have done with the photographs to see that all the parts are fitted in their correct positions.

If after carefully checking it over, you have still been unable to locate anything wrong, then we recommend that you take the receiver and these building instructions to some radio serviceman in your district. He will, for a small fee, no doubt, rectify the trouble.

FURTHER INSTALLATION HINTS.

Although the need for an efficient aerial and earth installation has already been stated, it is felt that a few additional hints in regard to the former would not be amiss, because so much of one's ultimate success with the set depends upon this important item.

The wire used for the aerial should have adequate mechanical strength, preferably being hard drawn copper of the type known as "seven-twenty two;" this means that it comprises seven strands of twenty-two gauge wire. The wire may be either bare, or insulated with enamel or fabric material. Soft copper wire may be used, although it is not quite as satisfactory as the hard drawn variety. The principal objection to soft copper wire is its tendency to stretch and sag. This is especially the case with fairly long aerials, as the weight of the wire is then quite considerable. Electrically, of course, one type of copper wire is the same as any other of equivalent gauge, consequently, as long as the wire is about the size just mentioned there is no need to worry unduly whether it is hard or soft.

There is some advantage in using insulated aerial wire in districts situated close to the sea, as corrosion of bare copper wire, due to the chemical action set up by the salt air, may materially affect results, especially on short-waves. If enamel-covered wire is used, great care should be taken to scrape off all the enamel around the area to which the lead-in wire is to be soldered.

The down lead should always be insulated. A good type of wire for this lead is the kind used by electricians in house wiring. The insulation is usually coloured red or black and consists of rubber, with an outside covering of tough cotton braid.

Although the insulated covering of this wire is quite tough it is not proof against a prolonged rubbing or chaffing. As a consequence, care should be taken to keep the wire at least six inches away from the sides of a wall, the edge of a roof, etc. If this is not done, the swaying of the wire causes the insulation to wear away, eventually exposing the bare wire. The result may be reduced signal strength or severe crackling noises from the loudspeaker.

Finally, a word about soldering connections to the aerial. Make sure that the two wires to be soldered are perfectly clean and bright,

that the soldering iron is very hot and that a non-corrosive flux is used. The latter is especially important. Spirits of salts and other acid fluxes may be all right for plumbing jobs and the like, but these can cause endless trouble when used for ardio or electrical work. Plain powdered resin is probably the best type of flux to use.

BUYING SERVICE NOTES

NEW OSCILLATOR KIT SETS.—Students will be pleased to hear that by the time this issue of "Service" goes to print, supplies of the new University Battery operated oscillator kit set will be available. The price is £7/10/- plus 10% Sales Tax, postage or freight is additional. This is the oscillator described in the June 1947 issue of "Service." There is bound to be a big demand for these kit sets, and those students who are interested are recommended to place their orders with Electronic Parts Pty. Ltd., the well-known wholesale firm located at the same address as the College.

PRICE INCREASES.—As and from the 1st August, 1947, many items manufactured in the Metal Trades and used for radio purposes, were increased by upwards of 7½% on the factory price. In some cases the manufactures are adding this increase to the cost of the goods immediately, in other cases they are waiting until stocks of raw materials have been used up. In any case, many radio components have been increased in price, and servicemen should take these increases into account when calculating the cost of repairs.

SIGNAL TRACER.—The new University S.T.B. Signal Tracer has proved extremely popular. This is the first signal tracer to be placed upon the Australian market, and the whole radio trade is demonstrating its approval of the instrument by absorbing every instrument as it comes from the manufacturers. Supplies of these instruments and full details of same can be obtained from Electronic Parts Pty. Ltd.

AUSTERITY.—We do not know what effect the dollar position will have on the supply of radio materials. However, it is bound to have some effect because the importation of many commodities will be banned. Servicemen, dealers and experimenters are advised to keep their stocks of spare parts well up to normal levels "just in case."

ORDER BOOKS.—It is noted that many dealers and servicemen order from wholesalers without supplying an official order. It will give your business, whether it be full time or part time, added prestige if you make your purchases on one of your official order forms. This is quite a simple matter, for the cost of a shilling or so, you can purchase an Order Book from any stationers, and have a rubber stamp made with your name and address and any other business particulars you require inserted on it. Rubber stamping your letters will also help considerably when you write away for quotations, technical information, etc., to wholesalers and manufacturers.

PUBLIC ADDRESS WORK.—The 20 watt amplifier described in the April 1947 issue of "Service" can prove a real business-getter for those interested in public address work. Recently the Stanmore, New South Wales, Boys' School saved a considerable sum of money by installing one

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A.R.C. TRADING POST

A free Buy - Exchange - Sell Service for A.R.C. Students

FOR SALE. 600V centre tapped 250 m.a. transformer, 250 m.a. choke. Best offer.

K. Moore, 19 Hillview Road, Eastwood.

FOR SALE. Pair of 19 Valves. New. 10/- each.

K. Moore, 19 Hillview Road, Eastwood.

SELL OR EXCHANGE. 1 x 902 Cathode ray tube and 2 x 884 gas triodes for £5/10/-, or exchange for gramo. motor or good pick up.

D. R. Rees, Entrance Ave., The Entrance, N.S.W.

FOR SALE. 1 PM3 valve, 1 PM4 valve, 1 PM4DX valve, 1 crystal set, 1 2 valve set (with one valve and dial missing),—this set is new, 1 old fashion cone speaker, 1 chassis 16" x 2½" new, 1 audio transformer, coil formers, number of resistors and fixed and variable condensers, valve sockets, 1 pair headphones, knobs and phone plugs. The lot £12/15/-.

D. King, Llandilo, via St. Marys, N.S.W.

FOR SALE. Home made tuning crystal sets. Good for city use or country town with local station. Price, less headphones, £1. Write

R. Jasprizza, "Cherry Hill," Cowra Road, Young, N.S.W.

Do you want to buy, sell or exchange something with a fellow student? If so, the College will gladly insert your advertisements free of charge on this page. Write carefully—or, better still, print your advertisement. Condense it to 30 words or less, and it must be confined to radio subjects. The College of course reserves the right to re-write advertisements as necessary, or to reject those that may not fit in with the spirit of this service.

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of these amplifiers. Actually, they had on the staff an ex-student of the College who was able to advise on the purchase of equipment. This ex-student also supervised the installation of the equipment, with excellent results. The whole installation, which catered for nine speakers, and included 20 watt amplifier, tuner, microphone and stand, speaker boxes, and other incidentals, including microphone cable and other cables, only cost the Stanmore Parents' and Citizens' Association a little over £60. Quotations placed by other commercial firms which specialise in the installation of public address equipment, ranged from between £150 and £250. Why not contact your local Parents' and Citizens' Association about the installation of amplifying equipment in your local school? If you require prices for various items of equipment which might be necessary, it will be gladly supplied by Electronic Parts Pty. Ltd., located at the same address as the College.

"University" Test Equipment may now be purchased on terms.