

# LITTLE COMPANION

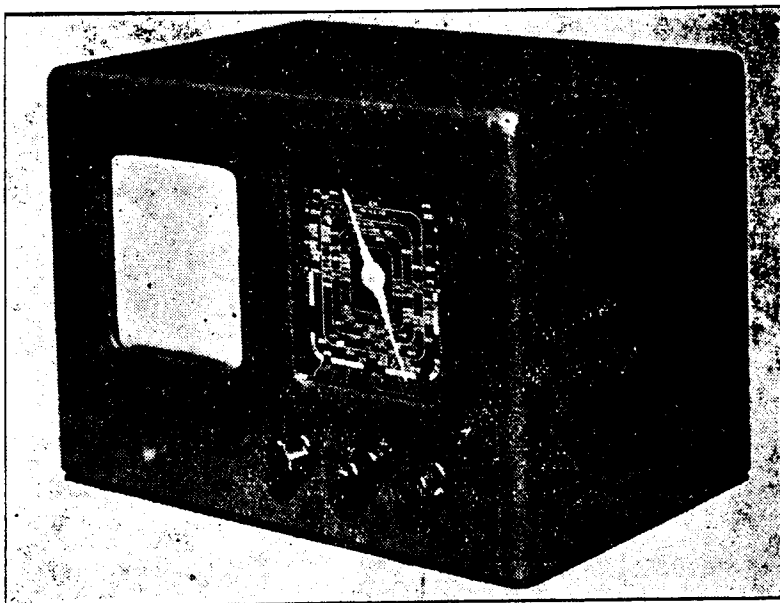


It has been a long time since we had the pleasure of publishing an article to cover the constructional details for a receiver which is readily available in kit form.

BEFORE the war we devoted considerable space to these articles, but for about five years now, the radio factories have been busily engaged on the production of communications equipment for the fighting forces.

Components have not been available for domestic set production, or for experimenters.

Now we are able to say, "That was a war — we've had it!" and get right back to where we left off. Production of parts is not quite back to normal yet, and there are bound to be shortages in certain directions, and so we are most fortunate to be able to present this story, which is probably the first of the post-war series to appear in this part of the globe. It has been made possible only by a considerable amount of organisation and co-



The Completed Receiver

operation. Many manufacturers of component parts might have concentrated their attention on the big factory orders if the importance of the experimenters and radio enthus-

iasts had not been pointed out to them by that champion of the cause, Mr. J. H. Magrath, of J. H. Magrath Pty. Ltd. Working with tireless energy, Mr. Magrath has arranged all the minor details for the procurement of everything, down to the last screw and nut, so that a complete kit of parts becomes available throughout the Commonwealth.

We are happy to do our bit by providing the photographs, picture diagrams and assembly instructions to complete the job.

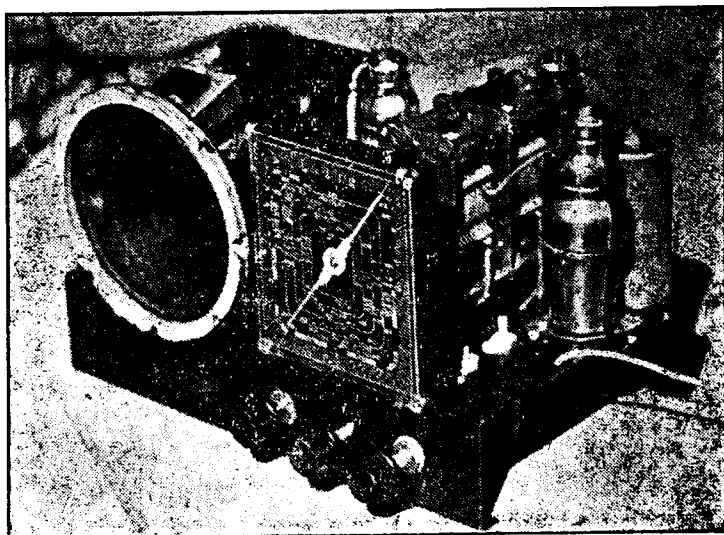
#### A Pleasant Job

With this kit of parts you can build yourself a really effective dual-wave receiver of performance and appearance equal to anything on the market.

The job should take you only a few hours. The work is pleasant and interesting.

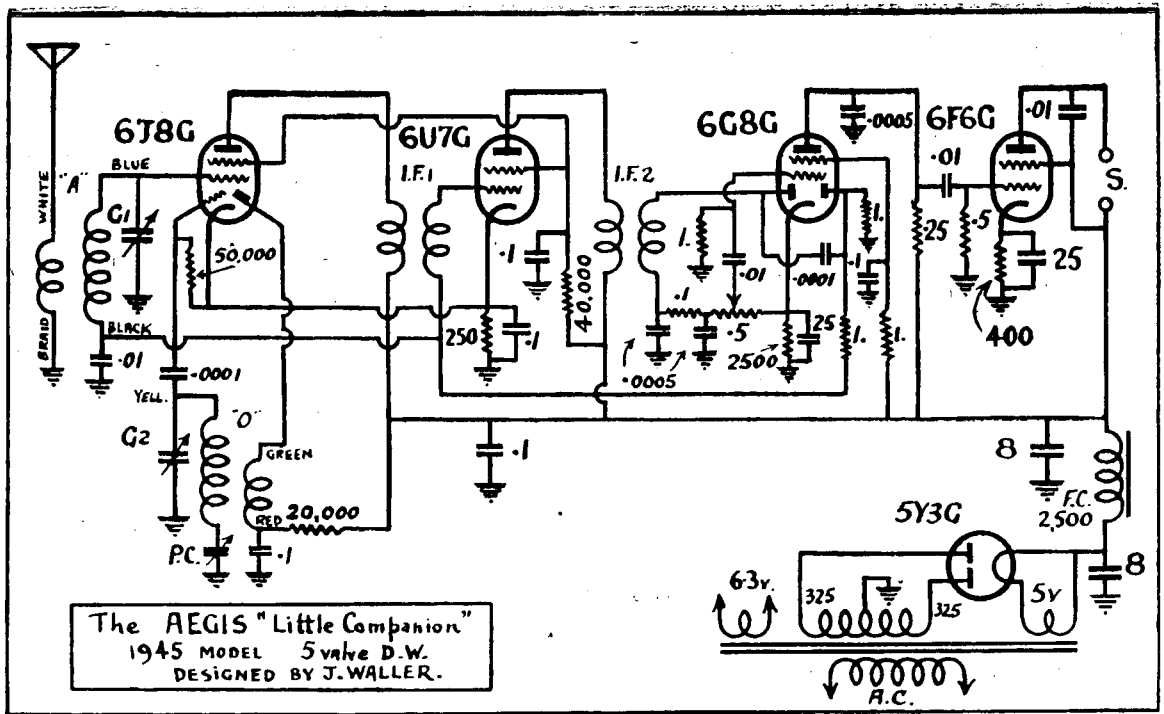
After you have finished, you will find that you have picked up a lot of useful knowledge about radio

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A front view of the finished chassis





matic circuit is drawn up in its simplest form, the complicated switching of the dual-wave coils being entirely omitted. The dual-wave coil unit which is supplied with the kit is wired up with the coils, trimmers and padders mounted on it, so that it comes to you ready for fitting into the chassis. It is provided with connecting wires which are colour-coded, so there is no need for the schematic to be cluttered up with switching details which you don't need to take into consideration.

#### Alternative Valves

For the converter valve it is possible to use either a 6J8G or a 6A8G; and no circuit or component changes are necessary. Results are almost identical in practice. Theoretically one should give slightly lower noise level and the other slightly better stability on the short-waves, but in each case the difference is so minute that it would be most difficult to detect without specialised laboratory testing gear. So far as this kit is concerned you can take it that the 6A8G and 6J8G are interchangeable.

If at any time there is any doubt about the proper operation of the converter stage there is one quick and sure way of checking up on it. The cathode end of the 50,000 ohm

oscillator grid leak is unsoldered from the cathode and a milliammeter inserted to read the actual grid current under operating conditions. This grid current will vary according to the setting of the dial, but should not wander too far away from the normal rating of 400 microamps (.4 milliamp). If it is found, for example, that at the high frequency end of the band the grid current drops away considerably, the performance of the converter will also drop away. Many factors will be found to have an influence over the grid current, including the voltage dropping resistors in the screen and plate circuits, the grid-leak value, the capacity of the grid condenser, the coupling of the primary and secondary of the oscillator coil, and even the impedance of the intermediate transformer. Fortunately all these factors have been looked after in the design of the kit and any big variation in grid current is almost certain to indicate an error in socket connections or some such major mistake.

For the intermediate amplifier stage the valve type specified is the 6U7G, but a 6K7G could also be used without any changes of any kind.

For the detector socket you can use either a 6G8G or a 6B8G, ac-

ording to how the stocks of these types are coming through from the manufacturers.

For the output valve the type which we show on the circuit and picture diagrams and consider most favourably, is the 6F6G. These appear to be readily available, but if any difficulty is experienced in this regard it is possible to use the 6V6G by altering the value of the bias resistor from 400 ohms to 200 ohms. If the 6V6G is used the sensitivity will be greater, giving the set slightly more range, but the distortion is also up a little, making it desirable to fit a resistor or two to introduce inverse feedback. Details of the necessary alteration will be published in next month's issue if space can be found. The addition of inverse feedback improves the tone a lot, but cuts back the gain, so that there is little to choose between the 6F6 and the 6V6. The simplest way is to use the 6F6G if it is available.

For the rectifier socket the 5Y3 is the main choice and there doesn't seem to be any likelihood of these being in short supply.

#### Resistor Wattage Ratings

Carbon resistors of the type which we used to call grid-leaks in the

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good old days are now available in various wattage ratings, the size of the resistor varying according to its wattage rating for any given resistance value.

In the past it has been customary to specify all resistors as "1 watt type," as these are handy in size and have an ample reserve of current carrying capacity for nearly every general use. But if space and price are factors it becomes worthwhile to use 1 watt resistors only in those positions where they actually need to have ability to carry current and dissipate power. For example, in this particular set we have several 1 megohm resistors which are not carrying any appreciable current, such as the grid leak which keeps the grid of the audio section of the 6G8G at earth potential. There should be no current flow

through this resistor under normal circumstances, and so there is need for it to have a power rating. And so we find that in this kit there are two sizes of 1 megohm resistors, three of them are quarter-watt types, while one has a rating of 1 watt. **The big resistor should be used for the screen feed of the 6G8G detector valve, as this particular resistor is called upon to carry some current.**

## The Speaker

The speaker supply position does not look too bright, so that it is fortunate that alternative speaker specifications can be made optional. **With regard to the field coil resistance, this can be anything between 1200 and 2,500 ohms without results being seriously affected, although it is preferable to use either 1,500 or 2,000 ohms.**

Students of theory may be staggered at the statement that a field

of anything between 1200 and 2500 ohms can be used, but this is possible because the power transformer rating provides for a high tension voltage of 325 volts. If the highest resistance field is used the actual h.t. voltage on the plates of the valves will be well below the manufacturers' maximum ratings, probably down around 200 volts, at which plate voltage the plate current will be much lower than normal, so that the field coil may not be unduly overheated. Then, at the other extreme, the applied plate voltage will be right up to the limit, and the plate current likewise, but the actual wattage dissipated in the field will not be far from the makers' ratings. For the output transformer the load rating should be 7,000 ohms, but again it is possible to "get away" with anything between 2500 and 14,000 ohms. At the lower loading the maximum power output may be slightly less than normal, but distortion will also be less. On the other hand, at higher loading the power output capabilities may be higher, but with greater distortion. The optimum (or happy medium) value is 7,000 ohms.

## LIST OF PARTS

- 1—Mantel cabinet.
- 1—Metal base.
- 1—Power transformer, 325 v. 60 ma.
- 1—Dual-wave coil uit.
- 2—Intermediate frequency transformers.
- 1—Two-gang tuning condenser.
- 2—8 mfd. 525 v. electrolytic condensers.
- 2—25 mfd. 40 v. electrolytic condensers.
- 5—.1 mfd. 400 v. paper tubular condensers.
- 4—.01 mfd. 400 v. paper tubular condensers.
- 3—.0005 mfd. mica condensers.
- 2—.0001 mfd. mica condensers
- 1—250 ohm 1-watt resistor.
- 1—400 ohm bias resistor for 6F6G.
- 1—2500 ohm 1-watt resistor.
- 1—20,000 ohm 1-watt resistor.
- 1—40,000 ohm 1-watt resistor.
- 1—50,000 ohm ½-watt resistor.
- 1—100,000 ohm ¼-watt resistor.
- 1—250,000 ohm 1-watt resistor.
- 1—500,000 ohm ¼-watt resistor.
- 3—1 megohm ¼-watt resistors.
- 1—1 megohm 1-watt resistor.

- 1—500,000 ohm volume control potentiometer.
- 1—5-in. midget loud speaker.
- 1—set of dial assembly parts consisting of back plate, 8 lugs, 4 eyelets, dial drum, pointer, spacer, pointer screw, spring, cord, spindle, bush, nut, 2 washers and 2 lock washers.
- 1—set of sundries comprising 3 knobs, dial light and holder, 5 octal valve sockets, 2 valve cans, 3 grid clips, 2 yards of power flex, resistor strip, 14 ¼-in. bolts, 6 ½-in. bolts, 30 nuts, 24 spring washers, 12 solder lugs, 2 feet of bus bar, 3-ft. red hook-up wire, 3-ft. black hook-up wire, 3-ft. green hook-up wire, 1-ft. shielded wire, 3-5/32 screws, 3 5/32 washers, 2 sticks of solder.

## Valve Equipment

The following valves are required. They are not normally supplied as part of the kit. One each of types 6A8G or 6J8J, 6U7G or 6K7C, 6B8G and 6G8G, 6F6G or 6V6G and 5Y3G.

## Assembly

To start the job of building up the kit, the first thing to do is to mount the power transformers on the base, then the valve sockets, taking care that the centre keyway points in the direction as shown on the picture diagram. The intermediate transformers can be mounted, also the volume control potentiometer. Then start the wiring job by connecting up the heaters of the valve sockets to the 6.3 volt winding, except in the case of the 5Y3 socket, which is connected to the 5 volt winding of the power transformer. Note that the heater terminals of the 5Y3G valve socket are different from the heater terminals of the other valves in one respect. All of this heater wiring should be carried out with twisted wires, although the point is not important. One side of the 6.3 volt winding should be earthed, for preference close to the 6J8G socket. Needless to mention (we hope) neither side of the 5 volt winding can be earthed, as this winding becomes the supply point for the rectified high tension current, and to earth it would be to short-circuit the high tension, a serious mistake.

After the heaters are wired up

the rest of the wiring can be done, bit by bit, with condensers being fitted in as neatly as possible as required. The dual-wave coil unit, gang condenser dial and speaker should not be mounted until after the bulk of the wiring has been completed. When the time comes for the mounting of the coil unit the colour-coded wires should be connected as indicated on the picture diagram, being cut to right length so as to be as short as reasonably possible. Wires for the gang condenser should be taken through to the top of the base, as that will be the next component to be mounted and wired.

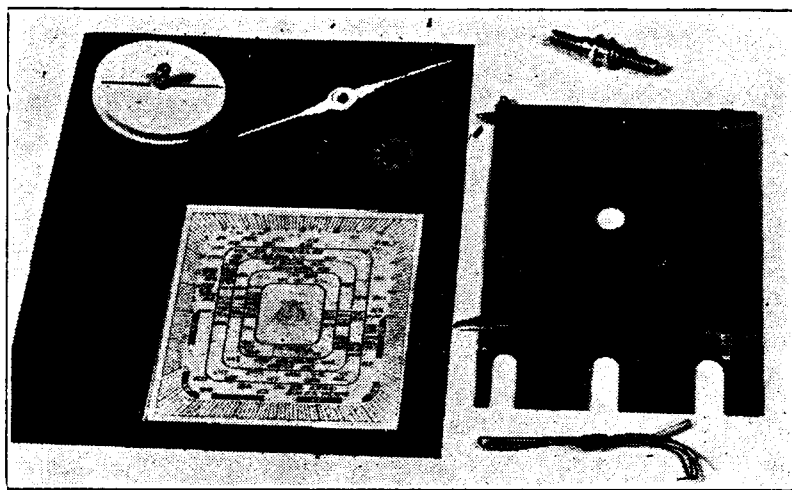
### Earthing Precautions

An important feature of the wiring job is to make quite certain that all the earthing connections are effective. This is best done by mounting earthing lugs under screws in convenient positions to hold the various components which are to be earthed, but making doubly sure by running a piece of bare wire around to link up all these earthing lugs after the main wiring job has been finished.

The effective earthing of the coil unit is also of great importance. Lengths of braided copper are attached to the unit and these should be cleanly soldered to earthing lugs connected up to the other earthing lugs, as mentioned above. **The earthing of the gang condenser is equally important, and it is not the slightest use depending on the mounting screws for the earthing of this component.** Short direct pieces of wire should connect the proper earth terminals of the gang to the main earthing system of the underneath wiring.

### Polarity of Electrolytics

Unlike ordinary condensers, the electrolytics have polarity of the terminals, making it most important to see that due respect is paid to this polarity. The positive terminal is usually marked with a "plus" sign, or coloured red. It should connect to the high tension positive voltage. The other terminal is the negative, marked with a "minus" sign, or colour-coded black and should go to earth or the low potential end of the voltage across which it is fitted. **This matter is of great importance and has been duly indicated on the picture diagram.** Make sure that you pay attention to it!



A photograph of the parts for the dial assembly

### The Intermediate Transformers

There are two types of intermediate transformer cans, square and round, and you may get either type in your particular kit, according to the way supplies come through from the makers. If you happen to get the square type cans you will find that there is not much room to spare, in fact, in one case the can will come 'down on to the screw head which holds a neighbouring valve socket. A couple of nicks with your angle-cutting pliers, or a touch of a round file will make it easy for the can to fit down snugly over the screw head and on to the base.

### The Dial Assembly

Unlike most dials supplied for kit-set use, this one is part of the general design of the layout and requires to be assembled step by step as the gang and chassis are assembled. This is not a difficult job and means a much neater dial arrangement in the long run. To make the job quite clear, however, we will list out the steps to be taken. All the bits and pieces for the dial assembly are packed together in the kit, and consist of a back-plate, fitted with the glass retaining lugs and rubber cushions, a dial drum, dial pointer, pointer screw and pointer spacer, a spring and cord, a driving spindle with mounting bush, shakeproof lockwasher and nut and, of course, the dial glass itself.

No part of the dial should be fitted to the chassis until after the gang condenser has been mounted.

Then the dial drum can be fitted to the spindle of the gang. Next the dial spindle and bushing is mounted in the base on the bottom right hand corner. Next the cord is fitted. The cord should be fitted after the manner of a belt, except that it goes twice round the spindle, but only once round the drum. The spring is used to couple up the two ends of the cord, and without the spring extended, the overall length of the cord should be about a quarter of an inch too short. The spring will stretch that amount to allow the cord to be fitted to the drum like a belt. After the belt has been fitted and tested, and the action of the drum is considered satisfactory, the back plate is mounted by loosening the dial and potentiometer mounting nuts and sliding the back plate down behind them. When the back plate is in proper alignment for the hole in the centre of the dial drum, the nuts can be tightened. This should then clamp the back plate firmly to the base. Next fit the spacer and pointer with screw. Then the glass is mounted on the rubber cushions, held in place over it. It will be noticed that a spacing washer is required under the pointer in order to bring it forward to clear the glass. Open the gang condenser fully and then set the pointer to zero before tightening up the screw which holds it in position. Give the dial a trial run to make sure that the pointer is in track with the gang, in other words, that it is at zero when the gang is fully out

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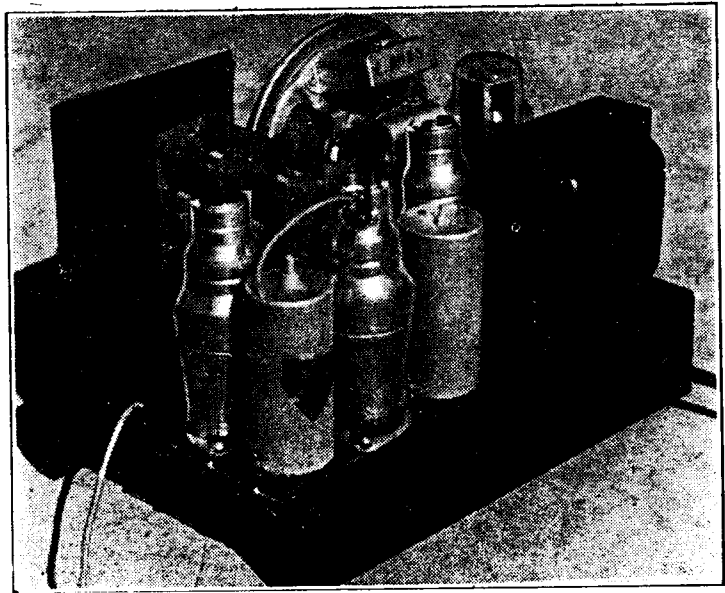
and at maximum when the gang is fully closed. This is important, as the alignment procedure takes it for granted that the pointer is a true indication of the setting of the gang condenser plates.

After you have assembled this dial we fell sure you will agree that it is a great improvement over many of the simple dials, which were popular for mantel models in pre-war days.

## Cutting the Spindles

It may be found that the spindles of the dial assembly, the dual-wave bracket and the potentiometer are all of different lengths. It is, therefore, necessary to cut the spindle with a hacksaw, and this should be done before assembly, as otherwise the vibration may not be too good for the chassis assembly. Normally it will be found that the dial spindle will be of the correct length, and the other two will need to be cut to the same length.

In the case of the dual-wave spindle it is necessary to take into account that the bracket does not mount right up to the front of the actual base. The volume control potentiometer mounts between the front of the base and the front of the dual-wave bracket, so make due



A rear view of the chassis.

allowance for this fact when you cut the dual-wave spindle.

Still another point about this spindle might be mentioned: the switch takes a fair bit of power to turn by the knob, and to avoid the knob slipping it may be advisable to file a flat on the spindle so that the grub screw of the knob can be screwed down on to a flat surface and thereby guarantee a non-slip grip.

Speaking of filing reminds us to draw your attention to the fact that a few filings can just about ruin a loud speaker if they get into the magnetic field around the pole piece and the voice coil. Once the filings become attracted to the pole piece they are most difficult to remove. **Be careful to keep filings well away from loud speakers!**

## Trimmer Colour Code

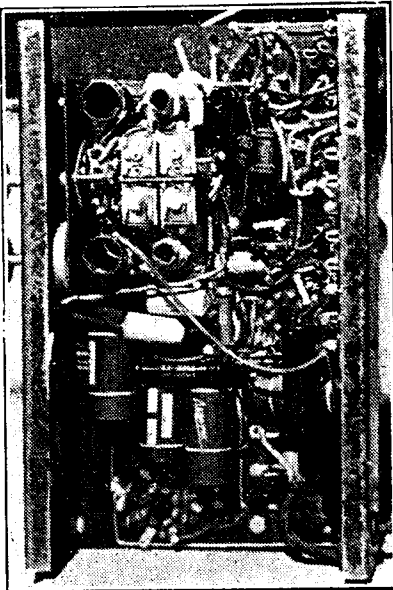
A rather novel and extremely useful innovation with the Aegis dual-wave coil kit is the colour coding of the trimmers. With most coil units it takes quite a bit of looking around to make sure that you are working on the right trimmers, but when they are colour-coded you can see what you are on in a glance. For the broadcast band the aerial trimmer is yellow, and the oscillator trimmer is red. On the short-wave band the aerial trimmer is green, and the oscillator trimmer is blue.

## Aligning the Trimmers

When the assembly of the set is

finished, the chassis should be tested and aligned before it is installed in the cabinet. The first thing is to fit the valves and make sure that the speaker is properly connected. Fit an aerial of twenty or thirty feet length. Plug in to a suitable source of alternating current power and switch on. Keep one eye on the rectifier valve, 5Y3G, and if it lights up brightly, or has a blue or purple glow inside, switch off again quickly as a short circuit of the high tension is indicated. If everything is in order the set should give a quiet hum from the speaker and then, as the valves warm up, it should be possible to tune in a station by swinging the dial.

Now for the adjustment of the trimmers, which is a most important subject if the set is to give its best performance, but don't let it frighten you. Even without a signal generator it is possible to get trimmer adjustment near enough to perfect to give you excellent all-round performance. Don't get flustered, and be sure to feel your way along as you go. Only slight adjustment should be needed and the usual mistake is to adjust (?) the short-wave trimmers when the set is tuned to the broadcast band, or something equally silly. If you do that sort of thing you may get the adjustments right out and the trouble starts. The adjustment should be done in



Compare this photograph of the actual wiring with the picture diagram on page 16

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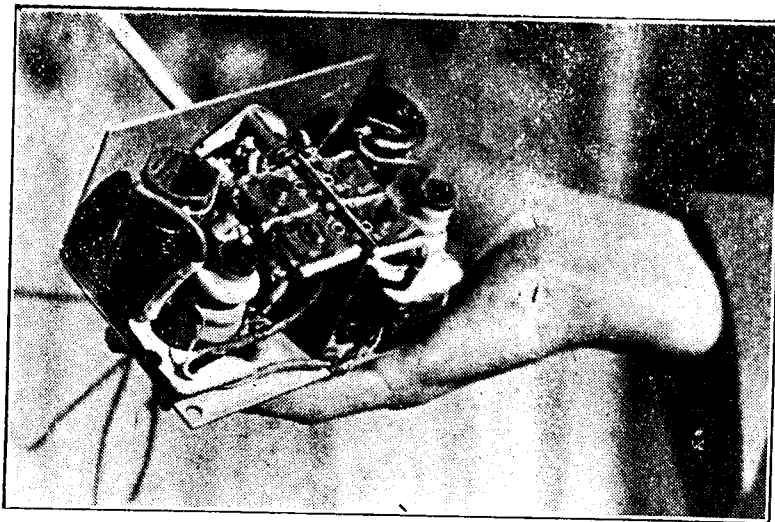
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a systematic manner, so we will set out the various steps in just such a manner and hope that it will encourage you to do the same.

(1) Switch the set on and switch wave change knob to broadcast position.

(2) Swing the dial until pointer is at 600 kc. Set signal generator to 600 kc. If a signal generator is not available, tune to a powerful station up at this end of the dial, find its correct frequency and set the pointer to this frequency. Adjust iron core of the broadcast oscillator coil to bring signal to maximum, and check by peaking, viz., a fraction of a turn either way should reduce the output signal, which should be kept at a low level by the volume control, as it is then much easier to tell whether the signal is louder or softer. Next peak the iron core in the aerial (broadcast) coil. Go over this again to make sure that dial pointer is on same frequency as signal and that iron core adjustment for both aerial and oscillator broadcast coils are peaked.

(3) Now swing dial pointer to 1400 kc. and signal generator to same frequency. If no signal generator is available, tune to a station of known frequency and set pointer at that frequency. Do not touch the adjustment of the iron cores. Work only on the colour-coded trimmers. Adjust broadcast oscillator trimmer for maximum sig-



Heart of the set is this dual-wave coil assembly which comes to you completely wired and color-coded.

nal output. This is the trimmer colour-coded red. Then adjust the aerial trimmer (yellow) for maximum signal, making quite certain that you get a definite peak on both adjustments.

(4) Repeat operation number 2, working on the iron cores at the 600 kc end of the dial. Then repeat operation number 3, working on the trimmers at the 1400 kc. end of the dial.

(5) Switch to the short-wave band by operating dual-wave switch knob.

(6) Set dial pointer to 40 metre end of band by tuning dial. Get signal of this frequency from signal generator, or station of known frequency. Adjust iron core in aerial short-wave coil in the same way.

(7) Swing dial pointer to 16 metre band. Set signal generator to same frequency as pointer. Adjust short-wave oscillator trimmer, coloured blue, to give peak. Then adjust short-wave aerial trimmer, coloured green, for maximum output.

(8) Repeat operations 6 and 7. In practice you may find the short-wave band a little hard to adjust without the aid of a signal generator, but don't let that worry you. Get the set operating to perfection on the broadcast band and then wait your chance to get a strong short-wave station on which to work. Remember that if it is up at the 40 metre end of the dial, you should bring the pointer to the right wave-length setting by means of the iron core in the oscillator coil, then lining up the iron core in the aerial coil to match. If, on the other hand,

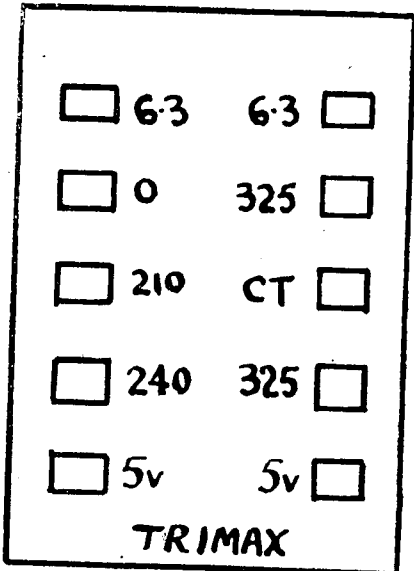
the station is down on the 16 or 19 metre band, you should work on the trimmers only, adjusting the oscillator first and then bringing the aerial trimmer into line.

## The Cabinets

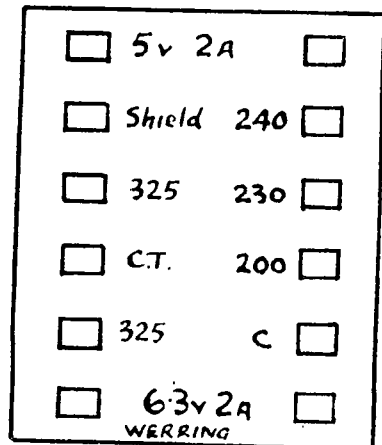
The cabinet which is supplied as part of the kit is a well-built job of timber construction, covered with a leatheroid cloth. This surface wears well, and does not scratch readily. The acoustic properties of the wooden cabinet are also excellent.

The standard colour of the cabinet is a dark brown, but those who are particularly keen for a blue or a cream to match up with special colour schemes may be able to get the special colour by so ordering.

— Good Luck —



Transformer terminal board arrangement for Trimax power transformer.



The terminal lay-out for the Werring power transformer supplied with some kits.