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Radio World

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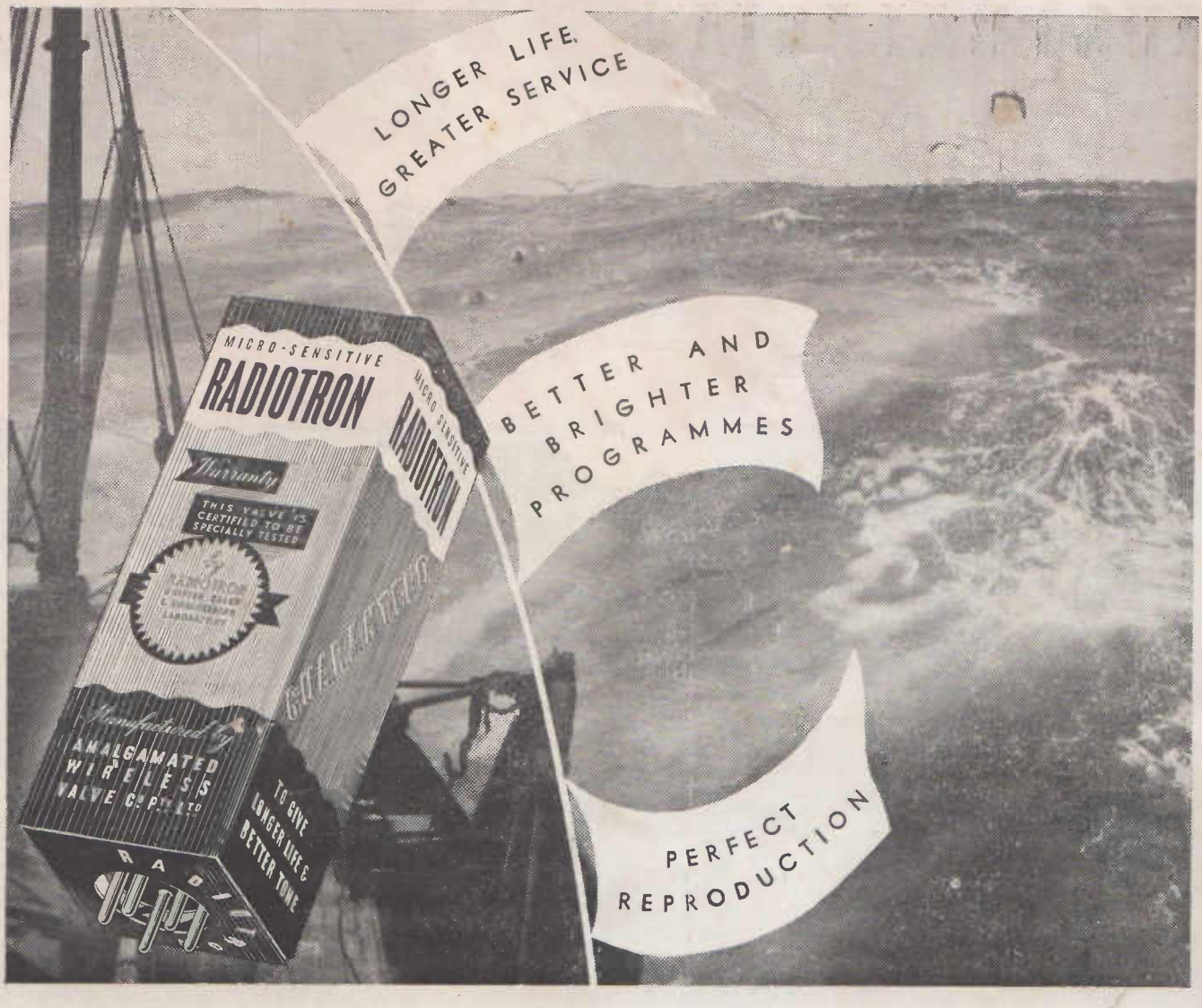
—See Page 8

- "TRIPLEX ALL-WAVER": MORE ABOUT THE "1938 DE LUXE FIDELITY EIGHT": "AIR-ACE COMMUNICATIONS FOUR": "VIBRA D.W. FIVE":
- "TRANS TASMAN U.H.F. TWO": WINNING ENTRY IN QSL CARD CONTEST.



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THE AUSTRALASIAN RADIO WORLD

Incorporating the

ALL-WAVE ALL-WORLD DX NEWS.

Managing Editor:
A. EARL READ, B.Sc.

Vol. 3. **SEPTEMBER, 1938.** **No. 5.**

CONTENTS:

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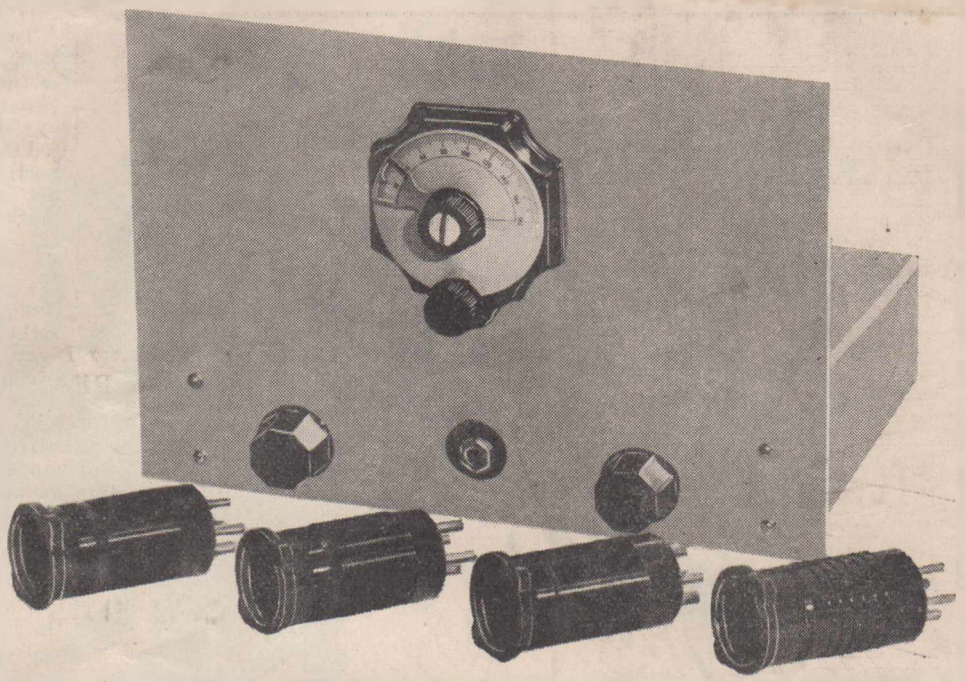
The . . . ATLAS All-waver



A front view of the completed one-valve model. Control on left is the rheostat, with 'phone plug in the centre, and regeneration control on the right.

The one-valve version of a three-valve all-wave receiver that can be built stage by stage is described below.

THERE must be many hundreds of shortwave fans who would like to build an all-wave set, capable of bringing in two or three dozen broadcast stations at full speaker strength as well as the main shortwave stations throughout the world, but who cannot afford to outlay at one time the ten or twelve pounds required for a complete kit of parts.

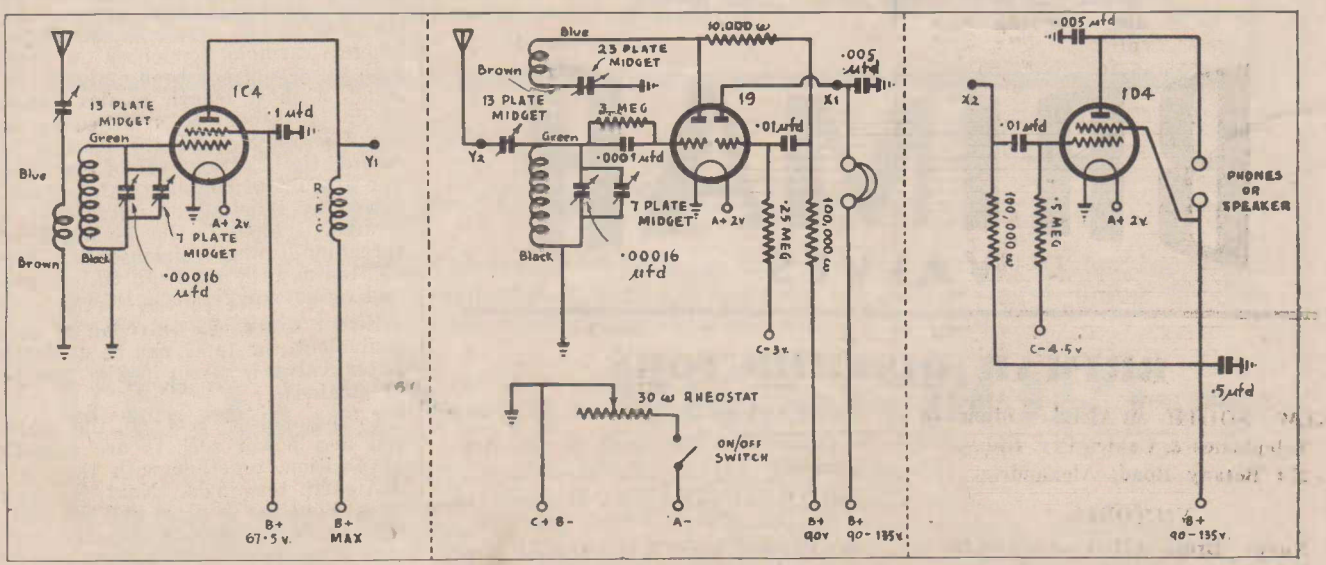
With the co-operation of Standardised Products, of Sydney, who developed the all-wave coil kit, the "Atlas All-Waver" shown above has been designed, and it provides a very effective solution for those who would like to build a receiver on what amounts to the instalment plan.

Is A Four-Valve T.R.F. All-Waver.

In its final form the "Atlas All-Waver" is the equivalent of a powerful battery-operated four-valve receiver, with a tuned r.f. stage using a 1C4, a 19 twin class "B" valve as regenerative detector and first audio stage, and a 1D4 output pentode. The chassis is supplied to builders stamped and drilled as for the three-valve model, though the single-valve version is built first of all. Then later on the r.f. stage can be added if desired. and finally the output pentode is wired in circuit, completing the receiver.

Three-Section Circuit.

The way in which the circuit is divided up is shown below. Enclosed between the dotted lines is the circuit of the single-valve version (it is actually equivalent to two valves). This is substantially the circuit of the "All-Wave Bandspread Two," described in the "Radio World" some time ago—a set that many builders reported as giving exceptionally fine



The three-section circuit referred to in the text, that of the single-valve model being in the centre.

performance on all wavebands.

To obtain speaker volume, the pentode audio stage is added according to the circuit shown on the right. The two circuits may be joined together by folding along the right-hand dotted line, and folding the left-hand portion back again so that the black dot marked "X1" falls on the dot marked "X2."

Adding The Third Valve.

For increased sensitivity and selectivity, the r.f. stage shown on the right may be added in a similar way—by folding along the left-hand dotted line and folding again to make dot "Y1" fall on dot "Y2." In this way an exceptionally powerful three-valve receiver can be built up stage by stage over a period of some months, obviating the need for a heavy outlay all at one time.

All-Wave Coil Kit Covers From 15 To 600 Metres.

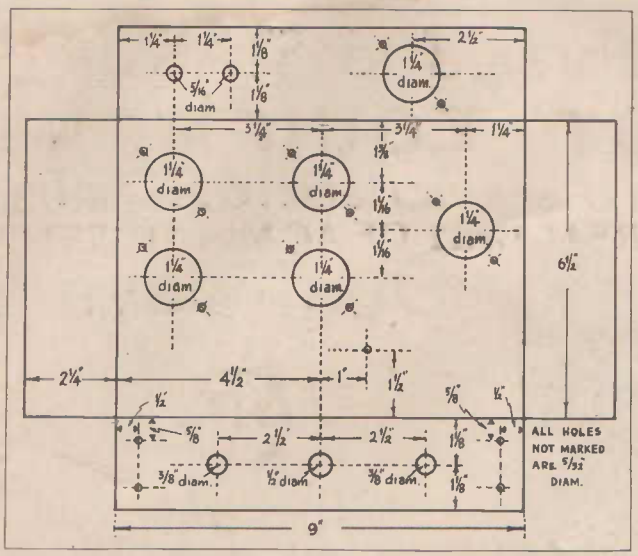
The Rayway Coil Kit developed for the "Atlas All-Waver" comprises five coils giving coverage from 15 to 600 metres. Particularly efficient in design, the performance of the receiver is largely due to their use, and hence substitutes are not recommended. A further point worthy of mention is that this coil kit is to be adopted as standard for a number of "Radio World" receivers, and so will have an almost universal application, both in a.c. and battery type sets.

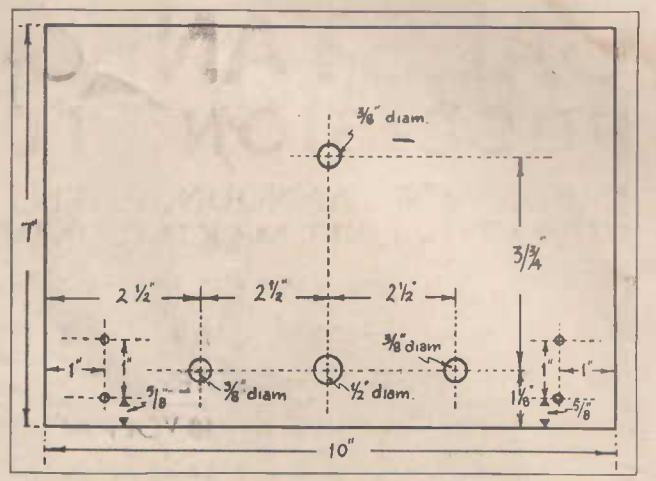
The Single-Valve Model.

The receiver illustrated in the photographs and diagrams accompanying this article is the single-valve version, the circuit of which is shown between the dotted lines in fig. 1. There are several minor alterations, the first being that no on/off switch is used, as turning the rheostat knob right back accomplishes the same object. Secondly, the 7-plate midget variable condenser in series with the aerial has been omitted. Instead, a short length of flex (about 10 or 12 inches) is attached to the aerial terminal, and the lead-in is twisted tightly round this a few times. The amount of coupling can be easily varied by twisting or untwisting as desired. Lastly, the 7-plate band-spreading tuning condenser has been omitted as it is not required in a general receiver of this type.

Either a type 19 valve or its octal equivalent, the 1J6G, can be used (the latter valve is used in the receiver illustrated).

In assembling the set, the valve, coil and power sockets are mounted in position, together with the aerial and earth terminals. Next, the front panel is bolted in place and the .00016 mfd. tuning condenser mounted, together with the 23-plate midget reaction condenser, the 30-ohm rheostat and 'phone plug. Note that the latter





Left, chassis dimensions, and right, panel dimensions, of the "Atlas All-Waver."

should be insulated from the chassis with washers, providing, of course, it is of the type that required insulating.

The chassis is now inverted and wired in accordance with the circuit and under-chassis wiring diagram, colour coding of the coils being shown on both diagrams.

After the wiring has been completed, the six-wire battery cable can be connected to the six-pin plug. Identify each pin and make a note of the colour of the lead running to it, and of its designation.

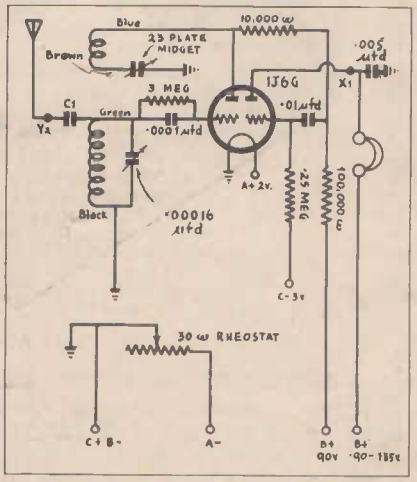
After everything has been given a final check, plug in the valves, one broadcast coil and the headphones, connect up the earth and aerial leads (the latter via the flex as mentioned previously), and finally connect up the batteries. Battery requirements include a 9-volt "C" battery, a 2-volt accumulator (or two 1½ volt P.M.G. type cells), and 90 to 135 volts of "B" battery.

If it is intended to add both r.f. and pentode output stages at a later date, then the best plan would be to buy two heavy duty 45 volt "B" units, adding a third later when the pentode is added. If, however, it is intended to use the set only as a one or two-valver with r.f. stage, then two Ever-Ready 60 volt light duty "B" batteries would fulfil requirements.

If two 1½ volt cells connected in series are used for "A" supply, then the rheostat should be turned on only sufficient to provide two volts across the filament. Using a full 3 volts would quickly ruin the valve. Of course, if a 2-volt accumulator is used, then the rheostat is turned full on each time the set is operated.

With the batteries correctly con-

(Continued on page 42)

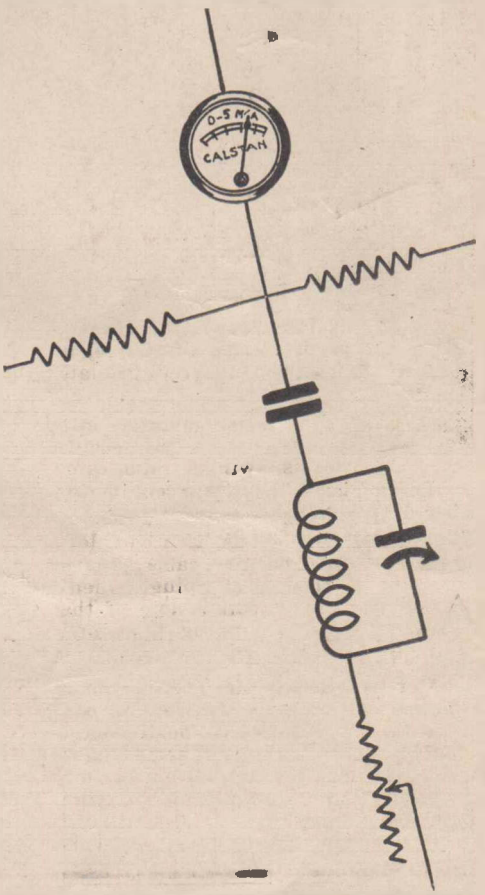


The circuit of the single-valve model. "C1" is replaced by a length of twisted flex, as explained in the text.

CALSTAN (CALibrated to STANdard) PRECISION TEST EQUIPMENT

IMPORTANT ANNOUNCEMENT TO SERVICEMEN CONCERNING VIBRATOR UNIT MAKING UNIVERSAL UNIT OF AC MULTITESTER

FREE FOR A LIMITED PERIOD TO PURCHASERS OF THE AC223 MULTITESTER A NEW 6 VOLT VIBRATOR UNIT TO CONVERT THE MULTITESTER TO A GENERAL PURPOSE INSTRUMENT FOR 240 VOLT AC OR 6 VOLT BATTERY OPERATION.



● This Vibrator, which is separate from the Tester, is a general utility converter, strong, light in weight, and is easily portable. Will run a Mantel Model 5 Valve A.C. Set from a 6-volt accumulator, drive an Electric Shaver, and generally act as a universal unit between the battery and the A.C. device.

● By the use of this New Vibrator Unit which is plugged into a six-volt battery the AC223 Multitester now becomes a universal A.C. Tester. The plug on the other end is an A.C. outlet, and the multitester may then be hooked up in the usual manner.

● Here is an outstanding advantage for the Country Radio Dealer servicing A.C. and non-reticulated areas, who requires the multitester to operate under both conditions. The AC223 will meet all demands in the Test Room, but if the dealer goes out on a service job, A.C. equipment is useless unless converted. Here this new unit comes into operation, and the AC223 becomes an equally EFFICIENT BATTERY UNIT.

MODEL AC223 MULTITESTER

The Serviceman's Portable Testing Laboratory

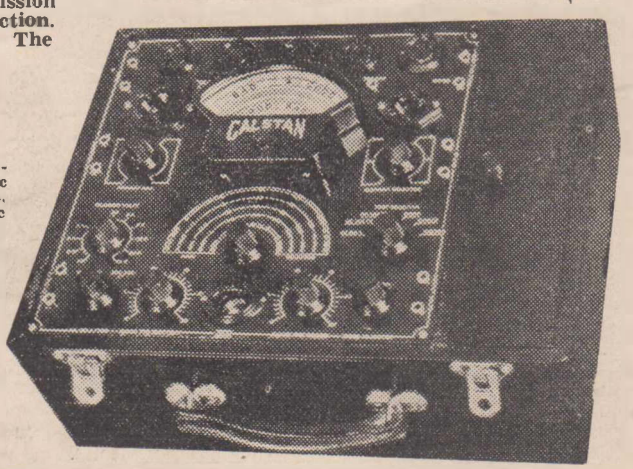
. . . which creates yet another Calstan triumph and has filled a much needed place in the Radio Servicing Field.

● Released by SLADE'S RADIO PTY. for the discriminating Radio Dealer and Serviceman who appreciate and practise the finer points of efficient Radio Service. Here is an outstanding instrument for all-round perfection, combining the multiple functions of a Valve Tester and Multitester. This instrument is a boon to the Radio Serviceman and Dealer, and needed by ALL who rely on RADIO SERVICE as an effective means of building up a MODERN RADIO BUSINESS.

● A.C. Model 223 will test every valve used in Australia, including American and European P. and V., and in addition to the emission test a Neon leakage indicator is fitted for individual electrode selection. Eleven steps for filament voltage from 1.5 to 30 volts is provided. The Multitester range is:—

A.C. and D.C. VOLTS: 5, 10, 50, 250, 1250.
MILLIAMPERES: 5 Ranges, 1, 5, 25, 100, 250.
OHMS: 5 Ranges, from 1 ohm to 5 megohms.

● This is also an excellent instrument for lining up sets and as a "Multimeter" operating in conjunction with the Power Supply an electrolytic condenser leakage test is available, and condensers may be checked at 10, 25, 100, 150, and 250 volts, and a "GOOD"—?—"BAD" meter scale provides the necessary indications.



. . . and for the Country Radio Dealer

● The D.C. VALVE TESTER MODEL D223 is also available as a Combination Tube Checker and D.C. Multimeter. As a D.C. Valve Tester it operates from a 6-volt battery, and tests every type of valve used in Australia. As a D.C. Multimeter it has 5 ranges of D.C. volts, 5 ranges of Milliamperes, and 4 ranges of Ohms.

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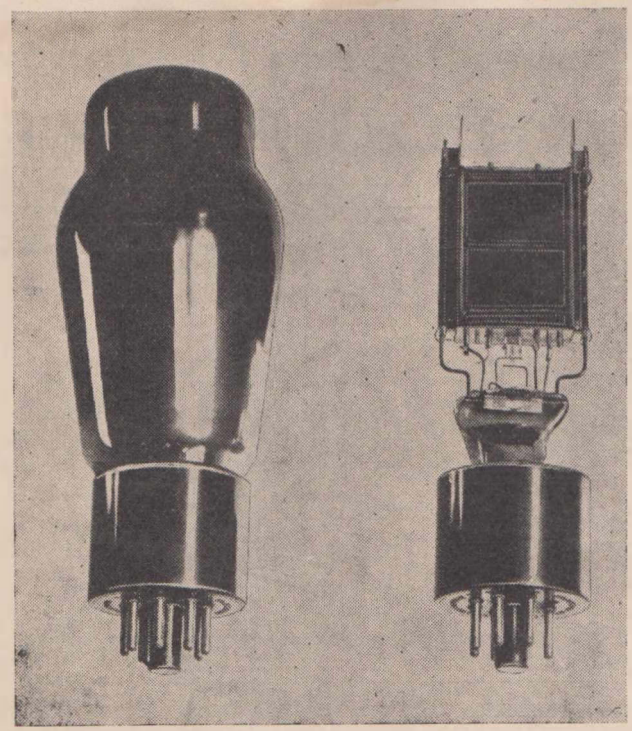


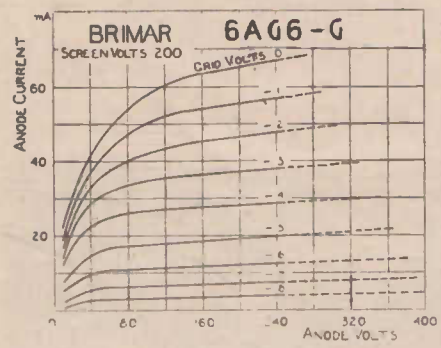
Left: The 6AG6-G, approximate overall dimensions being 5¼" x 2". Right: An exploded view, showing the rugged construction.

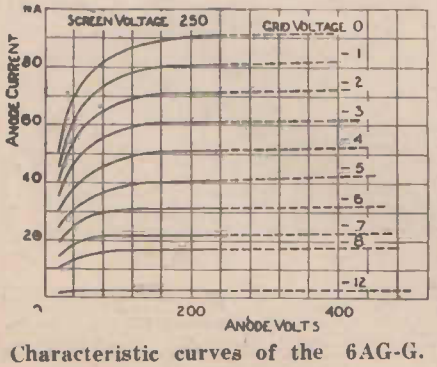
Brimar Releases 6AG6-G High Slope Pentode

Input of two volts R.M.S. fully loads new pentode, which delivers over four watts of output.

By T. P. COURT,
M.I.R.E. (AUST.), A.M.I.R.E. (U.S.A.).
Chief Engineer Standard Telephones & Cables (A/sia) Pty. Ltd.

A remarkable new Brimar pentode valve—the 6AG6G—has just been released by Standard Telephones and Cables Pty. Ltd. It has a slope of no less than 10 m.a./v., with a power output at orthodox set voltages of over four watts. Having a six-volt filament and a standard octal base, the 6AG6-G offers wide possibilities to the set designer.





Characteristic curves of the 6AG-G.

2-Volt Input Gives Full Loading.

The 6AG6-G is an indirectly-heated high slope pentode for use in a.c. receivers. The sensitivity is such that with an input of 2 volts R.M.S. (200 volts on the screen) the valve is fully loaded, thus dispensing with the intermediate audio frequency stage usually required.

However, as modern practice calls for fairly high level audio amplification, a triode valve such as the 6R7, 6Q7 may be used as a driver. This combination gives a high-quality high-gain audio amplification system.

Grid And Plate "Stoppers" Recommended.

Owing to the high efficiency attained, it is recommended that a resistor of the order 1000-10,000 ohms be connected directly in the grid circuit, while a resistor of 100 ohms should be inserted in the plate circuit. These stoppers prevent any tendency towards the generation of parasitic oscillations.

The use of automatic bias is strongly recommended, the usual cathode-ground bypass condenser being used in order to obtain maximum sensitivity and adequate low note response.

The characteristics of the valve are as follows :—

Base.	Standard Octal
Heater voltage	6.3 volts
Heater current	1.25 amps
Anode voltage (max.)	250 volts
Screen voltage	250 volts
Mutual conductance	10 ma/v.*
Mutual conductance	10 ma/v.†
Impedance	60,000 ohms†
Amplification factor	600†
Max. anode current	40 m.a.
Screen current	5 m.a.
Cathode Resistor (for automatic) bias	150 ohms
Plate stopper resistance	100 ohms
Grid stopper resistance	1000-10,000 ohms

(Continued on page 48)

This Month's Front Cover

This month's front cover photograph shows an interior view of the new Radiokes factory in Chippendale, Sydney, where the four conveyor belts shown have just been installed. According to Managing Director R. K. Stokes, this new system has already proved invaluable in speeding up production.

In the factory each operative has his own table, and as he completes his section of the work on a component he places the latter on the belt, which takes the unit to the next operative. Thus there is no waste of time and no hold-up of material.

Rectifiers, Filters and Hum

Published below is a precis of the third of a series of monthly lectures arranged for the radio trade by Amalgamated Wireless Valve Co. Pty. Ltd., of Sydney, to provide a refresher course for engineers and servicemen, and a useful groundwork of radio fundamentals for non-technicians.

RECTIFIER valves can be divided up into two main classes, vacuum and gaseous. The latter can again be sub-divided under two headings—mercury vapour and other gases, mainly argon. There are two varieties of mercury vapour rectifiers—shielded and non-shielded.

Vacuum rectifiers—the ones with which we are mostly concerned in radio receiving sets—are divided up into various sections, the most convenient classification being in the directly and indirectly-heated cathode types. These again can be sub-divided each into high and low impedance types.

The type with which we are mostly concerned is the directly-heated type, it being found frequently in ordinary receiving sets and amplifiers.

Because of interference due to r.f. oscillation inside the valve or in connections to it, the mercury vapour type may be discarded for receivers in general, and can be put aside for transmitters and low voltage amplifiers.

For receivers using class "A," "AB1," or "AB2" amplifiers, the rectifier used must have a very low impedance, giving constant voltage with all current drains. The directly-heated type is unsatisfactory here, certain indirectly-heated valves, notably the 83V, being most suitable.

Choosing A Rectifier.

In general, however, vacuum types are preferred, for various reasons. Firstly, they have a long and trouble-free life. The mercury vapour type have almost zero impedance, and cannot withstand overload, whereas the vacuum type is in itself equivalent to a resistance and so adds to the safety of the circuit. If a short circuit occurs in the filter condenser or some part of the circuit, the maximum current that can pass is limited by the valve.

Types such as the 80 are popular, not for their efficiency, but because they add protection—it is not because they are extremely good for regulation, or in any other degree. That is a matter to be kept in mind, particularly in large sets or large amplifiers where it is necessary to use valves having good regulation, and therefore providing very little or no protection against overload. In such cases other means of protection must be employed.

Another reason why vacuum types are to be preferred is that the available voltage under normal working conditions is far higher than that from the mercury vapour types. The use of a condenser input filter increases the available voltage, but in mercury vapour types the use of a condenser input filter is not permissible under normal working conditions.

Choice Of Filter System.

The condenser input filter is generally preferred on account of the higher voltage it produces, but its disadvantage lies in its poor regulation, which means that the voltage varies with the current drawn from it.

The usual capacity of the filter condensers varies between 2 and 8 mfd.; but for certain purposes, particularly a.c.-d.c. receivers, these values are increased to as high as 32 mfd. Even in ordinary receivers, where elaborate smoothing is required, the values quite often exceed 8 mfd.

The choke input filter is essential where good regulation is required, but it gives far less filtering effect and consequently far worse hum, unless precautions are taken in the design of the filter to increase the size of the condensers.

The Swinging Choke.

The swinging choke has an inductance which is variable with the d.c. current flowing through it, and it provides even better regulation than choke input of the ordinary type. We have three types of filters, the condenser input, the choke input, and swinging choke.

We can have parallel operation of valves under certain conditions; for example, high impedance valves such as the type 80 can be connected in parallel without any difficulty.

Regulation.

The regulation of a rectifier and filter is the constancy of the d.c. output under various d.c. currents. A valve with good regulation will provide almost constant voltage, whatever the current may be. Type 80, for example, gives bad regulation, while a mercury vapour rectifier gives practically perfect regulation.

Because of the constant current of a class "A" amplifier, the current drawn from the rectifier will be constant, so good regulation here is of no importance. Actually, bad regulation is an advantage as far as protection is concerned.

For a class "B" or similar output stage where the output current varies considerably, it is obvious the output voltage will vary, and consequently a power supply of good regulation is essential, calling for a choke input filter, or, in certain cases, a swinging choke.

The regulation of any system may be improved by the use of a bleeder resistance.

Design Of Filters.

The smoothing effect of a filter is dependent on all three values—"C1." "C2" and "L" (where "C1" and "C2" are the smoothing condensers on the input and output sides respectively of the smoothing choke "L"). We can improve the filtering by increasing the size of "C1," by increasing the size of "L" and by increasing the size of "C2." The question is, which is most economical, or would it be more economical to add another section to the filter?

Any increase in capacity at "C1" is good as far as smoothing is concerned, and there is no harm in exceptional cases going as far as 32 mfd. if required. A distinct improvement in filtering can be obtained by an increase of choke inductance, which falls as the current through it increases. Many 30-henry chokes may easily prove to be 10 or 12 henries, sometimes less. The speaker field has not a very high inductance for modern sets, less inductance than years ago, particularly if a beam power valve is used.

The larger the output valve, the greater the current drawn through the speaker field. This decreases the inductance of the latter, and more hum will be the outcome. For sets with excessive hum, a larger field will provide a solution, though if this is impracticable a further choke and condenser may be added, giving far better results. This is essential if beam power valves are used, and the speaker field is used as a choke.

Causes Of Hum.

There are eight different causes, of which lack of sufficient filtering is perhaps the commonest.

Induction hum is caused by a wire carrying a.c. voltage being close to a high impedance circuit such as the plate circuit of a resistance-coupled pentode. Similarly, an approach to a grid circuit would cause capacitance pick-up. The pick-up is in proportion to the frequency; consequently the harmonics of the a.c. will come through in proportion more than the fundamental, so what we hear is not a low-pitched a.c. hum but a higher-pitched noise.

Electro-magnetic pick-up between laminated iron-cored components such as audio transformers and chokes is also a common cause of hum.

Next, there is r.f. oscillation pick-up in mercury vapour rectifiers, which can usually be avoided by placing r.f. chokes, one in each plate lead from the valve, the leads being screened. However, this type of rectifier is not recommended for ordinary receivers.

Next we come to the presence of magnetic fields causing hum. This is less common and was described in a recent issue of "Radiotronics." The valve is like a cathode ray tube, in that electrons pass between the cathode and plate.

If we put in a deflecting plate at one point we can vary the stream of electrons, which is dependent on the voltage. Similarly, if we had an electro-magnetic field with one of the electro-magnetic deflection cathode-ray tubes, that would produce a movement of the electron stream. Obviously we could have the same effect in a valve, and if one is located in close proximity to a transformer, filter choke, etc., it is likely to cause modulation.

Another cause of hum lies in the presence of capacitive coupling between the heater and other electrodes. Still another cause is leakage between the heater and cathode insulation. In every valve there is a certain amount of leakage, the amount varying considerably in different valves. It is recommended that very high voltage between heater and cathode should not be used.

There is often a voltage at which minimum hum occurs, and this may be round about 10 volts positive or negative between heater and cathode. If hum is experienced it is always possible to vary the voltage between heater and cathode. If hum is experienced it is always possible to vary the voltage between heater and cathode in order to discover the voltage at which hum occurs.

Unfortunately leakage is not only taking place there; there is also emission from the heater or from the cathode indirectly to the heater. The cure for that again is suitable voltage arrangement, and by biasing positive or negative it is possible to minimise the hum.

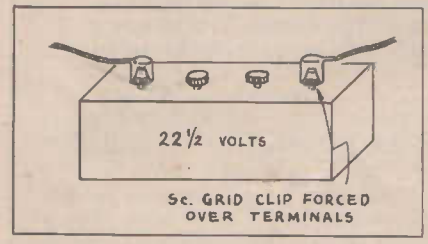
Radio Ramblings

A page for letters from readers. A prize of 2/6 will be awarded for every technical contribution published.

★ ★ ★

Screen-Grid Clips For Battery Connections

Some "C" batteries, notably the 22½-volt type, are still fitted with screw terminals, which do not as a



rule prove as satisfactory as the usual Fahnstock clips; there is always a tendency to unscrew with the movement of the connecting wires.

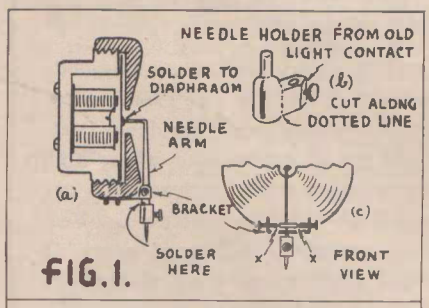
Ordinary screen-grid clips which can be bent to make a tight fit when pushed on to the terminals make very efficient connections, and may be quickly changed from one tap to another.—**H. W. Unger, Alectown, via Parkes.**

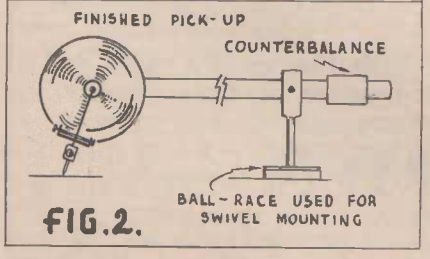
★

Pick-up Made From Earphone

A very simple yet efficient magnetic pick-up can easily be made from an old earphone and a few odds and ends.

Having obtained the earphone, which must be in good working order, get an old lamp socket, take out one of the spring contacts, and cut it as shown in fig. 1 (b). Now solder this to the needle arm as shown in fig. 1





(a). A support for this arm can now be made, see fig. 1 (a) and fig. 1 (c). The rest of the constructional details are shown in the diagrams.

It was found that when a piece of hard rubber was put between the points marked "X" on fig. 1 (c), there was a marked improvement in tone.

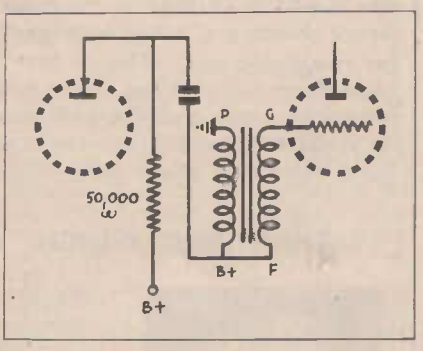
Fig. 2 shows the completed pick-up. An old auto-ball-race was used for a swivel base, ensuring minimum drag on the record. A counter-balance is very handy, and saves wear if the earphone is of the heavy type.

This pick-up will give ample volume, using a 5 to 1 audio transformer. I have used it several times to supply music for dances, using audio section of a broadcast set as an amplifier.—**L. Wilson (AW300DX); Chatswood Sydney.**

★

Increasing Audio Transformer Ratio

Gain is an essential factor when building small receivers. An apparent increase in turns ratio can be obtained by connecting an audio transformer as shown. This method



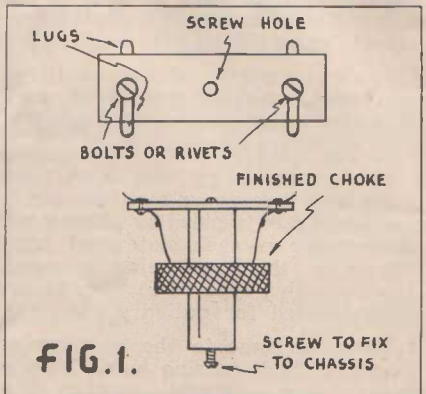
keeps all direct current out of the transformer primary, preventing saturation, a desirable feature in transformers. If a 2:1 transformer is used we obtain a 3:1 effect.

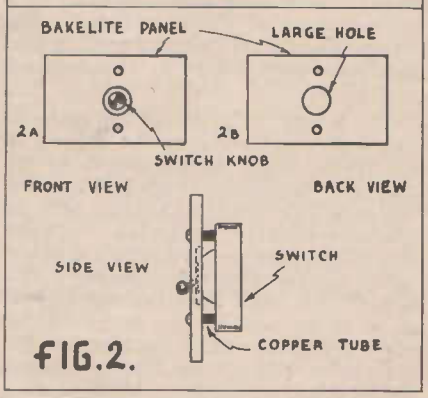
An audio transformer can also be used as a choke, utilising primary or secondary or primary and secondary in series. The connections shown should be adhered to to prevent opposition of the lines of force.—**H. Small, 9 Woodford Road, Rockdale, N.S.W.**

★

Two Useful Kinks

I have a couple of hints here that might prove of some interest to readers of your splendid page of "radio kinks." The first is for making an r.f. choke out of an old i.f. transformer found in any radio man's scrap box.

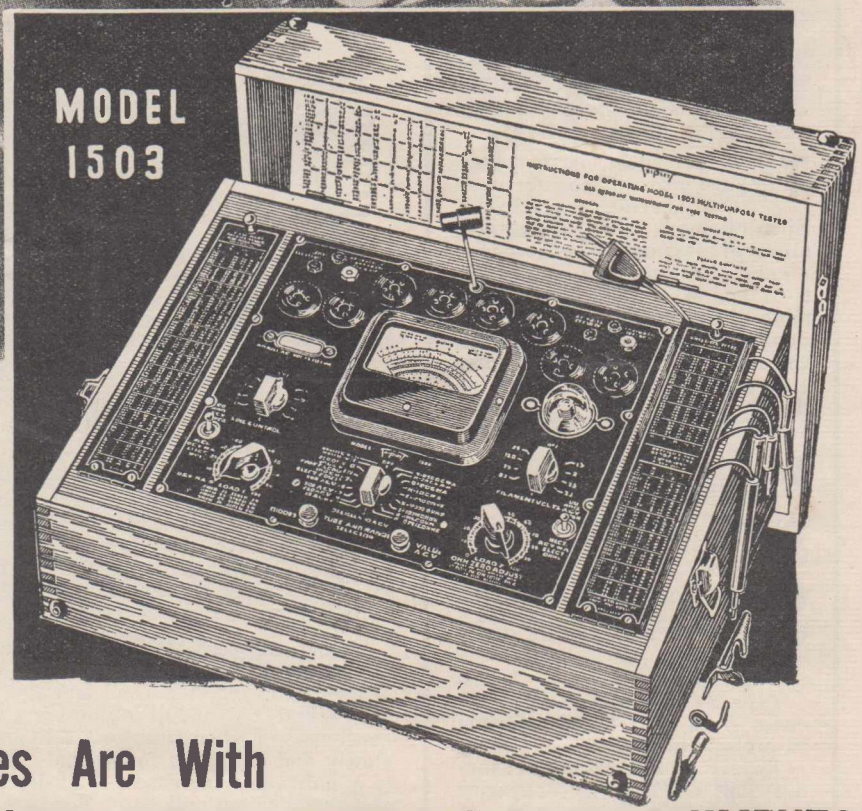




First select the good winding and cut the wooden dowel. Then place a scrap of thin bakelite on to the dowel and fasten it with a small wood screw. Bore two small holes at end of bakelite by means of an ⅛" bolt or rivet. Now solder the two loose wires from the winding to the bottom lugs and you have a very reliable choke.

The next kink is a way to make a good flush switch for radio panels. Get an ordinary electric light switch and bore a hole in the panel about a $\frac{1}{16}$" larger than the knob. Now get a big drill and bore a big hole in the back of the panel nearly through to the front, and fasten the switch by means of two ⅛" bolts with a bit of copper tubing over the bolts so that the knob will not press on the bakelite, delaying action.—**Jack Wallace (AW248DX), Bendigo, Victoria.**

"...WILL YOU CALL AND FIX MY RADIO?"



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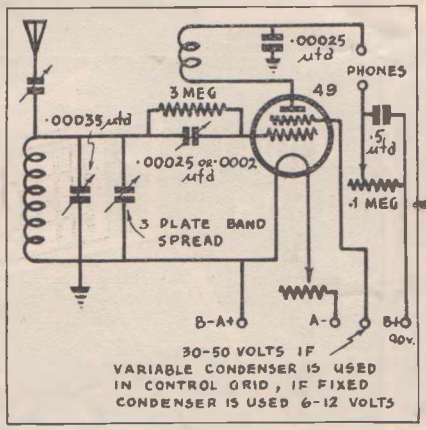
One-Valve All-Waver Uses Variable Grid Condenser

I am very interested in the "Radio Ramblings" page of your excellent magazine. These hints are of the most helpful nature, and touch on those small yet large difficulties that are always coming up in front of those new to radio.

Here is a hint that I think will prove very useful in small battery sets of 1, 2 and 3 valves. When listening to far away stations, the regeneration is very important, and if



the valve is slipping in and out of oscillation softly, as it should be, it is rather difficult to tell with a potentiometer just when the oscillation ceases, which is a decided disadvantage. This effect is most noticeable in the two and three valve sets, because it is hard to tell when the background noise merges into the rushing noise caused by a carbon control.

To overcome this simply substitute the grid condenser with a .0002 or .00025 mfd. variable condenser. Set the carbon control full in and the grid condenser in, then turn the latter out slowly and it will be found that there is a noticeable increase in sensitivity and the reaction will be no fiercer but quite distinct. I also find it makes the signals much louder and clearer, and the annoying rushing noise while the condenser is being turned is entirely absent.

I notice the 49 valve becoming very popular for single and two valve sets. Here is another circuit for which great claims can be made, both on b.c. and s.w. It is better than any other single valve I have seen, excluding sets using the 1E7G twin pentode. It is equal to a transformer-coupled 19. I obtained this circuit while experimenting with an old baseless 49, having blown all the valves in my regular set. I had been trying all kinds of combinations to get the highest gain from the valve. I am situated at about 20 miles from 2YA (60 k.w.), 2YC (10 k.w.), 25 miles from 2ZB (1 k.w.), 350 miles from 3YA (10 k.w.) and about 250 miles from 1ZM (54 watts). In the evenings with a good aerial 80 feet long and 20 feet high all these stations could be brought in on a horn speaker, loud enough to be heard in a room 18 by 12 feet.

The following stations were received on b.c., 20 m. "ham" band, 19-31 m. band and 40 m. band. The three stations on forty metres were received in fifteen minutes: 44 VK's, 26 W's, and K6FEV, F6FAB, J6MAY, JA1DH, K6BNR, YV1AK, CO8JK, K6BEA, K7MBE, K1JZ, K6KGA, K6GQF, K6OQE, K6NZQ, besides 13 stations on b.c. and VK3JQ, VK4NO and VK3QJ on 40 metres.

The whole secret lies in the variable grid condenser. Using a potentiometer alone, the reaction is too fierce to put sufficient screen voltage on to get the full gain. The circuit is not space-charged and without a variable condenser screen volts will be about 6v.—**Phillip A. G. Howell, Valley Road, Paraparaumu, North Island, N.Z.**

★

Improving Sensitivity of Low-Gain Receivers.

Here is a simple way of increasing the sensitivity of a low-gain receiver such as a four-valve superhet. Removing the shield from the intermediate valve allows a certain amount of feedback, with an increase in volume. This will be very helpful for daylight reception, when stations which are just audible can be tuned in at fair speaker length simply by removing the valve shield.—H. W. Unger, Alectown, via Parkes, N.S.W.

[If not sufficient, the amount of feedback resulting when the i.f. valve shield is removed can be increased by twisting one end of a short length of flexible push-back round the i.f. grid lead, and placing the free end near the mixer-oscillator grid lead. The amount of coupling to give a useful degree of feed-back can be determined experimentally.—Ed.]

★

Neat Chassis For Transmitters

I would like to make this contribution to "Radio Ramblings," as I have obtained many handy ideas from this page. Perhaps some may find this idea useful.

Using the chassis method of construction, when building my transmitter, I had found it rather difficult to insulate the various components which are at r.f. and d.c. potential above ground (such as condensers, etc.). To overcome this. I made the chassis sides of aluminium and the top of sheet bakelite (bolted to flanges around the sides).

In closing, I would like to congratulate you on the excellence of your magazine.—**A. J. Pratt, 70 Cary Street, Marrickville.**

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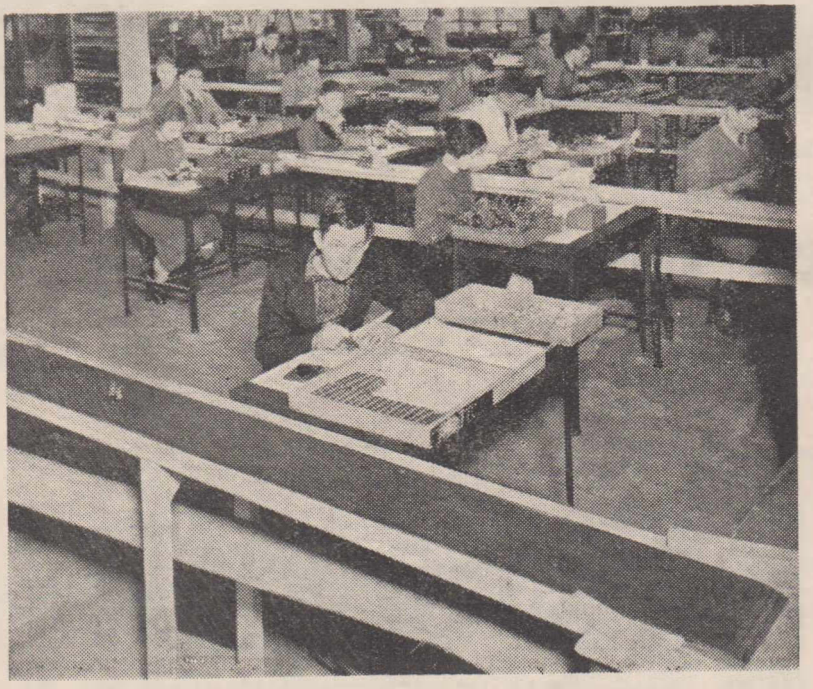
CHALLENGER D/W SIX
VIBRA D/W FIVE
ATLAS ALL-WAVER
AIR-ACE FOUR



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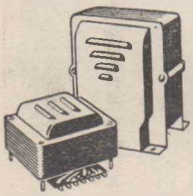
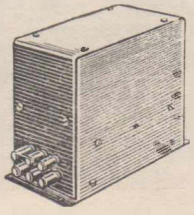
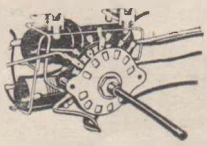


In the "CHALLENGER DUAL-WAVE SIX" use the Radiokes M-80-6 power transformer; Radiokes DWU3 dual-wave coil unit; Radiokes full-vision dial; 2 Radiokes TIC iron-cored i.f. transformers;

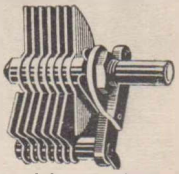


Radiokes IP-7 padder; Radiokes 25,000 ohm voltage divider. "VIBRA DUAL-WAVE FIVE": Radiokes DWB-3 dual-wave box; 2 Radiokes TIC-465 i.f. transformers; Radiokes VB-25 vibrator unit;



Radiokes full-vision dial.

"ATLAS ALL-WAVER": Radiokes 23-plate midget condenser; Radiokes all-wave r.f. choke.



"AIR-ACE COMMUNICATIONS FOUR": 2 Radiokes 40 mmfd. midget variable condensers; Radiokes high-impedance audio choke; 2 Radiokes all-wave r.f. chokes. Illustrated here is Radiokes latest release : the Star Midget Variable Condenser, type S. For set builders, experimenters, laboratories.

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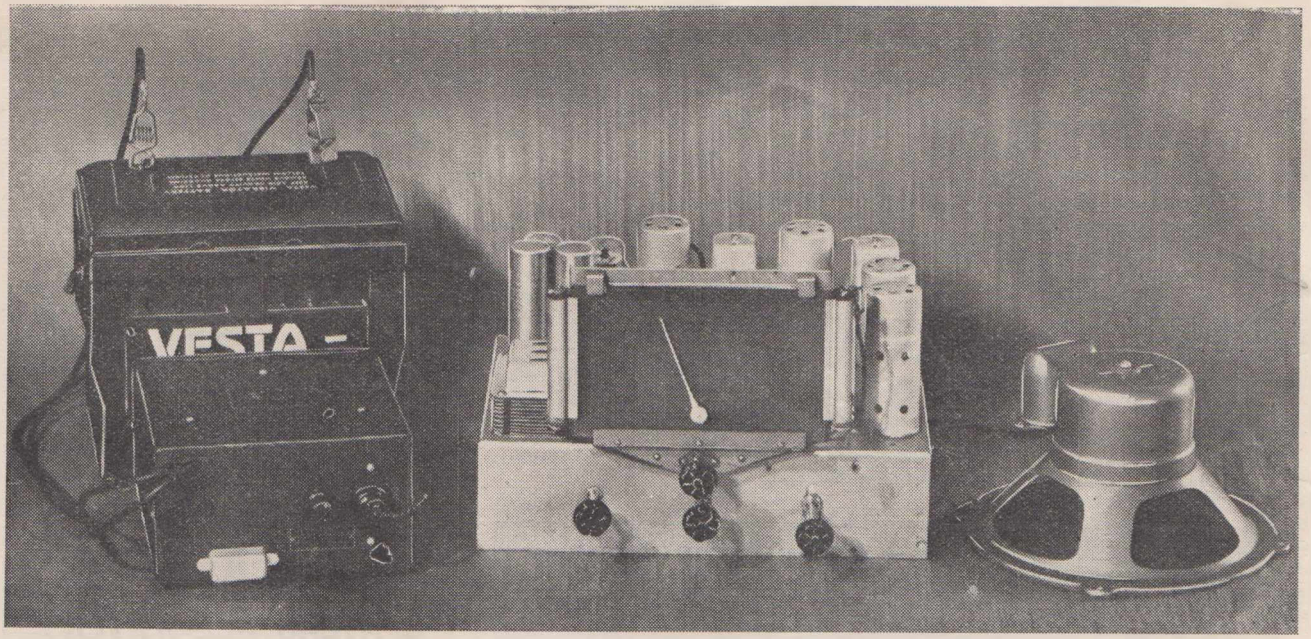


The "Challenger," which is an a.c. receiver of standard design, can be operated as well from d.c. by using the ATR inverter shown on the left. On the right is one of the latest Rola K-10 10" speakers.

The . . . . Challenger Dual-Wave Six

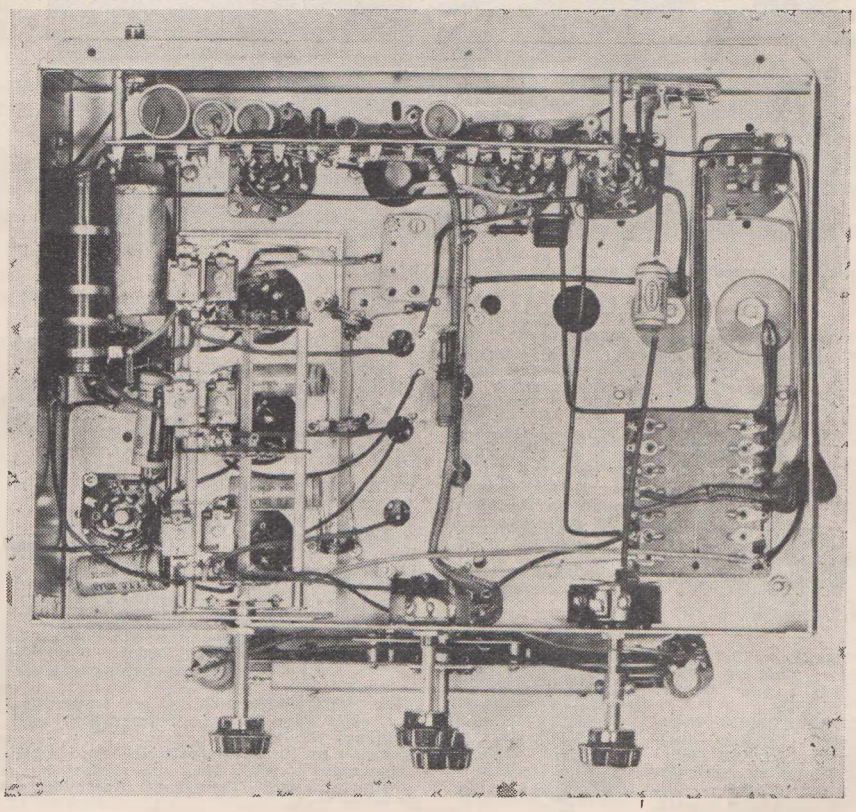
Hints on the assembly, wiring, and alignment of the "Challenger Dual-Wave Six" described last month are given below.

THE power transformer and the valve and speaker sockets are mounted on the chassis first of all, and the heater wiring put in. Next, the aerial and earth terminals and two i.f. transformers are locked in position, together with the volume and tone controls. Then commencing at the plate of the mixer-oscillator, complete the wiring of the receiver from that point onward.

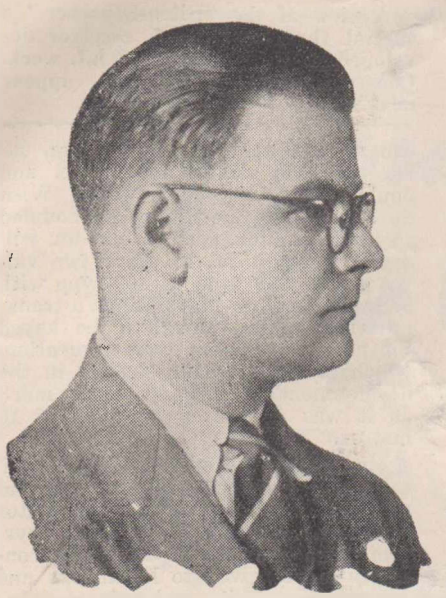
The DWU3 coil unit and condenser gang are next bolted in place, and then both are wired. The colour code of the DWU3 unit is shown on the circuit published on p. 41. The leads to the volume control should be shielded with copper braid, and the shielding earthed. The tuning dial is mounted last of all.

After the wiring has been completed and checked, the valves and speaker can be plugged in, and the valve shields and control knobs fitted. Connect up the aerial and earth leads and switch on, at the same time watching the rectifier closely for any signs of sparking or of a blue glow, either of which denotes overload. If, however, the valve heaters light up and a faint

(Continued on page 41.)



This view of the under-chassis assembly and wiring shows the location of the DWU3 coil unit, with the voltage divider mounted on the left wall of the chassis. Note the method of mounting the majority of pigtail components on a panel bolted to the rear wall.



The "Ultra-Shorts" In Review

An outline of the progress that has been made in the past few months towards the development of the ultra short waves as a reliable means of communication.

By DON B. KNOCK

Radio Editor, "The Bulletin."

Left: The author, who in the past few years has perhaps accomplished more in the direction of pioneering the "ultra-shorts" than any other amateur in Australasia.

SINCE the writer last put pen to paper in the pages of "A.R.W." on the subject of 56 megacycle (5-metre) developmental work and experimentation, much has happened, both overseas and in Australia, in the way of putting the amateur 5-metre band on an equal footing with the accepted DX frequencies. So much so that, in U.S.A. at least, the band has been a major subject for widespread interest and discussion, both in print and in a practical manner.

As time has "marched along," technical men prominent in developmental work in amateur radio have shown the way to better and more efficient apparatus, mainly in the pages of "Radio," "QST," and "T. and R. Bulletin." A stage has definitely been reached where, in these times, the employment of what was once considered appropriate apparatus for 56 m.c. experimentation is considered by those who have taken the matter seriously, as prehistoric and completely retrograde.

Valves and their methods of employment have improved so much that anything but the application of a transmitter with equally stable characteristics as at lower frequencies is not only detrimental to the useful population of the 5-metre band, but is a step backward in many respects. There is now no reasonable excuse for the use of the frequency-grabbing unstable modulated oscillator as a transmitter for constant operation on the band, for the reason that it takes very little time, and certainly not much more cash expenditure, to make a good job of things.

Admittedly, if high power is to be considered, it is a different story, but in the light of recent DX happenings overseas and between Australia and New Zealand, the average experimenter has no need to think in terms of anything more than his allowable 50 watts as a maximum. That power, and less, is all that is necessary, with the right kind of associated equipment, to get satisfying results which may not be realised for obvious reasons with ten times the power with a transmission that cannot be copied.

During May and June this year, the 56 m.c. band repeated the behaviour of recent years in U.S.A., but this time far excelled itself. The most amazing long-distance contacts took place during day and night, and although contacts were made with wobbly oscillators and screeching super-regenerators, these were far away down the scale in comparison to those between stations using crystal or other forms of stability control and receivers designed to deal with such signals.

Two Americans in particular did such consistently good work that they finished up in the position, when the DX conditions subsided, of needing only two districts to have communicated two-way on 5 metres with the whole of U.S.A.

Cross-Continent DX Now A Reality.

Thus has a long-cherished dream of cross-continent working on 5 metres been realised in U.S.A., and the fact remains that here in Australasia there must assuredly be some period of the year corresponding when ionosphere conditions are such as to permit cross-continent and trans-Tasman ocean working at this frequency.

Unfortunately, there is a vast difference in another direction. U.S.A. has many thousands of experimenters consistently active on the band; it is never unpopulated, and for this reason there is every encouragement for the amateur to get busy and make use of it. In Australia the number of amateurs interested in the band to the extent of making use of it continually is yet small, but the number is growing in the light of recent events.

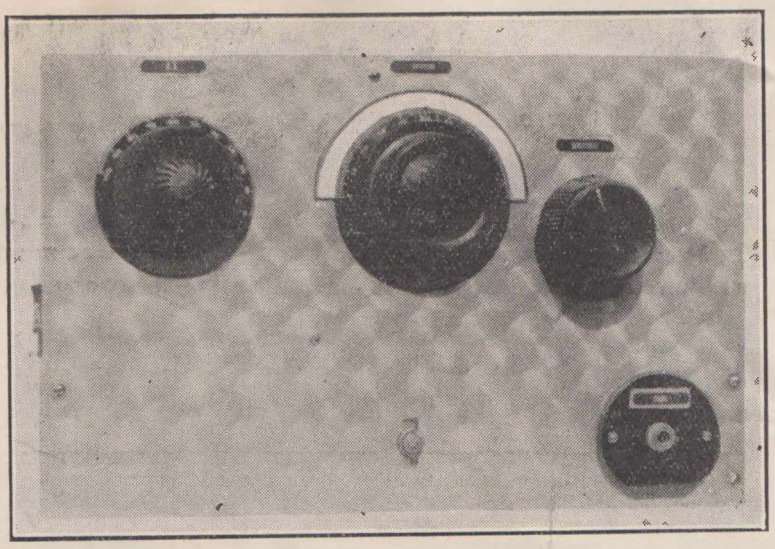
An important aspect of the question of making use of the band is reflected in the outcome of the recent Cairo conference on international radio frequencies. There, the amateur came out of the fray with his wings clipped somewhat, and with the ominous warning that he can expect the complete loss of 20, and perhaps 40, metres in the next seven years. The next conference is scheduled to take place in Rome.

Meanwhile, the amateur loses in effect the higher frequency 100 kilocycles in the 7 m.c. band, for the reason that this allocation must be shared with short-wave broadcasters from September, 1939. The broadcasters will be faced with an unpleasant outlook from amateur interference and vice-versa.

The 5-metre band did not escape intact, for the range from 56 to 58 m.c. is to be set aside for television purposes on a shared basis. There are other clippings in other bands, affecting mainly the European amateurs, and to some extent Australians may be more leniently treated by their regulating authorities.

One thing is certain, however, if we do not make good use of all our allocated frequencies, it will be assumed in due course that they are not sufficiently interesting to be of value to us. Television is unlikely to invade 5 metres in Australia for many moons; it has yet to get a start in the 7-metre region; but apart from this art, there are commercial organisations which before long will be applying for frequencies in the u.h.f. spectrum.

Any amateur who misguidedly assumes or voices the opinion that 5 metres is of no use is, in the writer's



A view of the "Ultra-Searcher," a special three-valve t.r.f. receiver developed by the author for u.h.f. work. Constructional details will appear next month.

opinion, not worth his ticket as an experimenter. The trouble is that so many have had a mild "flutter" on "five," either hearing or using antiquated gear, that the impression has been formed that the direct line transmission capabilities are limited to a matter of a few miles.

This is far from the case with the correct kind of equipment, which means stable transmitter, selective and sensitive receiver, and high-gain aerial systems. Under such conditions a 5-metre two-way circuit can be maintained to around 80 miles radius and further with reliability. Many constant 14 m.c. 'phone men ridicule the use of 5 metres as a useful channel, and in expressing their opinions thus to others in lengthy local QSO's are defeating their own objective.

If such stations were operated by experimenters with any sense of proportion, they would have u.h.f. equipment on hand, so that when starting a local QSO on a crowded DX band, and intending to "have a yarn while the DX is not coming through," they could change to the ultra-high channel. By so doing they would leave valuable frequencies clear for others for a period, and would get in their chat minus interference of any kind. And if anybody doubts that local QSO's on 14 m.c. over a distance of only two miles can be wrecked by other locals, they should try it in some of the congested parts of Sydney.

Listening to a conversation between two Sydney 14 m.c. 'phones recently regarding 5 metres, the writer was amused at the allegations from the one, and the defence of the band by the other. No. 1 station is one with an installation for 40, 20 and 10 metres to delight the heart of any "ham." So much cash has been expended on equipment that the station borders on a commercial instead of amateur aspect. He maintained that one "might as well use the telephone as use 5 metres, as all the QSO's one can get are in a small radius." If so, why work locally on 14 m.c.? The telephone would serve equally well!

No. 2 station touched on Cairo, and remarked that it is increasingly essential to make use of all allocated frequencies. No. 1 then alleged that "a man cannot afford to spend money on 5-metre gear and then have it idle." But why have it idle? This unfortunately has been the attitude for so long with many people who like to be considered experimenters and not mere microphone artists and card hunters. It is a case of "let George do it." But George can't do it all on his own.

The reason that the 5-metre band has not had the appeal in Australia that other bands now have is that people with these ideas of limitations are mainly talkers and not workers. They never get down to the job properly.

Many have, in all good faith, made attempts in a half-hearted manner, and they are to be commended for at least making some kind of a show. Perhaps recent and pending developments on this band will have the effect of demonstrating that it is after all a very valuable channel, and worth expending a little time and energy on in making up apparatus which will give an entirely different aspect.

Technical Developments.

To touch now on actual technical developments. With valves of types obtainable to-day, it is no problem at all to design and build a transmitter with no more than four, and even three, r.f. stages for crystal control with 56 m.c. output.

If crystal control is considered a stumbling block, there is the ever-useful electron oscillator as a master control. The 6L6G, for instance, can be used very effectively here, using the grid circuit on 28 m.c. and doubling to 56 m.c. in the plate. With an 802 or two 6P6's, capacity-coupled to the oscillator, such an exciter will deliver enough r.f. to drive two valves of the 809 type or 807 type with 50 watts or more input. Such a transmitter is stable enough to be keyed for c.w. telegraphic communication, which is an important aspect in the development of the band just as much as it was in the opening up of 10 metres.

Modulation for speech transmission calls for nothing but conventional practice, and an existing modulator can be used readily. The aerial system is no problem at all if due consideration is given to handbooks and data on directivity and gain.

Recently some illuminating articles have appeared in overseas publications on the design of compact arrays using closely-spaced elements, and in this connection the familiar W8JK bi-directional system lends itself admirably to the ultra-high-frequencies. This type of aerial can readily be erected in a vertical position, and its dimensions are such for 56 m.c. that it is nothing to worry over when high winds prevail. The W8JK scheme of out-of-phase close-spaced elements is now well familiar to most who dabble with 14 m.c. DX, and for a vertically polarised 56 m.c. array, the overall dimensions of a two-section type are only 17 feet long by 2 feet across.

From this it will be seen that one can even make this aerial up on a light bamboo structure and use it on a rotatable foundation, with no bracing to speak of. It can be fed at the bottom end, either with tuned feeders, quarter-wave matching section and spaced non-resonant line, or similar section with EO1 cable. With more than two sections, of course, the angle of radiation will be still lower.

Being a bi-directional system with a fairly broad horizontal angle of radiation, this aerial has obvious advantages as well for purely local communication. Stations can be heard and worked quite well with the main directivity as much as 30 degrees off position.

That it is possibly one of the best systems for possible DX communication was proved by the fact that this type of array was in use at the writer's station, when logged on two occasions by Mr. Morrison, of Wellington, New Zealand, in October last year. Being bi-directional, it needs to be arranged only for 180-degree rotation to cover all points of the compass effectively.

(Continued overleaf.)

A method adopted by the writer may be of interest. The whole array was made up on a bamboo pole 17 feet long. As it is difficult to obtain a bamboo of this length of sufficient uniform thickness, two shorter lengths were used and joined at the centre with a pegged butt joint. Splints of metal strip are fitted for a few inches, and the whole then bound securely with twine, which is afterwards treated with cellulose lacquer as a protection against the ravages of weather.

Two cross-arms are fitted at the ends, 2ft. 2in. in length, and one at the centre to carry the cross-over. Longitudinal with the centre of the array, a strip of timber about 1in. section and 4ft. long, is bolted to the long bamboo. This strip carries two hinge-bolts. To the aerial pole halyard is lashed a similar strip of timber with two sockets spaced to correspond with the hinge-bolts on the array. All that is necessary is to drop the bolts into the sockets, and to haul the array to the top of the pole, after fastening two light ropes to the ends of the centre cross-arm for rotational purposes.

Provides Light But Strong Array.

Such an array, being light, is no strain on the pole or halyard. To keep it vertical, of course, a continuous halyard is used, and with the array at the top of the pole, the two lengths of halyard comprising the dangling loop are pulled tightly around the anchor fixture at the base of the pole. By this means, a highly efficient 56 m.c. directional array can be hauled up to the highest pole the experimenter possesses, and there is no expense and engineering necessary in the way of a complicated rotary arrangement. If the two ropes are conveniently placed in relation to the operating room, they can be fed through tubes with guiding pulleys, and directivity simply controlled by handling the ropes inside the room.

The W8JK is only one of the several close-spaced arrangements possible. The question may be raised of vertical versus horizontal polarisation in relation to possible long-distance results. Opinions have always differed on this subject, but the recent 56 m.c. |DX communication in U.S.A. shows that there is little if anything to choose between the two. It was noticed at many stations that a DX signal might appear strongly on a receiver with a vertical aerial, and to be fading heavily when a change was made to a horizontal system. A few minutes later, with the same apparatus and same signals, the reverse would be the case, the signal predominating on the horizontal and fading heavily on the vertical. Apparently under the ionosphere conditions responsible| for the communication rapid changes occur in polarisation.

Furthermore, it was noticed that in many cases, well-designed directive aerial systems, when used to listen to DX stations, displayed the unexpected symptom of showing a complete disregard of directivity. Swinging the arrays around made little difference in the strength of the signal. It was discovered that signals appeared to be arriving at locations at one moment from all directions at once, and then the apparent direction would suddenly change to a defined and unexpectedly different path to the one towards the transmitting station.

This effect was noticed in commercial investigations of the 7-metre television transmissions from London across the Atlantic a few months ago. With the object of getting the best possible signal from London, rhombic arrays were erected with horizontal polarisation aimed on London. It was found that the signal changed direction frequently, and also that at times a simple vertical dipole gave equally good results.

ROUND THE SHACKS

Amateur operators desirous of having their transmitters and activities featured under this heading are requested to forward details to "Reporter," C/- "Radio World," 214 George St., Sydney. Articles should be similar in style to those already appearing in the series, and should, where possible, be accompanied with photographs of operator and transmitter.

Still Plenty To Learn.

From these findings it will be seen that there is a great deal that is yet unknown about the propagation and reception of long-distance reflected ultra-short-waves. From this, the dubious experimenter can take heart. He is just as likely to get unexpected DX results on 5 metres with almost any kind of aerial system, provided he has a good receiver and transmitter.

The most interesting instance of this possibility was demonstrated on March 13 this year, when A. M. Phillips (VK5ZU), of Prospect, South Australia, was logged in Dunedin, New Zealand, by ZL4DQ. VK5ZU used only 18 watts input to his final stage, and the aerial was a simple twisted pair vertical doublet. But the transmission and reception apparatus was of the kind to make for such results. The transmitter is crystal-controlled and the New Zealander's receiver is a |specially-designed 56 m.c. superhet. Transmission was C.W. telegraphy, and the signal was received at R5-6. ZL4DQ has a high-power crystal-controlled 56 M.C. transmitter, and naturally called VK5ZU frantically.

It seems certain that there would have been every chance of a two-way contact, but for the fact that at that time VK5ZU was using one of the early resistance-coupled i.f. types of superhet, and consequently was not equipped to copy weak C.W. signals.

Aerial Used By 4DQ Was 40-Metre Zepp.

The aerial at ZL4DQ was nothing more or less than a 40-metre zepp, and in the writer's opinion the vertical portion of this aerial—that is the feeder lines—were doing the pick-up of VK5ZU's signals. This is a matter of opinion, and there is no reason why conventional lower-frequency aerials should not be tried out for possible long-distance results in view of the recent findings in U.S.A.

An interesting feature of this communication of March 13 last is that on that day the writer received a telephone message from VK2GU in Canberra, passing on information that skip was extremely short on 28 m.c. and that Mt. Stromlo had reported very favourable conditions for u.h.f. DX. At VK2GU's suggestion, VK2NO went on the air in the early afternoon, in an attempt to get through to Victoria, using a vertical array of two half-waves in phase and 150 watts input on C.W. Nothing happened and nothing was heard, and it subsequently transpired that VK5ZU and VK2NO were both transmitting at the same times. Possibly in this case the directive array turned out to be a disadvantage as it was "end-on" to New Zealand during this period.

The reason why VK5ZU came to be on 56 m.c. c.w. at the favourable period is worthy of note and illustrative of how amateur can co-operate at times. Another VK5, who lives two miles from VK5ZU, was working ZL3JA on 28 m.c. The New Zealander told him that several signals on weak 'phone, which were obviously Americans, had that |morning been heard on 5 metres at his location. The VK5, knowing that 5ZU would probably like to know something of these conditions, got out his push-bike and pedalled around to Phillips' shack.

The result was that VK5ZU went on the air, doubling in his 28 m.c. final to 56 m.c., and the Dunedin station picked him up. There was no pre-arranged schedule with New Zealand. One imagines that both listener Morrison and ZL4DQ experienced one of the real thrills of radio experimentation at hearing 5-metre signals from Australians clear across the Tasman. It has previously been a pipe dream, but now it has been shown that it is quite possible.

(To be continued next month.)

A.O.C.P. Questions & Answers

The questions set for an A.O.C.P. examination for last November, together with model answers, are published in the article below—the fifth of a series specially written for "Radio World" by . . . .

H. WHEELER (VK5HW)

Questions And Answers, A.O.C.P. Examination, November, 1937.

1. Explain briefly, with the aid of diagrams, the principle of heterodyne reception.

A.: The purpose of heterodyne reception is to render audible c.w. telegraph signals which would otherwise appear in the output as a series of clicks, which is what occurs with a non-regenerative detector or in a receiver with local oscillator tuned to zero beat.

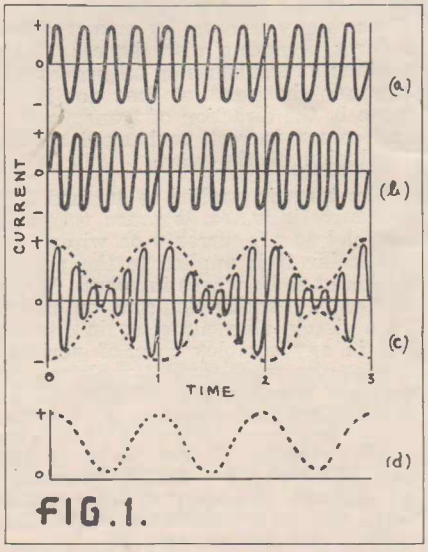


Figure 1, which illustrates the production of beats. (a) First frequency of four cycles, (b) second frequency of five cycles, (c) combined frequencies, 5 — 4 = 1 beat in each time interval, (d) audible beat note after detection.

The system requires the generation of local oscillations either from a separate oscillator, or from an autodyne detector, at a frequency differing slightly from the signal frequency. The two frequencies are combined in the detector circuit.

Fig. 1 illustrates two r.f. currents not of the same frequency, and the form of the resulting current when these two are combined. Current amplitude is plotted along the vertical axes, and time along the horizontal. For the sake of simplicity the first current is shown at a frequency of four cycles in unit time, and the second at five cycles. The third curve is the resultant obtained by taking various points along the time axis and adding together the two corresponding values of current at each.

Inspection of this third curve reveals a regular rise and fall, outlined by the dotted line, at a new frequency. This is the beat or heterodyne frequency which always appears in the output when two dissimilar frequencies are superimposed, and is equal to the difference in frequency of the two original components.

In the heterodyne reception of c.w. the local is tuned, say, half a kilocycle away from the signal frequency. Then a beat frequency of 500 cycles is generated, and after rectification becomes the audio frequency. In autodyne reception the regenerative detector itself is made to supply the heterodyning frequency by working it at oscillation point and mistuning slightly. Then provided that the local oscillations are not pulled, the audible beat frequency in the detector output will be equal to the amount by which the detector circuit is out of step with the signal frequency.

Fig. 2 is a simple circuit showing a Hartley oscillator inductively coupled to the tuning circuit of a non-regenerative detector for the purpose of heterodyning the incoming signal. For self-heterodyne or autodyne reception any regenerative detector circuit would suffice.

2. Explain briefly the construction and principle of operation of two different tvpes of direct current measuring instruments.

A.: There are two types of instrument for measuring direct current, depending on the magnetic effect of the current.

(a) The moving-coil meter has a coil of fine wire wound on a former which is mounted on bearings so that it is able to rotate about a fixed iron core in a strong magnetic field. The field is provided by a permanent magnet whose pole-pieces almost completely enclose the coil. Attached to the former is a pointer which moves over a graduated scale.

The coil is maintained at rest in zero position by a spiral spring. Current flowing through the coil sets up a magnetic field which interacts with the field of the permanent magnet causing the coil to turn. The pointer comes to rest at a position on the scale where the restraining force of the spring just balances the twisting force due to the magnetic field of the coil, which is proportional to the current flowing. The scale is uniformly graduated in this type of instrument.

(b) In one type of moving-iron meter the current-carrying coil is fixed in position, and there is no permanent magnet. The pointer is attached to a disc of soft iron capable of rotation against a spring, but set up unsymmetrically on its pivot in such a way that the larger part of the iron can swing into the interior of the coil. The magnetic field of the coil due to the current flow attracts the iron towards the coil, causing the

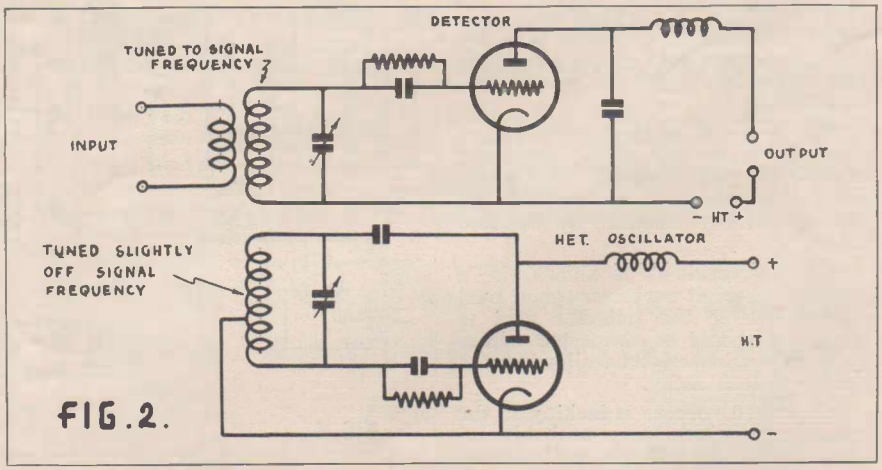


Figure 2.—This swetch shows an elementary circuit for heterodyne reception.

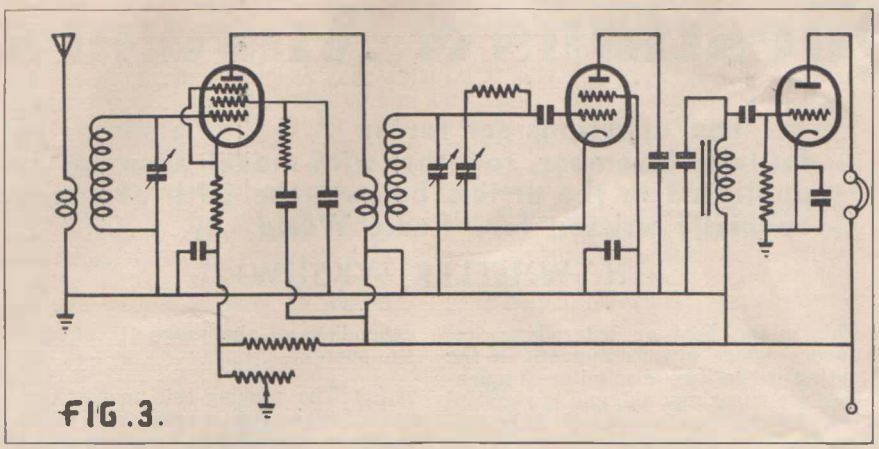


Figure 3.—The circuit referred to in question 4, which asks candidates to name at least five errors in it and to describe what the effect would be if each error existed singly in a receiver.

pointer to move. The scale in this instrument is not uniform, but is graduated according to the square law.

3. Compute the total capacity of three condensers of 2 mfd., 4mfd., and 6 mfd., respectively, when connected —(a) in parallel, (b) in series.

A.: The answer to this popular question was published in the February issue, p. 36 (8).

4. Name at least five errors in the following receiver circuit drawing, and describe what the effect would be if each fault existed singly on a receiver wired to conform with the drawing (see fig. 3):

A.: (i) The cathode by-pass condenser on the r.f. stage is incorrectly connected. The condenser should be connected between the upper end of the resistor and earth. As shown in the diagram, there is no easy path for the r.f. currents back to the cathode. The inclusion of a high impedance in the cathode circuit may cause the valve to oscillate at high frequencies.

(ii) A condenser is shown in series with the screen grid of the r.f. stage. This would not allow d.c. screen current to flow.

(iii) A direct connection is shown from the lower end of the plate coil of the r.f. stage to earth. This would short-circuit the plate voltage. A by-pass condenser should be inserted here.

(iv) The gridleak is shown in a position where it serves no good purpose, allowing the detector grid to block. It should be connected across the grid condenser, thus allowing the charge to leak away.

(v) Screen voltage is lacking in the detector circuit. It is probably intended that the screen grid should be connected not to earth, but through a series resistor to the H.T. positive.

(vi) There is no plate voltage on the detector owing to the omission of the customary r.f. choke between the two by-pass condensers in the plate circuit.

Incidentally, the detector is not regenerative. This can be remedied by tapping the cathode a short distance up the tuning coil, and controlling regeneration by varying the screen voltage.

(vii) Plate voltage is short-circuited a second time by a connection from the lower end of the a.f. choke to earth.

(viii) Grid bias is missing from the audio amplifier. Under these conditions the valve is not being operated at the correct point for Class "A" amplification, and the plate current would be very high. The bias resistor should be placed in parallel with the by-pass condenser in the cathode circuit.

(ix) The H.T. connection at the right should be marked positive. The negative connection which is omitted in the diagram should be earthed.

5. Draw a full schematic circuit diagram of a three stage crystal-controlled c.w. transmitter with power supply derived from the 230 volt a.c. mains supply. Include a suitable "feed-back" mains filter and a "key-impact" filter.

A.: See Fig. 4.

6. Discuss "wave motion," explaining, with the aid of sketches, the relationship between velocity, frequency, wavelength and amplitude.

A.: Wave motion is a term used to describe the transmission of energy through any medium by means of regularly occurring disturbances. The medium of transmission undergoes oscillatory changes, but does not itself move in the direction of transmission, and comes to rest unchanged at the conclusion of the wave.

The term is applied to surface disturbances in water, to sound waves in air, and to r.f. currents on wires. In particular it is applied to the propagation of radio waves in space. Wave motion is usually depicted on paper as a simple sine curve, as in Fig. 5, but in any complex case of periodic motion the wave-form can always be resolved into a series of sine curves in harmonic relationship.

The **velocity** of the wave is the rate at which the energy is propagated through the ether. Radio waves have the same velocity as light, 300 million meters per second.

The **frequency** is defined as the number of cycles, or wave peaks, passing a given point in one second.

The **wavelength** is the distance between corresponding points on adjacent waves, for instance, between two peaks.

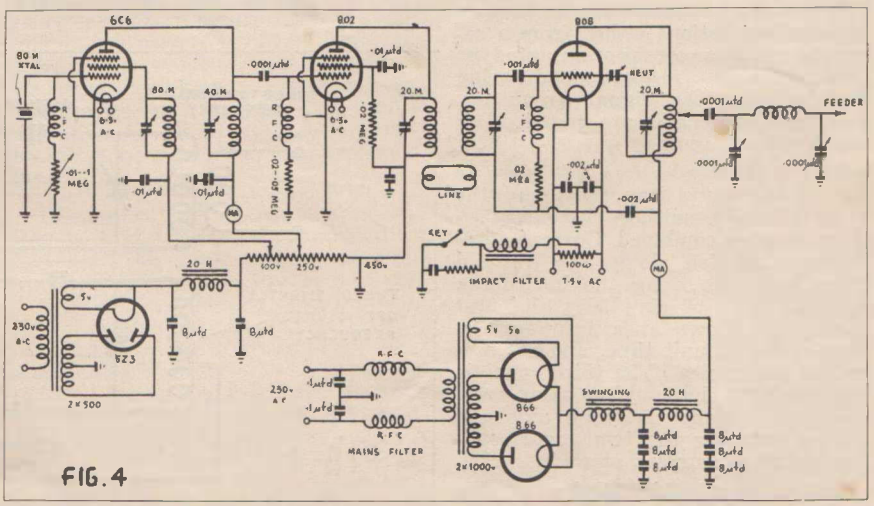


Figure 4.—This circuit of a three-stage crystal controlled c.w. transmitter with power supply provides the answer to question 5.

If the number of peaks per second, and the distance between the peaks in meters are known, the product of the two will give the velocity in meters per second. The relationship of these three quantities therefore is: Velocity = Frequency × Wavelength. Fixing velocity at 300 million metres per second, the relationship between the other two is

$$w = \frac{3 \times 10^8}{f}$$

where w is the wavelength in metres, and f is the frequency in cycles per second, or

$$w = \frac{300{,}000}{f}$$

when f is given in kilocycles.

Amplitude expresses the intensity or strength of the wave. In the figure

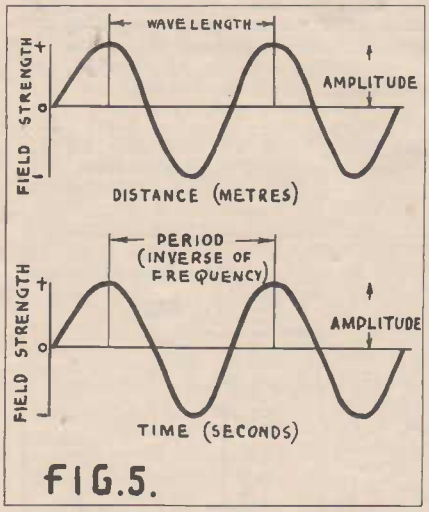


Figure 3.—The top curve represents a wave in space at a given instant, while that below represents a wave in space at a fixed position.

it is represented by the maximum departure of the curve from the zero line. It can be measured in peak amperes in the case of an r.f. current, or as field strength in millivolts per metre in the case of a radio wave.

7. A battery of 3 volts e.m.f. and having an internal resistance of one ohm is connected across three resistances of 4, 5 and 20 ohms joined in parallel. What is the total current taken from the battery, and the current flowing through each resistance?

A.: The joint resistance of 4, 5 and 20 ohms in parallel is

$$\frac{1}{\frac{1}{4} + \frac{1}{5} + \frac{1}{20}} = 2 \text{ ohms}$$

Add to this the internal resistance of the battery to obtain the total circuit resistance of 3 ohms. The e.m.f. of 3 volts sends a current of 1 ampere through the resistance; this is the total current taken from the battery.

The voltage drop due to internal resistance of the battery when de-

(Continued on page 31.)

High Fidelity Reception Of Local Stations

In the article below are given full details of a de luxe nine-valve t.r.f. receiver designed to give high fidelity reception from local stations . . . .

by K. A. UPTON

AS this set is an attempt to obtain fidelity reproduction, the power ratings of all components used and specified in the circuit diagram are in the interests of absolutely silent running and trouble-free service, more than are actually required. Very generous filtering has been provided in set and power supplies to ensure absolutely hum-free reproduction, as any hum will be very apparent with any good "fidelity" type of speaker. It is most advisable to adopt a form of assembly with the set which will result in a minimum of capacity to earth in all parts of the circuit carrying high frequencies, such as grids and plates and their associated leads. For the same reason, avoid as much as possible any shielding of any h.f. leads.

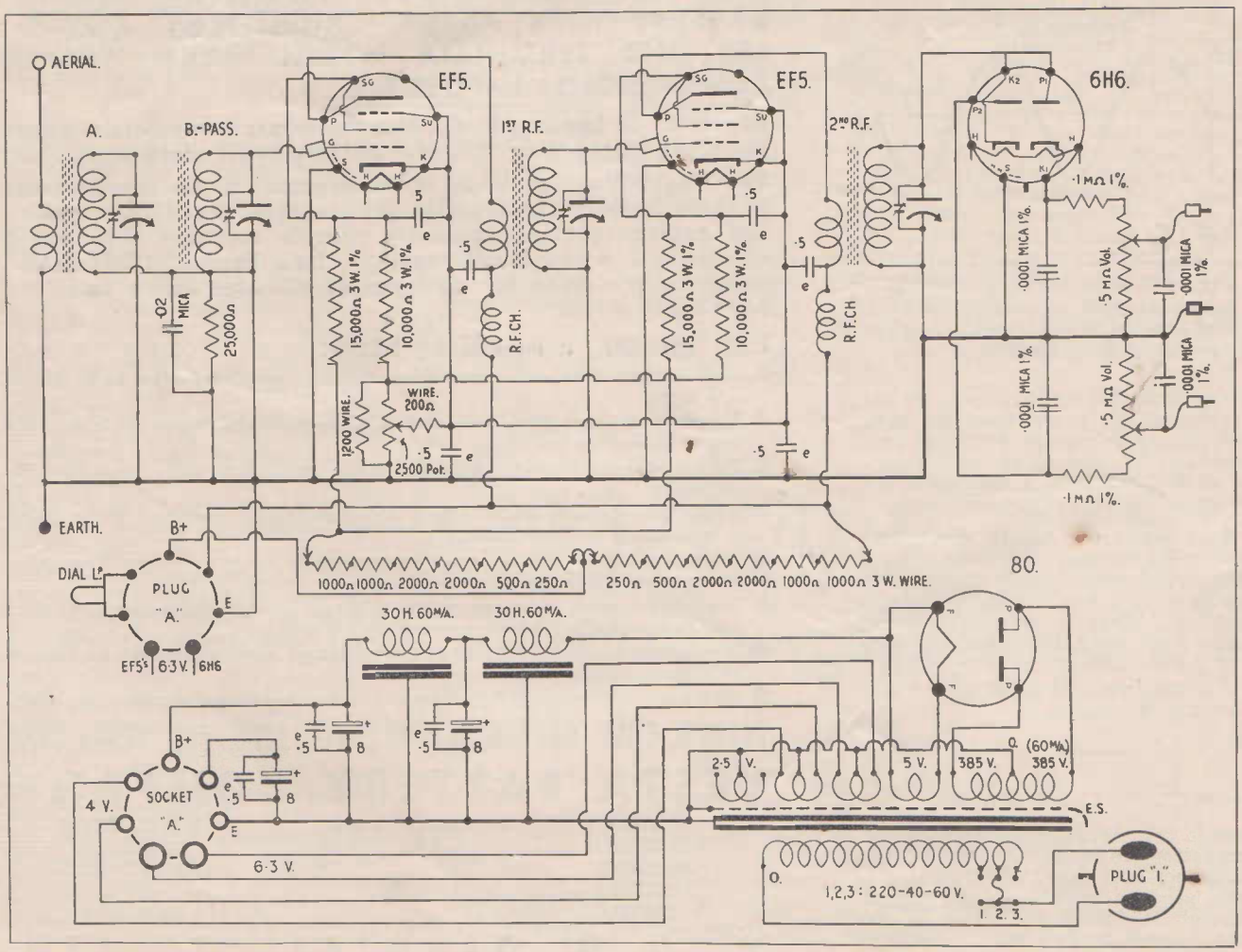
The higher the fidelity of any set the more readily reproduced is any noise inherent in it, so any care paid to the assembly is well repaid by clearer and cleaner reception.

THE CIRCUIT.

This is a seven-valve set (excluding power rectification) comprising two stages of radio frequency amplification and band-pass coupling with screen-grid feeds having heavy bleed-currents to ensure constant but easily adjusted screen-grid voltages, detector giving push-pull output, and audio amplifier consisting of push-pull screen-grid driving stage feeding push-pull triodes giving an undistorted output of 7-8 watts.

Circuit Diagram.—The writer has drawn the circuit diagram in a manner to enable the constructor to see at a glance the way to wire up all valve sockets as they actually appear when he is wiring up the job from underneath the chassis, and to present all essential data in as precise and concise a manner as possible.

Construction.—This has been carried out, in the writer's case, on the "Four-Unit" plan to give utmost flexibility. It enables one to use the



"tuner" with a different "amplifier" (or vice-versa), a different "tuner" with the same "amplifier"; having separate "power-supplies" the voltage distribution of one unit cannot upset or be upset by the other. It does, of course, necessitate the use of two sets of power equipment, but each power transformer does not have to be as big as it would be if only one were used to supply both units, so the cost should not be so very much more.

However, if the constructor prefers he can use only the one power chassis, but he will have to make alterations in the set to suit. The circuit diagram shows all power equipment as used in the original set. The four units comprise four chassis carrying 1, the tuner; 2, the amplifier; 3, tuner power supply; and 4, amplifier power supply. Both tuner and amplifier are connected to their own power chassis by heavy leads 6 feet long with Amphenol plugs and sockets.

TUNING UNIT.

The Tuning Condenser Gang.—The one used was an old but excellently-constructed "Radiophone" (English) .0005 mfd. four-gang, with split end-plates for matching of circuits. Actually it is of too high a capacity for the coils used with it (2SM at 10 degrees, 2FC at 65 degrees). Still, as this set was designed only as a "local station receiver" and they all come in, it is of small matter. If four-gang condensers are unobtainable, three gangs can be used, but the band-pass stage will have to be cut out with a reduction in selectivity and an increase in sensitivity.

Tuning Coils.—These are all Sirufer iron dust cores of the cross type and should be easily obtainable ready-wound with litz wire. The excellent selectivity for t.r.f. obtained is attributable to the use of these coils. They incorporate a trimming screw in each core and enable matching of the stages by very carefully loosening the dope with which they are locked in adjustment at the factory. This should only be attempted if the circuits are badly out of line through differences of capacity in set wiring not permitting correct alignment of all tuning circuits.

The coil set comprises a high-gain aerial coupling coil for use with band-pass (or a high impedance capacity coupled aerial coil if band-pass is omitted), band-pass tuning coil and two r.f. coupling coils. These coils were mounted in coil cans of 2½" diameter by cutting the cans in two, thus enabling the coils to be wired in circuit, etc., the top portion forming a lid, easily removable, the bottom plunger being attached to the middle of the can on which the coils were mounted on their insulated strip bases. The cores must not be connected to ground.

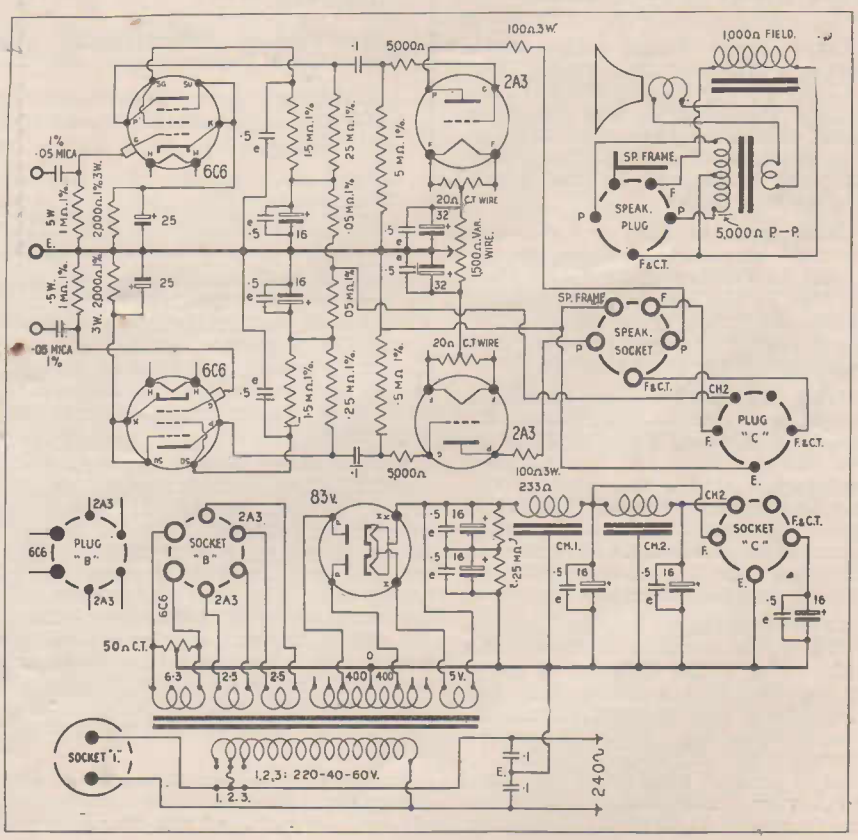
Fixed Condensers.—The non-inductive mica condensers (T.C.C.) are shown in the circuit as 1%, meaning that they are bought matched to each other to within 1% of their value(or as near 1% as possible). This is a little dearer, but most advisable, as it means the two sides of the diode detector remain matched.

The same remarks apply to the resistors marked 1%. The .5 mfd. condensers are non-inductive Chanex tubulars of as high a voltage rating as obtainable. Where shunted across electrolytic condensers they are to reduce the reactance of the "electros," which is rather high at radio frequencies. The signs "e" in the circuit indicate the shielded ends of the tubular condensers which should be earthed. The circuit shows where these shielded ends should go in the wiring.

Screen-Supply And Voltage-Resistor Network.—The screen supply network has been designed on the old lines used years ago to ensure as constant a screen-grid potential as possible relative to the cathodes of the valves, and the constants shown have been worked out to give a heavy bleed-current to ensure that constancy. The voltage resistor network consists of 3-watt wire-wound resistors (to make certain of cool running) mounted on a resistor strip under the tuner chassis. The 10,000 and 15,000 ohm resistors are "I.R.C." metallised.

Detector.—This is (as shown) a modification of the Twin-Diode Full-Wave Balanced Detector" by Orval La France, and published in the "Radio World" of U.S.A. This detector gives a push-pull output without any centre-tapped tuning coil secondary, enabling push-pull operation from the detector input onwards. The detector also is a voltage doubler, yielding approximately twice the output value of that fed into it. Having to split this doubled voltage for push-pull audio amplifier operation means that half this output voltage is applied to each side of the amplifier, resulting in the same gain as a single-sided amplifier. An ordinary detector used with the common systems of phase-inversion would only give half the input voltage to the phase-inverter.

The modification was made by the writer in an endeavour to equalise the D.C. and A.C. loads. The original circuit as published by "Radio World" (U.S.A.) gives a degree of automatic volume expansion which adds much to the greater realism of the reproduction, orchestral music especially. It will also handle up to 100% modulated signals, it is claimed. One disad-



On the left is given the circuit of the tuner portion, while that of the 7-watt amplifier is shown on the right. Separate power supplies are used for each.

vantage it seems to have is that it reproduces the louder stations louder, and the weaker stations with lesser strength.

This characteristic really makes the inclusion of automatic volume control most desirable, but it was purposely omitted because of the tendency of A.V.C. to introduce distortion, which would negative the employment of t.r.f. amplification which was employed to get good quality in an easy way.

However, it seems the best detector system heard so far, and gives a realism and quality very pleasing. If the constructor desires to try the original detector system instead of the modification shown, it is only necessary to short out with a piece of wire the two .1 meg. resistors between cathode No. 1 and .5 meg. volume control, and plate No. 2 and .5 meg. volume control. (Also, disconnecting both .0001 mfd. mica by-pass condensers which are across both volume controls—but wire the detector up and see for yourself which idea suits your own ear.)

The extra two .0001 mfd. mica condensers across the volume controls seem to cut the "highs" a little; try disconnecting them, and see if you like it any better. The two .1 meg. 1% resistors are ½-watt insulated "I.R.C." The modification certainly cuts down the volume a lot, but there is such a lot of it that a fair bit can be spared, at least if a modern high-efficiency high fidelity speaker is used.

Tuner Power Supply.—The transformer, a universal type giving 385v. C.T., 60 m.a., and 2.5v., 4v., 6.3v., 5v. rectifier was used, as they are more easily obtainable than the 250-volt type, which is out of date. The excess 135 volts is dropped by the 3-watt wire-resistor bank.

Choke input to filter is used with the "80" rectifier to reduce voltage further at the low drain taken from the "80." The tuner power supply takes the 240 a.c. from the amplifier power supply through the plug and socket as shown on the circuit.

Radio Frequency Volume Control.—This is to enable a setting to be obtained for a fairly "hefty" signal to feed the detector for distortionless reproduction at low and medium volume levels, and if more volume is needed when the audio volume control is turned to maximum. It is marked "2500 pot." on the circuit, and is a Marquis tapered control.

Audio Frequency Volume Control.—This is the weakest link in the chain, owing to the difficulty of ganging together two potentiometers and of matching and keeping them both in step regarding their resistance values. The a.f. volume control as fitted at present consists of two Yaxley .5 meg. composition potentiometers ganged together by fitting the spindle of one into the rotating arm of the other in tandem fashion, with a home-made insulating bushing. It works very well with this make of resistor, or did, till too much strain was put on the pots. by bending the spindles out of alignment when using a flexible coupling to bring the control out through the front of the chassis. Then noise developed, and it is here that least noise can be tolerated, as it receives the full amplification of the audio amplifier.

Later some scheme of fixed resistors (matched) varied in steps with switching, may be tried. But in the absence of dual pots. on the market, do your best with the problem, as an A.F. volume control is really necessary. For minimum detector distortion, r.f. gain should be kept up as far as possible, which means that audio gain will generally have to be kept down.

Official Shortwave Observers.

N.S.W.: V. D. Kemmis, "Brampton Hall," 49 Kurraba Road, Neutral Bay, Sydney; A. R. Payten, High Street, Coff's Harbour.

South Australia: A. E. Bruce, C/- 54 Currie Street, Adelaide; Joseph C. Linehan, 181 South Terrace, Adelaide.

Queensland: Ern Neill, 26 Canning Street, Nth. Ipswich; J. K. Sorensen, "Fairholme," Station Road, Gympie.

West Australia: G. O. La Roche, 62 Gladstone Avenue, South Perth.

New Zealand: Robert Russell, Taupo Road, Taumarunui.

Tasmania: Henry Alexandra Callander, 1 Franklin Street, West Hobart.

Victoria: James Ferrier, "Winninburn," Coleraine.

Sockets And Plugs.—All plugs and sockets excepting 240v. a.c. mains are Amphenol, and are an excellent job for the purpose. They are shown in the circuit exactly as used in the set, and seen as fitted to chassis for wiring up. The 240v. a.c. power is connected up by the ordinary electrical type of bayonet adaptor and lamp holder type of fitting. The tuner is connected to the amplifier with banana plugs and sockets, using hook-up wire, as also are the aerial and earth.

Earth Wire.—This is a No. 16 gauge tinned copper wire earthed to "Earth" terminal of set on all four chassis, to which all points of circuit to be earthed are soldered. It helps to retain stability.

AMPLIFIER UNIT.

Circuit.—This is a modification of the A.W. Valve Co.'s "Push-Pu Seven-Watt Fidelity Amplifier." This modification consists of the deletion of the phase-inverter (not needed, as invertion is supplied by the detector employed), the substitution of push-pull screen-grid driver valves for single s.g. driver, and separate heater windings for each output triode with adjustable bias-resistor for matching each triode. Both screen grids are matched to each other, as are the triodes. The A.W. Valve Co. will sell them matched, if requested. As a prevention of audio oscillation, stopping resistors have been fitted in grid and plate leads of both output valves.

Driver Valves.—Fitted with valve shields.

Fixed Condensers.—Remarks apply as in the tuner section.

Filament Leads.—All are six feet long from power supply to amplifier. Driver stage, separate leads to each s.g. valve; output stage, power flex, separate leads to each triode as filament current is 2½ amps. These heavy leads make filament voltage drop negligible.

Output Bias Resistor.—This is a special I.R.C. power resistor of 1500 ohms to carry 120 m.a. It has only to carry approx. 60 m.a. each leg, but is designed to carry 120 m.a. to ensure cool running, and for the same reason is mounted on the outside of the amplifier chassis in free air. It is a specially-coated heavy wire-wound adjustable type. To adjust the bias: Insert a milliammeter in each 2A3 plate circuit in turn, and move slider (which is earthed), till both valves show exactly the same plate current on the meter. This may be done on no signal, or with a constant audio voltage applied to the amplifier. When properly set, the needle should show no variation and remain perfectly steady when set is operating.

Speaker.—A high fidelity type should be used, capable of handling heavy volume with no distortion if the set is to be extended. The design allows a full 14 watts for field excitation, and possibly more. The input transformer should give a loading of 5000 ohms plate to plate. The frame of speaker is earthed as indicated on circuit diagram.

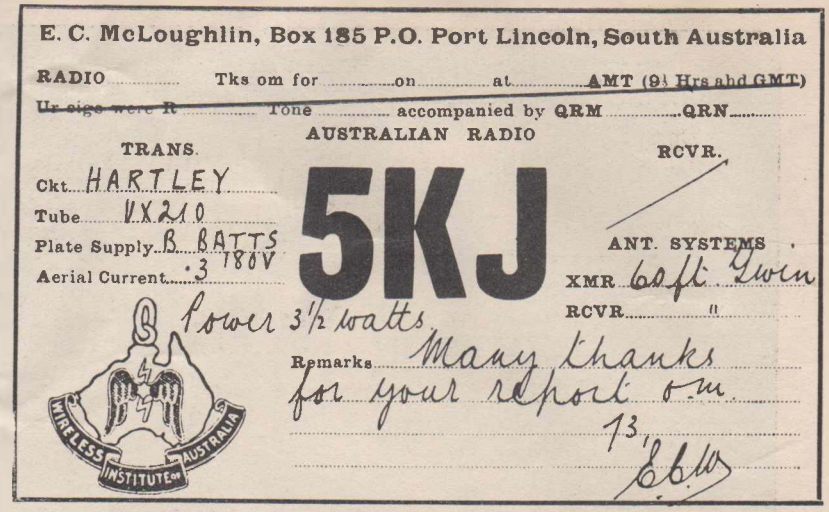
Baffle.—The better the baffle, the better the tone. The writer used a piece of ½" celotex 4ft. x 4ft. for experiments, and as yet has not used anything else. The "Infinite Baffle" ("Australasian Radio World," April, 1938, p. 20), should be ideal and most acceptable in any lounge-room, and will be tried out as soon as possible.

(Continued on page 31.)

Radio Reminis-censes

Some experiences in the early days of radio in South Australia are related in the article below by . . . .

H. H. YOUNG



A card received by the author from 5KJ, Port Lincoln—one of the handful of enthusiasts who pioneered amateur radio in South Australia.

South Australia had no broadcasting service in 1923. The first commercial station to be established was 5DN, the licence being granted in 1924. Station 2FC Sydney was the only interstate station to be heard, and even this station was considered a great DX catch.

2FC Heard On Crystal Set.

I well remember an item in the press in 1924 stating that a listener had heard the Sydney broadcast programme quite plainly on his looselv-coupled crystal set, with two stages of audio frequency. He had even heard the Sydney town clock striking! How we envied him. At the same time, even now one cannot regularly hear interstate programmes in daylight.

Morse signals from Port Adelaide and various ship stations were all that could be heard for a time on the average crystal set, and it was a real thrill then to hear these signals.

Amateur radio was conducted on a wavelength around 180 metres; the most active stations being 5BN (H. L. Austin) and 5BG (H. Kauper) As far as I remember, there were no more than six amateurs operating in 1924. Records comprised the greater part of the programmes, and I had many request numbers played for me on Friday nights by these amateurs.

Receivers used were crystal sets, sometimes with the addition of one or two valves (if funds permitted) as amplifiers. Tuning was achieved either by means of loose couplers or by tapping the coils.

Tapped Coil Wound On Cocoa Tin.

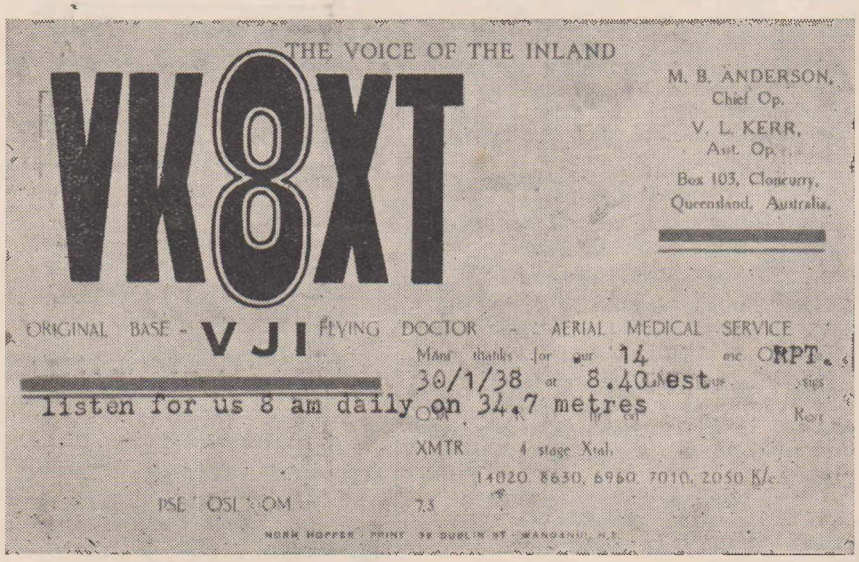
My set consisted of a tapped coil wound on a cardboard former (cocoa packet). Contact studs were galvanised iron nails, and switches were made from the two halves of a cotton reel, with a piece of tin attached to make the contact. An excellent crystal was found to be a piece of silver lead or (galena) obtained in the hills.

Cage and twin aerials were considered the most effective, but as a licence—costing 30/-—was required even then, many aerials consisted of a single wire and were only raised at night. An adaptor plugged into the house lighting system was also a favourite antenna.

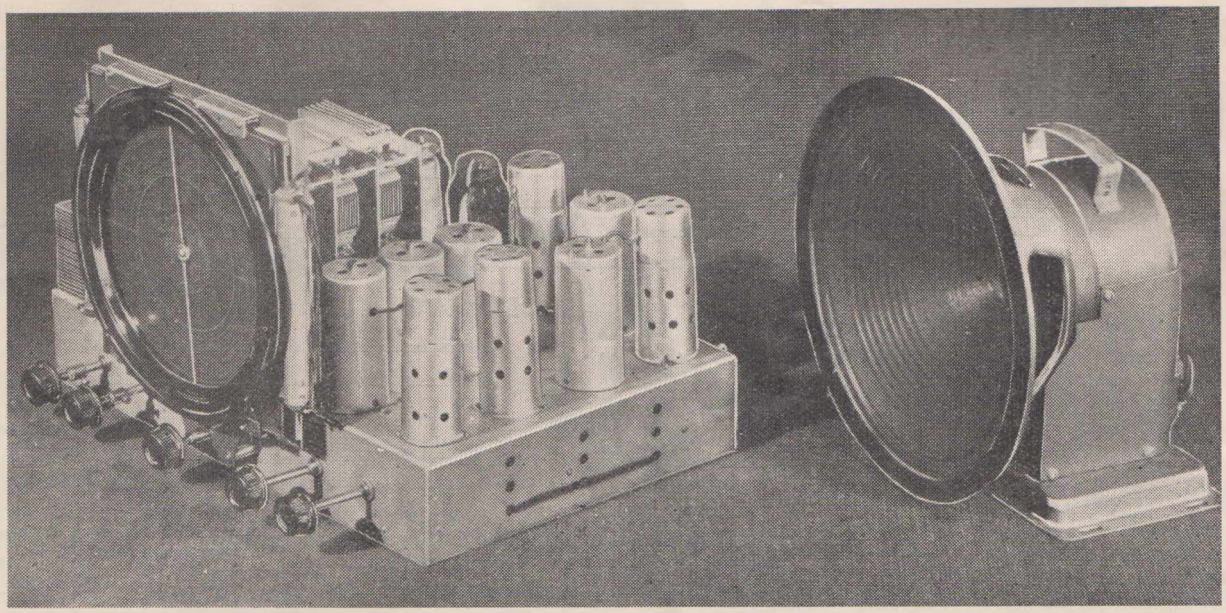
One could not send out many reports on amateur transmissions, for when the verification came back (on a postcard) the authorities had definite proof that you were operating a radio without a license. A letter to this effect would soon follow the verification, and many radio enthusiasts had to dismantle their sets or pay the fee.

Our first "A" class station was 5AB, later changed to 5CL, situated at North Terrace. Later 5KA came on the air. More amateurs were to be heard, among them being 5DR, Seacliff, 5KC and 5GA, Kangaroo Island, 5KJ, Port Lincoln, 5BY, 5HP and 5WS.

Then, as now, the amateurs did great pioneering work, and although radio has advanced rapidly since, they did a great job and for a time supplied the only broadcast service in South Australia.—H. H. Young (AW-333DX), Angaston, S.A.



A card from one of the comparatively rare VK8's—this one was received by Shortwave Observer Ern. Neill (AW64DX) from VK8XT, the station operated by the aerial medical service base at Cloncurry, Queensland.



The . . 1938 De Luxe Fidelity Eight

Assembly And Alignment Details

THE assembly and wiring of the "1938 De Luxe Fidelity Eight" was covered briefly in last month's issue, enough information being given to enable experienced set-builders to complete the receiver. For those with less experience, a diagram has been prepared showing the complete under-chassis wiring, with a separate sketch showing connections to the coil unit. For the convenience of builders, the circuit diagram is re-published above the wiring diagram, so that reference can easily be made to both.

For the sake of clarity, various points on the wiring diagram that should be joined together have been numbered. Thus, the red lead from the second i.f. transformer, numbered 1, joins to a point also numbered 1 on the diagram; "2" joins to "2," and so on.

Letters of the alphabet are used for connections to the coil unit, except where the leads are identified by abbreviations, such as "r.f. pri.," etc. As in the wiring diagram, the sketch of the coil unit has been prepared looking at it from the front of the chassis, with the three sections of the switch folded forward.

Aligning The "Fidelity Eight."

For best results the "Fidelity Eight" should be aligned using a calibrated service oscillator. With the latter adjusted to 1400 k.c., set the broadcast oscillator trimmer a turn or so out, and then adjust the r.f. and aerial broadcast trimmers for best results.

Next, swing over to the other end of the band, to a frequency approximating 580 k.c. Now adjust the padder and tuning dial simultaneously until a setting is found for the former which gives greatest output. A weak signal should be used, so that the a.v.c. will not spoil the adjustments.

If the shortwave trimmers are aligned in a similar manner on about 25 metres, tracking should hold consistently right across the band.

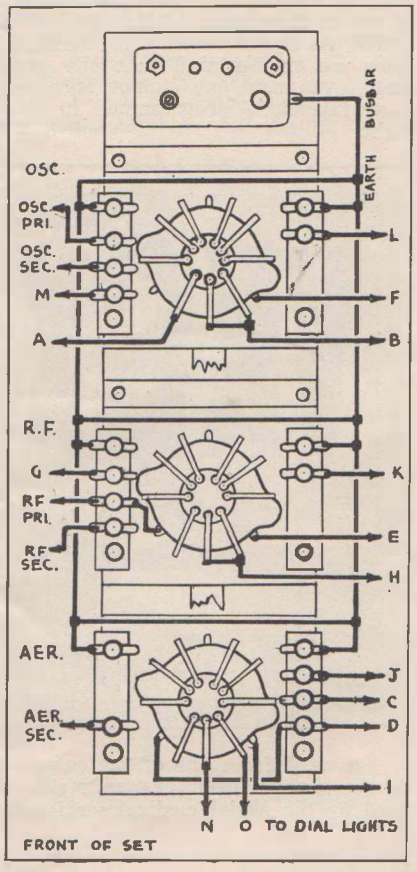
An Outspoken Performer.

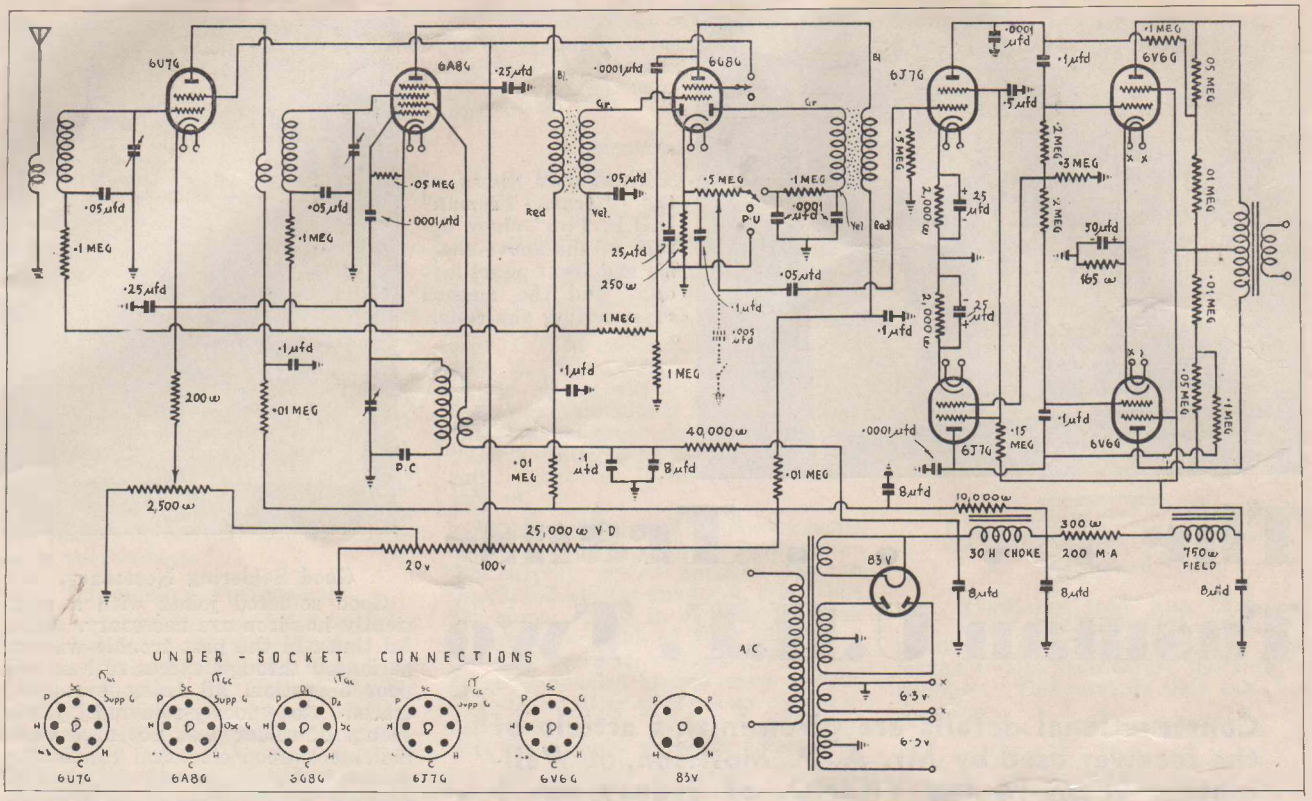
The "Fidelity Eight" will be found very simple to handle, despite the enormous reserve of sensitivity. For local work the r.f. gain control should be turned back slightly—not too much, but just sufficient to eliminate excessive inter-station noise. The tone control should not be brought into action except on distant stations, when its use will cut out a considerable amount of mush.

(Circuit and wiring diagram appear opposite)

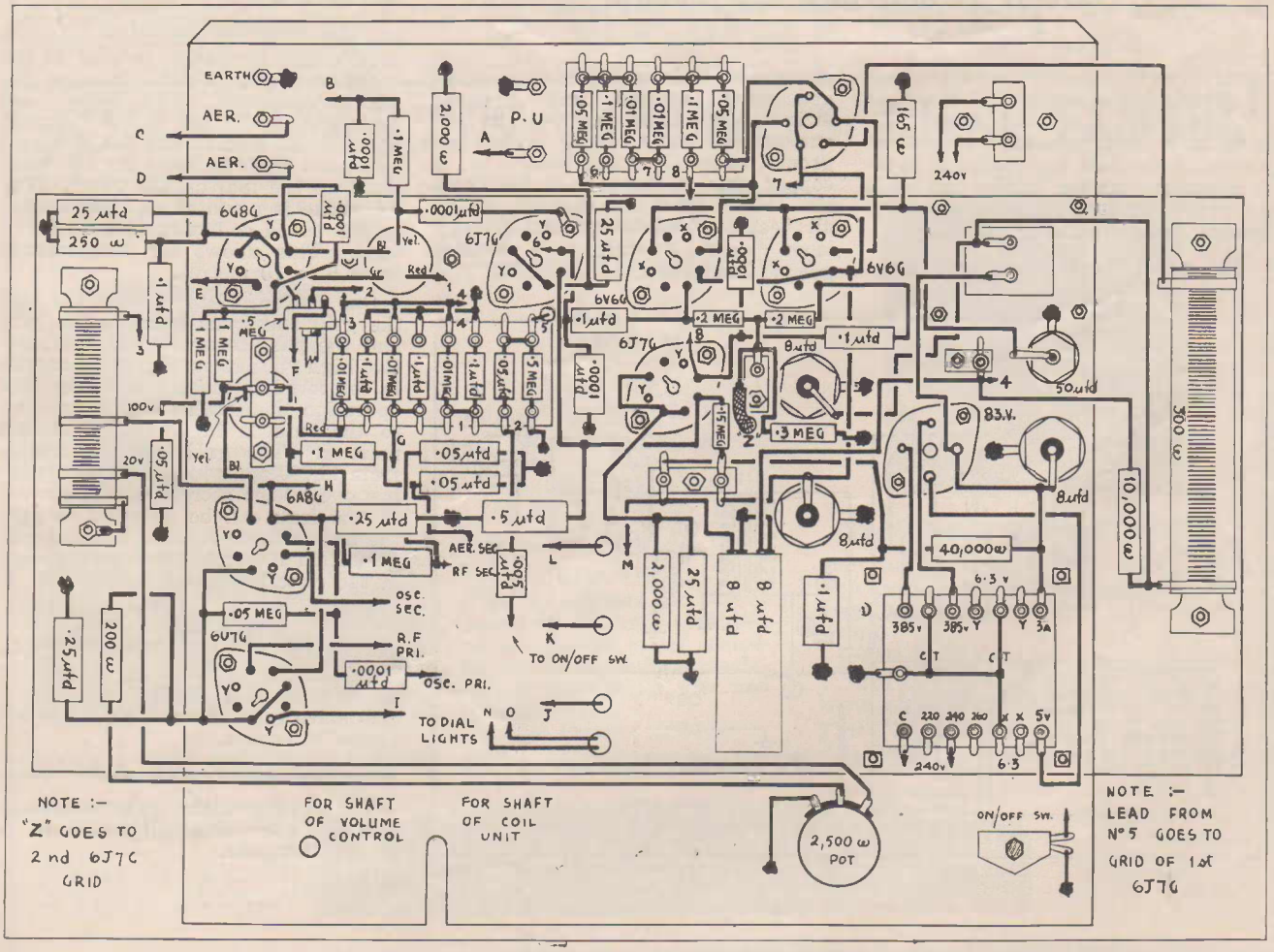
This sketch showing the wiring of the dual-wave switch should be studied in conjunction with that of the under-chassis wiring shown overleaf.

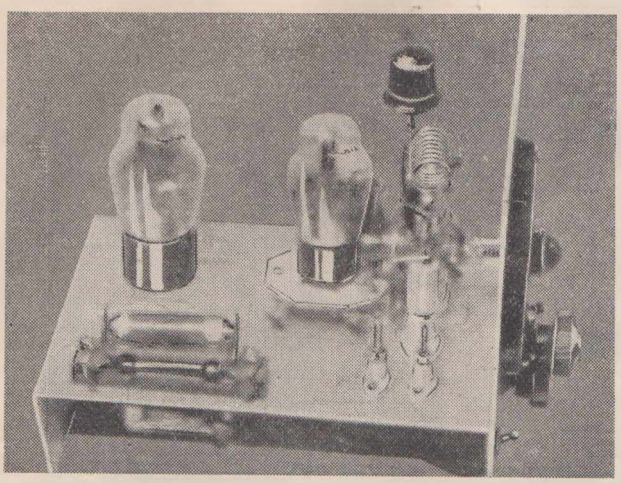
M—Bottom oscillator secondary.
C & D—Aerial primary.
G—Bottom R.F. primary.
A—Pick-up.
J—Fixed plates aerial section of gang.
K—Fixed plates r.f. section of gang.
L—Fixed plates oscillator section of gang.





The circuit (above) and under-chassis wiring plan (below) of the "1938 De Luxe Fidelity Eight."





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These two views of the "Trans - Tasman" U.H.F. Two" show details of the above-chassis and front panel layouts, and the method of mounting the coils.

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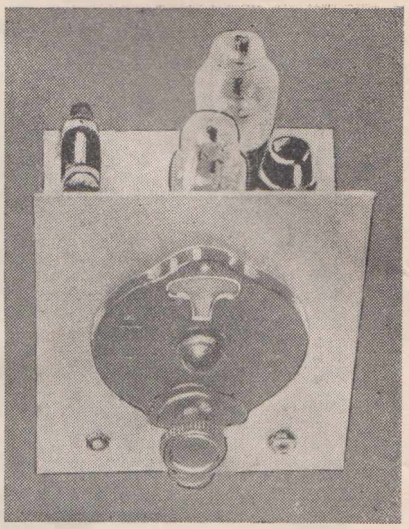
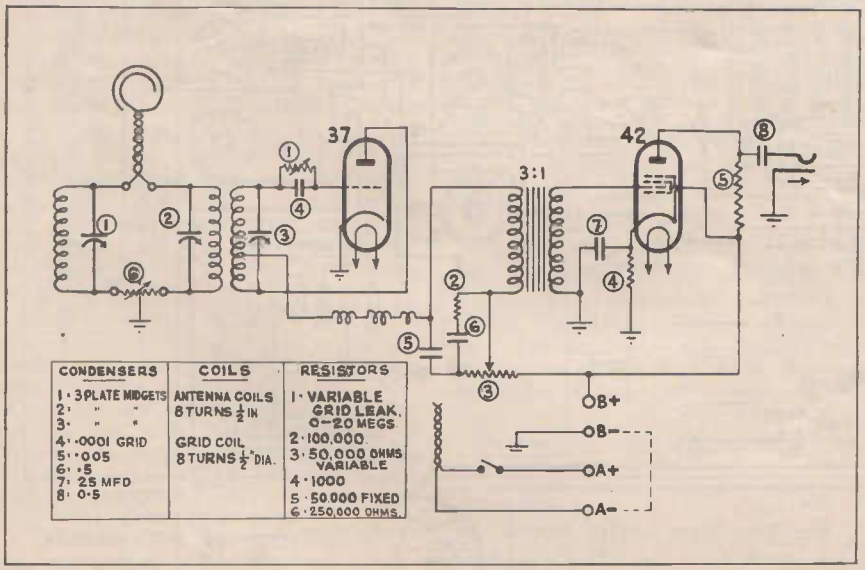


The . . . . Trans-Tasman U.H.F. Two

Constructional details are given in this article of the receiver used by Mr. A. P. Morrison, of Wellington, N.Z., to log VK2NO, of Sydney, on 5 metres as described last month.

THE receiver used in my ultra-high frequency experiments described last month is of the super regenerative type, consisting of but two valves. A detailed description is hardly necessary, as the builder can readily reproduce this little set from the photos and circuit diagram shown.

The panel controls are only three in number, main tuning condenser, regenerative control and filament switch. As will be observed, the layout permits short leads, while all ground connections are made to a copper strip at the rear of the chassis. Short leads are essential, while all "earthed" condenser and resistor leads should return to a common ground connection.



The circuit of the "Trans-Tasman U.H.F. Two," with full constants, is shown alongside.

Good Soldering Necessary.

Good soldered joints with a sufficiently hot iron are necessary. Several times in the past trouble was experienced through excessive hum and poor operation, all being eventually traced to poorly-soldered joints. Plenty of solder does not necessarily indicate a good electrical connection; mechanical strength and electrical efficiency should go hand in hand for best results.

Isolantite Insulation.

Isolantite insulation is used in the detector stage, which includes the tuning condenser, valve socket and r.f. choke, while the coil is mounted on stand-off insulators. An insulated extension shaft is made for the rotor shaft to the dial on the panel. The r.f. choke is mounted at right angles to the tuned coil, plug-in coils being used. This allows for easy change from 5 to 10 metres.

One feature of the receiver is that the grid leak runs between the grid and the part connecting to the positive high voltage supply. This results in improved selectivity and smoother operation than with the leak running to the cathode in the conventional manner. The grid leak is variable from 10,000 ohms to 20 megs., this being one of the secrets of the circuit, as the leak can be adjusted to give the best possible results. The antenna is a Reinartz rotary beam as shown in the circuit diagram.

Some Constructional Details. Coil Data.

2½ metre coil.—4 turns on ½" dowel tapped at centre.

5-metre coil.—8 turns on ½" dowel tapped at centre.

10-metre coil.—11 turns on ¾" dowel tapped at the 6th turn from plate.

All coils are wound with 18 tinned copper wire, and are sprung off the dowels.

The chassis measures 8" x 5½" x 2", with a panel 7½" x 6". The audio transformer is a 3½-1.

For this receiver it is advisable to procure the best quality parts possible in order to ensure good operation. The variable grid leak in the original receiver is a Bretwood, which undoubtedly would be very hard to obtain now, but any reliable make will be quite satisfactory. The valves used, 37 and 42, may be used with either A.C. or D.C. on the filaments. It will be found that the operation will be somewhat quieter when a 6-volt accumulator is used, but of course the results on an A.C. supply will be quite satisfactory.

Outstanding Performance.

The receiver may be built to cover three bands, 28, 56 and 112 m.c. A few months ago, when the 10 and 20-metre tests were on, I tested the receiver just to see how many stations could be logged on a magnetic speaker. On 10 metres, 80 stations were logged at comfortable speaker strength, including every district in U.S.A., Hawaii, Japan, Central America, South America, Chile, Argentine, Canada, Australia and New Zealand.

Constructed with care, with a good aerial system and reasonably good location, this little receiver can be expected to give unusually good DX performance.

High Fidelity Reception From Local Stations

(Continued from page 26.)

Power Supply.—The transformer used was a special type, home-constructed, to provide 400v., 450v., and 500v. C.T. at 225 m.a., 6.3v. tapped at 2.5v. 2a., 2.5v., 2.5a., 2.5v., 2.5a., and 5v. 3a. This was to permit of any future experiments if they be desired but a transformer delivering the necessary voltages as shown in the circuit diagram is all that is really wanted.

The first filter choke was also home made, a big affair to efficiently filter the current drawn between 120-140 m.a.'s. inductance unknown, resistance 233 ohms. This, in conjunction with the speaker field of 1000 ohms and the bias resistor, operates the 2A3's as recommended by the valve people. The second filter choke is an old high-inductance audio choke as once used with the 224 s.g. valve as detector; it may be omitted, but gives a little extra filtering.

The filtering capacitv used is on the generous side to keep down the hum, so much so that the set will play for about 5 seconds after it is switched off on account of the charge stored. Do not omit the two series-connected 16 mfd. electrolytic condensers with their equalising resistors of .25 megs. A single condenser here will break down, ruin the power transformer and rectifier, and 83 V's cost a guinea each. All electros used were of Ducon make. A single 16 mfd. used first boiled over and got almost red-hot for 20 minutes; after all that abuse it is still an excellent condenser, working in the set now in series with another. But all condensers won't stand up to abuse like that; so use two as in the circuit, being careful to insulate the top condenser from the chassis and to put an insulating cover over it to prevent anyone touching it and getting a nasty shock.

A.O.C.P. Questions And Answers.

(Continued from page 23.)

livering 1 ampere is 1 volt. This leaves 2 volts drop across the parallel resistors. The currents they take are therefore

$$\frac{2}{4} = \frac{1}{2} \quad \frac{2}{5} \quad \text{and} \quad \frac{2}{20} = \frac{1}{10}$$

amperes respectively. These three currents add up to the 1 ampere originally obtained.

What's New In Radio

A monthly review of latest releases in sets, kit-sets, and components

Two New Rola Models

The new Rola 8-14 PM speaker is an eight-inch permanent magnet model fitted with a 14-ounce magnet. An outstanding characteristic of this speaker, apart from its excellent overall frequency response, is the particularly high sensitivity, especially in view of the low price of 27/6, retail.

Another new permanent magnet model, particularly suitable for use with mantel receivers, is the Rola 6-14 PM. An entirely new speaker, it is a six-inch permanent magnet type fitted with a 14-ounce magnet. It gives extremely high efficiency, with excellent response.

New Ultimate Five-Valve Vibrator Model.

The recently-announced 6.3 volt, .15 amp. series of valves provides a completely new range of economical, indirectly-heated low-consumption octal-based valves. Ideally suitable for vibrator-operated receivers, they provide very efficient performance, are more robust, and give quieter operation than 2-volt directly-heated types.

Five of these new types have been used in the latest Ultimate vibrator dual-wave superhet—two 6S7G's as r.f. and i.f. amplifiers, a 6D8G as mixer oscillator, 6T7G diode detector, a.v.c. voltage generator and triode audio amplifier, and a 6G6G output pentode.

Technical features include a particularly effective a.v.c. system, iron-cored coils and i.f.'s, "spinner" type dial, two-position colour band indicator and the latest eight-inch Rola permanent magnet speaker, fitted with the new ribbed diaphragm and Iso-core transformer.

All Australian and New Zealand stations are zoned in distinctive colours on the edge-lit glass dial. On the short waves, the conventional 16-50-metre band is more than fully covered, while on the broadcast band the design has taken care of the new additional wavelengths made available at the recent Cairo conference. In fact, this model provides against obsolesence by including an extra tuning range of over 100 kilocycles.

The four controls are as follows:—(1) variable tone control; (2) main switch and volume control combined; (3) waveband switch, with positive locking device; (4) tuning spinner.

Further details of this and other new Ultimate models are obtainable free on request from the Australian representatives, Messrs. Geo. Brown & Co., 268 Clarence Street, Sydney.

★

In Latest "Radiotronics"

The subject of power output and efficiency in triodes, pentodes and tetrodes is discussed in detail in a four-page article in the latest "Radiotronics" (Technical Bulletin No. 89), issued by the Amalgamated Wireless Valve Co. Pty. Ltd.

Negative feed-back over three stages in push-pull amplifiers is described in a subsequent article, amended circuits being shown for the Radiotron 8.5-watt and 32-watt amplifiers, using 6V6G's and 6L6G's, respectively, in the push-pull output stages.

The valve data sheets released with this latest Bulletin comprise those dealing with types 1F7GV, 1F5G, 6X5G, 1H4G, 6Q7G, 1H6G and 1J6G.

★

Latest Philips Technical Review

Contents of the February, 1938, issue of "Philips Technical Review," issued by the Philips Research Laboratory at Eindhoven, Holland, include the following articles:—"Lamp Manufacture and Vitamin Research," "Properties and Applications of Enamelled Wire," "Colour Reproduction of Incandescent Lamps and Philiphane Glass," "Applications of Cathode Ray Tubes," "Work Bench Illumination," "Rotating Directional Aerial for Short-Wave Broadcasting."

The subscription (10/- per annum) may be paid to Philips Lamps (A/sia) Pty. Ltd., 69 Clarence Street, Sydney,

but subscribers will receive their copies direct from the laboratory at Eindhoven. A volume consists of 12 monthly issues, January being the commencing issue.

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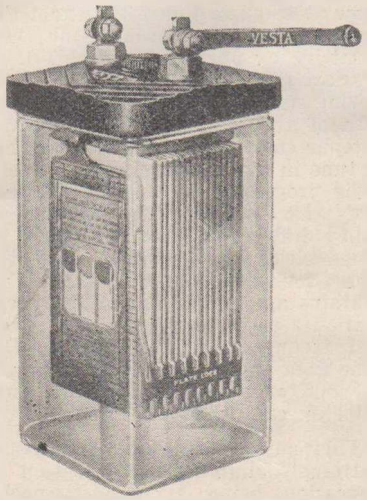
Special Vesta Batteries For Home Lighting Plants

Country readers interested in home-lighting plants will appreciate the



The Vesta type "VL" glass jar cell.

following details of the extensive range of home-lighting batteries made by the Vesta Battery Co. Pty. Ltd.,

A leak-proof cover is an attractive feature of the RJ21 cell.

of Sydney. A complete range of 2-volt glass jar cells is manufactured, as well as 2-volt and 4-volt ebonite units in all popular sizes and capacities.

The Vesta "RM" 4-volt unit.

The "VL" type cells shown on the table below are fitted with the patented Vesta "plate lock," which hold the plates firmly apart so that they cannot buckle or short circuit.

The "RM" type 4-volt units are made in two sizes. Sturdy and compact, they occupy a minimum of storage room on cruisers, yachts, etc.

The "RJ21" type is a rugged heavy-duty cell incorporating a lead-welded leakproof cover, absolutely eliminating leakage; hard rubber containers; non-corroding nuts, and heavy-duty solid lead inter-cell connectors.

Lastly, the "RL15" type provides the owner of a small lighting plant with a strong, compact accumulator of unusually high amperage for its size.

The batteries are supplied filled with acid, fully charged, complete with all connections, hydrometer, instruction chart, etc., and are ready for immediate use.

TYPE.	CAPACITY 10 hr. rate
VL9 .. .. 2 v. glass cell	100
VL11 .. .. 2 v. „ „	125
VL13 .. .. 2 v. „ „	150
VL15 .. .. 2 v. „ „	175
VL17 .. .. 2 v. „ „	200
VL19 .. .. 2 v. „ „	225
RJ21 .. .. 2 v. ebonite cell	210
4RM25 .. 4 v. „ units ..	210
4RM19 .. 4 v. „ „	150
RL15 .. .. 2 v. „ cell	110

★

Type 6K8G Is New Triode-Hexode Frequency Changer

Amalgamated Wireless Valve Co. recently announced the release of the Australian - made triode hexode frequency changer, type 6K8G. This type is the "G" equivalent of the metal type 6K8, and its exceptional shortwave performance should make it extremely popular. Due to its freedom from "flutter" and frequency drift, it is expected that this new type will enable better short wave performance to be obtained at less cost, since no "anti-flutter" filter is normally required.

Technical data on the Radiotron 6K8G will be given in Radiotronics 90 to be issued about September 15, and additional application data will be given in the following issue.

★

New N.Z. South Island Distributors For Radiokes

Radio Wholesalers, of Christchurch, New Zealand, have been appointed by Radiokes Pty. Ltd. as sole distributors of Radiokes products in the South Island of New Zealand. This appointment becomes effective from September 1.

Radiokes products are obtainable also in New Zealand from Thomas

Ballinger & Co. Ltd., Victoria Street, Wellington; Electric Lamp House Ltd., 27 Manners Street, Wellington; F. J. W. Fear & Co., 31 Willis Street, Wellington; Johns Limited, Chancery Street, Auckland; A. & W. McCarthy Ltd., 144 Stuart Street, Dunedin; L. B. Scott Ltd.. 191 Manchester Street, Christchurch.

The following are the wholesale distributors in Australia:—

NEW SOUTH WALES: Bloch & Gerber Pty. Ltd., 46 York Street, Sydney; Fox and Macgillycuddy, 57 York Street, Sydney; John Martin Pty. Ltd., 116 Clarence Street, Sydney; Martin de Launay Pty. Ltd., 289 Clarence Street, Sydney; United Radio Distributors Pty. Ltd., 234 Clarence Street, Sydney.

VICTORIA: Hartleys Pty. Ltd., 270 Clarence Street, Melbourne; Healings Pty. Ltd., 263 Swanston Street, Melbourne; Homecrafts Pty. Ltd. 211 Swanston Street, Melbourne; Arthur J. Veall Pty. Ltd., 243 Swanston Street, Melbourne.

SOUTH AUSTRALIA: Gerard & Goodman Ltd., Synagogue Place, Adelaide; Harris Scarfe Pty., Grenfell Street, Adelaide; A. G. Healing Ltd., 151 Pirie Street, Adelaide; Newton, McLaren Ltd., Leigh Street, Adelaide; Oliver J. Nilsen & Co. Ltd., 49 King William Street, Adelaide.

QUEENSLAND: J. B. Chandler, 43 Adelaide Street, Brisbane; Edgar V. Hudson Pty. Ltd., 284 Edward Street, Brisbane; Trackson Bros. Pty. Ltd., 157 Elizabeth Street, Brisbane.

TASMANIA: W. & G. Genders Pty. Ltd., 69 Liverpool Street, Hobart; W. & G. Genders Pty. Ltd., 53 Cameron Street, Launceston.

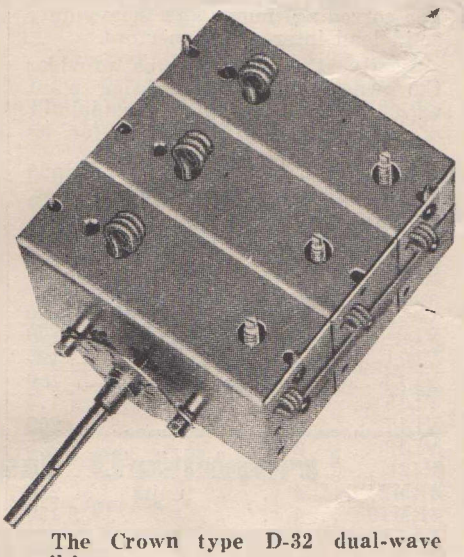
WEST AUSTRALIA: Carlyle & Co., 915 Hay Street, Perth.

★

Latest Crown Permeability-Tuned Dual-Wave Box

Illustrated below is a new three-stage dual-wave box lately released by Crown Radio Products, of Sydney. A totally enclosed dual-wave box, it comprises aerial, r.f. and oscillator sections with full switching and a.v.c. by-pass condensers completely wired inside the case. The unit is particularly compact, measuring only 5½" x 4½" x 2½". The latest permeability tuning is used throughout, an outstanding advantage being the ease with which excellent tracking is obtained on both bands.

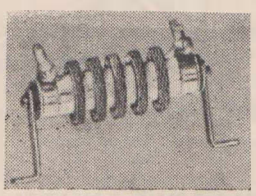
The type D-32 box gives coverage on the short waves from 12 to 35

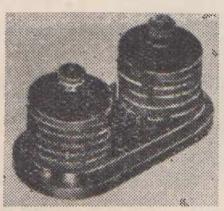


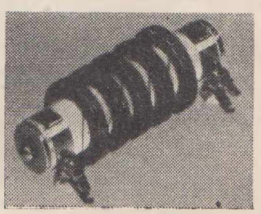
The Crown type D-32 dual-wave coil box.

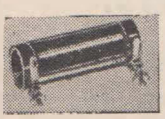
quired to produce a satisfactory check; metres, and the type D-36 from 16 to 50 metres. Type numbers for models to suit different converter valves are as follow:—D32 a.c. pentagrid, D32/O a.c. Octode, D32/B battery pentagrid, D32/OB battery Octode. Corresponding type numbers for the D36 box are D36, D36/O, D36/B and D36/OB.

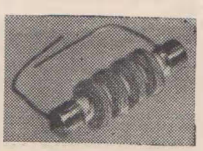
Complete circuit data, with colour code and instructions for installation, are supplied with each unit.











A selection of transmitting and receiving r.f. chokes manufactured by Raymart, and available in this country from John Martin Pty. Ltd., 116-118 Clarence Street, Sydney. Transmitting types are shown at top left right, remaining three are for receivers. The choke shown in the centre is a high inductance all-wave type, intended for use in converters or i.f. stages of superhets.

New Ghirardi "Gadget" Indicates World Time For Short-Wave Fans.

To hand by the latest American mail is the newest radio "gadget" issued by Alfred A. Ghirardi—his "Radio World-Time Indicator Gadget."

The object of this "gadget" is to show at a quick glance the exact time for any radio programme or news event in any part of the world. Readings are given for Standard, Daylight-Saving or Greenwich Mean Time. A turn of the dial, and the short-wave listener can tell just when and where to tune in for any foreign or domestic radio programme or event. The "gadget" also indicates the number of hours difference between any two given cities, and between local time and Greenwich Mean Time. It also contains a complete list of short-wave stations, their locations, call letters and frequencies; International Date Line data and information about when to send or receive foreign telephone calls or cablegrams.

This new World-Time Indicator is extremely simple in construction and operation, being a compact, pocket-size unit 5" x 7". It is attractively printed in two colors on light yellow stock and is punched for hanging alongside a radio set. All readings are perfectly clear; no calculations are necessary. Full instructions are printed on the "gadget."

These "gadgets" will shortly be available from Messrs. Angus & Robertson Ltd., 89 Castlereagh Street, Sydney.

VK2ME, 3ME And 6ME — Schedules For October.

The following transmission schedules will be observed by shortwave stations VK2ME, VK3ME and VK-6ME during October:—

VK2ME (31.28 m., 9590 k.c.)

	Sydney Time.	G.M.T.
Sundays:	3.30 - 5.30 p.m.	0530-0703
	7.30-11.30 p.m.	0930-1330
Mondays:	12.30 - 2.30 a.m.	1430-1630

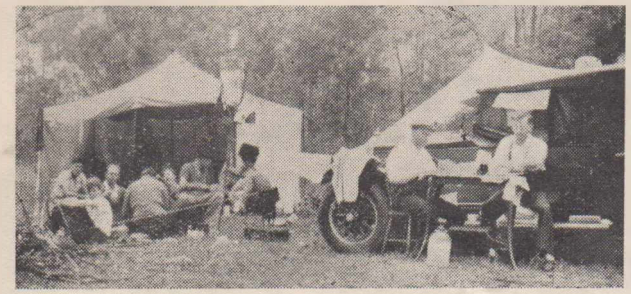
VK3ME (31.5 m., 1510 k.c.)

	Melbourne Time.	G.M.T.
Nightly Monday to Saturday (inclusive)	7 p.m.-10 p.m.	0900-1200

VK6ME, Perth (31.28 m., 9590 k.c.)

	Perth Time.	G.M.T.
Nightly Monday to Saturday (inclusive)	7 p.m.-9 p.m.	1100-1300

Lectures On Oscillograph And Home Recording



Plenty of good food is given first consideration by Lakemba members on week-end radio camps. Seated at the table are Charlie Luckman, 2JT (with cap), and Bert Clark, 2IC, with 2HB, Mr. Martin, and a few of the "boys" in the background, all doing justice to the evening meal!

Planned For Next Two Meetings ★ "Air-Ace" Demonstrated ★ Lakemba Radio Club Notes And News . . . .

By W.J.P.

A cordial invitation is extended to "Radio World" readers to attend meetings of the Lakemba Radio Club to be held in the Sunrise Hall, Canterbury (near the railway station), on Tuesday, September 27, and Tuesday, October 11, at 8 p.m.

On these occasions lectures and demonstrations will be given, firstly by Mr. L. Martin and G. Choules (2HB), September 27, on "The Practical Use of the Oscillograph," and secondly, "The Process Involved in the Making of Instantaneous Play-back Recordings," by Messrs. Warren (2QX), and O'Donnell (2OD), October 11.

To further illustrate this lecture, an actual recording will be made in the clubroom.

A few words on the apparatus being used. The traversing and cutting mechanism is similar to that described in July "Radio World," but with several additions to improve the overall quality of the recordings.

A one-sixth h.p. electric motor drives a weighted turntable which provides a flywheel effect and in turn drives a second weighted turntable, the latter carrying the record blank which is being cut. This method ensures a more constant speed with minimum possibility of any variation. A special control on the motor permits an infinite variation of the desired speed.

Considerable experimenting has been conducted by the owners of the apparatus with various types of audio amplifiers. For average speech, the pentode has been found satisfactory, but for high quality and musical recordings a triode in the final stage is more desirable.

It is necessary to conduct several experiments before complete success can be attained with home recordings. Different volume levels and record head pressures must be tried, a very important piece of apparatus being some type of volume level indicator. The one in use consists of a metal rectifier and a well-damped meter arrangement, connected across the final amplifier output.

Home recording is undoubtedly a fascinating pastime which should not be approached in a haphazard manner without the correct equipment, if success is to be attained and expense in preliminary tests kept to a minimum.

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The "A.A. Communications Four"

Experimenters desiring an efficient, cheap and easily constructed T.R.F. battery receiver were advised by Mr. L. T. Martin to construct the "Air Ace Communications Four" described in August "R. W."

Mr. Martin had the original receiver on demonstration at a recent meeting of the above club, and in course of discussion pointed out its advantages. Briefly, those out of the interference area desiring maximum efficiency at minimum cost could do no better than build themselves one of these receivers, simplicity being the keynote of the design, with no sacrifice in performance.

★

Do You Work DX?

Hams, do you work a lot of DX? If so, then you find it fairly costly for postage on cards. Being a fully financial member of the Lakemba Radio Club at 6d. per fortnight permits you to make use of the club's outward QSL Bureau, by means of which you may dispatch as many cards as you wish, irrespective of destination, through the QSL Manager, at the small additional fee of 3d. per month. Club membership is approaching the 100 mark. Join now!

Waverley Radio Club Notes.

By VK2AHJ.

An overseas visitor who attended the weekly meeting of the Waverley Radio Club, held on July 12 at the clubroom, 13 MacPherson Street, Waverley, was Mr. Gray. ZJICU, and secretary of the South African branch of the A.R.R.L. Mr. Gray was introduced to the club members by Wal. Ryan (2TI), and at his request the members autographed Mr. Gray's copy of the handbook, which bears the signatures of hundreds of "hams" the world over. Before he left Mr. Gray gave a very interesting talk on his extensive travels.

Final arrangements were made at this meeting for the field day, which in due course took place at National Park. The outing ended when Jack Howe's lost transmitter (2ABS) after being found, QSY'd to 40 metres and in pitch darkness made vain attempts to make QSO's. However, Jack's efforts were cut short when the whole party had to pack up and run from a storm.

The last theatre party held by the club proved a huge success, both socially and financially, and it was agreed upon that this outing should become a monthly feature.

July 19 saw the creation of a new office at the club—that of librarian. A vote was taken on the matter and the position fell to Bill Stanley. To inaugurate a small library a book night is to be held.

On July 26 two very fine amplifiers were demonstrated to the members. One was owned by Ted Rogers and the other by 2ABS. Both amplifiers used P.P. 45's. A novel feature of the latter was the method of coup-

ling a crystal pick-up to push-pull 57's. A potentiometer is placed across the pick-up and its moving arm and one end go direct to the 57 grids. Half megohm grid resistances are used on each grid to earth. Jack claims that the correct phase relationship is obtained by this method.

At this meeting it was also decided that a further field day should be held on September 11, and will be of a rather novel form. The writer has, over the air, extended an invitation to Hurstville Club members to attend, and all should have a very enjoyable day. The location to be used has not yet been determined.

Finally, readers are reminded that the Waverley Club extends an invitation to all those interested in radio to visit the club any Tuesday night at the clubroom.

★

Round The Shacks—VK2ABS.

VK2ABS first came on the air on April 1, 1936, the usual run of T.N.T. oscillators, Hartleys, etc., being tried. Just prior to the 1937 W.I.A. amateur radio exhibition, the transmitter shown in the photograph was constructed, and, incidentally, won second prize. The transmitter is built on a welded angle-iron rack with sheet steel sides, and each section is on a removable chassis with front panel attached, being easily accessible for adjustment or repair. The front panels are finished in black crystalline lacquer.

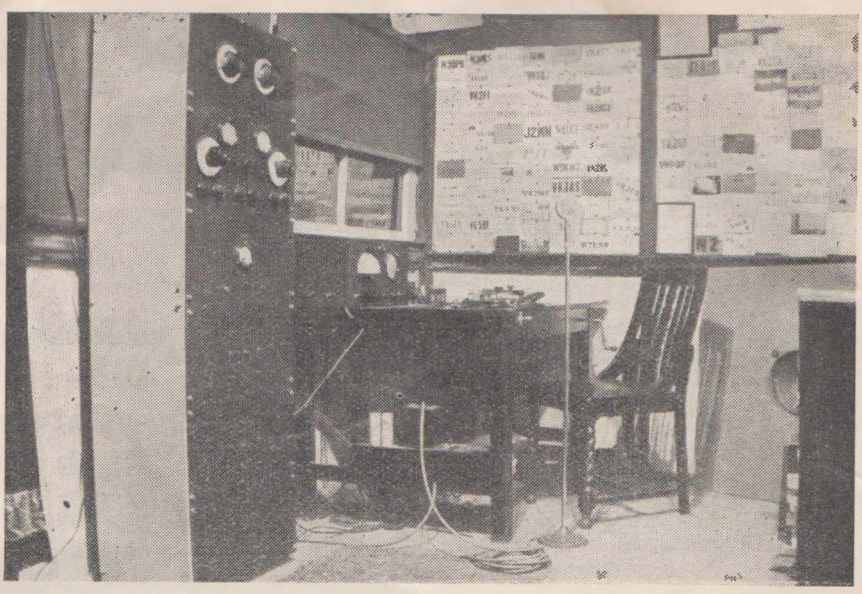
The a.f. unit consists of type 59 valve used as an electron-coupled oscillator, driving another 59 as a pentode buffer stage which in turn drives a single type 210 in the final stage with 600 volts d.c.

Any Of Three Bands Instantly Available.

Band switching is used in the grid circuit of the oscillator, and the grid tuning circuit has a "band-spread" arrangement controlled by a vernier dial so that any frequency within three amateur bands may be instantly selected. The modulating equipment employs two type 6C6 push-pull pentodes, resistance coupled to two type 50 triodes in push-pull, which are coupled through a high quality transformer to the modulated amplifier.

The microphone amplifier is a separate unit mounted on the operating table, and contains a 57 pentode resistance coupled to another 57 used as a phase inverter. It permits the use of either a D104 crystal "mike" or a condenser type.

No by-pass condensers are used across any of the cathode bias resistors, thus improving the frequency response although sacrificing some amplification. Incidentally, the modulating gear has been tested with standard frequency test records and a vacuum tube voltmeter, and shows a range extending from below 25 cycles to over 5000 cycles, including the modulation transformer. The wave form as viewed on a cathode ray oscilloscope is surprisingly good. The power supplies occupy the two lower sections of the rack, and great care has been taken to use ample filtering to remove the last trace of hum from the emitted carrier.



A view of amateur transmitting station VK2ABS, owned and operated by Mr. J. W. Howes, of the Waverley Radio Club.

Receiver A Modified "Communications Eight."

The receiver is modelled after the style of the Radiotron Communications Eight, and is a nine-valve superhet built into a metal circuit complete with midget dynamic speaker and finished in crystalline lacquer to match the transmitter.

An EF5 is utilised in the r.f. stage, followed by an EK2 octode as a frequency converter, with a 6D6 as high frequency oscillator. The i.f. channel uses two type 6D6's, with iron-cored i.f. transformers. The second detector, first audio stage and A.V.C. rectifier is a type 6B7S, which drives the 42 output pentode. The beat frequency oscillator for C.W. reception employs a 6C6 in an electron coupled "high C" arrangement, with a pitch control mounted on the front panel.

The A.V.C. can be switched either on or off as desired, and the strength of incoming carriers is indicated by a 6G5 "Magic Eye." Plug-in coils are used with the tapped coil system of band-spread, which allows any amateur band to spread over the full range of the tuning dial.

A turntable and crystal pick-up are mounted on the operating table near the key, and are used for playing gramophone recordings over the air.

The antenna in use at present is a "Zepp" type, 66 feet long and 50 feet high, the antenna tuning gear being situated on the topmost section of the rack. A diode monitor, not visible in the photo, checks the quality or otherwise of the outgoing signal.

Zero Beat Radio Club Notes

By "Russ."

This month the club begins its new series of lectures for A.O.C.P. candidates. These lectures begin on September 2, and will be demonstrated with actual pieces of apparatus, which it is thought will make the lectures more interesting and beneficial. The lectures will begin at 8 p.m. and the demonstration about 9; the morse class commences at 7.15, and the club is open from 7 o'clock every Friday evening. Any intending members should call next week and see the secretary—VK2AJO.

The president of the club, Mr. E. Treherne (VK2AFQ) has been carrying out mobile 20-metre experiments, which have been very successful to date; a report from members hearing these transmissions (which are hold on Sundays) would be greatly appreciated.

A station survey is being organised by the club, and to make this scheme a success it is necessary for all members to become interested so that all can be allocated a station to report on. The chief of transmitters, 2ABH, is making out the skeds. now, so members should hand their names in immediately.

Don't forget the 18th Field Day of the Club will be held on the last Sunday of September. Members should get in touch with the secretary for particulars—at the clubrooms, Gregson's Studio, 38 Sydney Arcade, King Street, Sydney.

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VK2MZ—The Hurstville Amateur Radio Club

(Affiliated with the W.I.A., N.S.W. Division.)

AT the last general monthly meeting of the club, a suggestion was made that a lecture be given by each member on any particular branch of radio they wished. Members agreed that a syllabus covering the A.O.C.P. be drawn up, with the result that a series of interesting lectures was set out.

The first of these lectures—on the vacuum tube—was very capably given by Mr. Doug. Howe, who explained the operation of all types of valves.

The second—on rectification—was given by Mr. Gibson Calvert (2VT). It was a very interesting lecture, and should help members a great deal.

Building alterations are being made to the premises where the clubrooms are located, and the entrance is now in the right-of-way at the rear of 316 Forest Road, Hurstville.

Visitors and intending members are always welcome to the club any Thursday night, or to the general meeting on the first Thursday of the month. Any information regarding club activities can be obtained from Mr. Gibson Calvert (2VT), 4 Jollys Arcade, Hurstville, or the secretary, Mr. J. Ackerman, 34 Park Road, Carlton.—P. J. Healy, publicity officer.

Gladesville Radio Club.

For the first time since it started the Club held a social night at the Protestant's Hall, Ryde, the "roll-up" being very good.

The club still progresses favourably, and we recently had a very interesting lecture on oscillographs with an actual machine. Morse practice is still ably carried out by Chas. Fryar (VK2NP), and lectures by Wm. Manly (VK2XH).

Things that members would like to know.—Where is the "canary" on 40 m. of Ryde Road? What happened to "Dick" on 20 m.? Who is station VK2PA, "Voice of Carlingford"? Why did "Les." chop the 'phone game? Why will J. R. not face the chair when talking to someone else?

The club is holding a receiver contest for the non-amateurs on September 13. The club much desires new members, so come along every Tuesday at 7.30 if you want some slow morse practice with VK2NP officiating.

Any particulars can be obtained on application to Mr. R. Ellis (VK-2AHR), of 180 Morrison Road, Ryde.

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New Amateur Station For St. Peter's College Radio Club.

The new amateur station which has just been built for the St. Peter's College Radio Club is situated in the College grounds at 5 Palm Place, Hackney, South Australia, and is known as VK5ST. It operates on both the 20- and 40-metre amateur bands, and is erected for the purpose of increasing the knowledge of young students interested in radio.

Under the control of the senior physics master, Mr. C. A. Gillham, the station is to be operated by Mr. R. Harris, CK5FL.

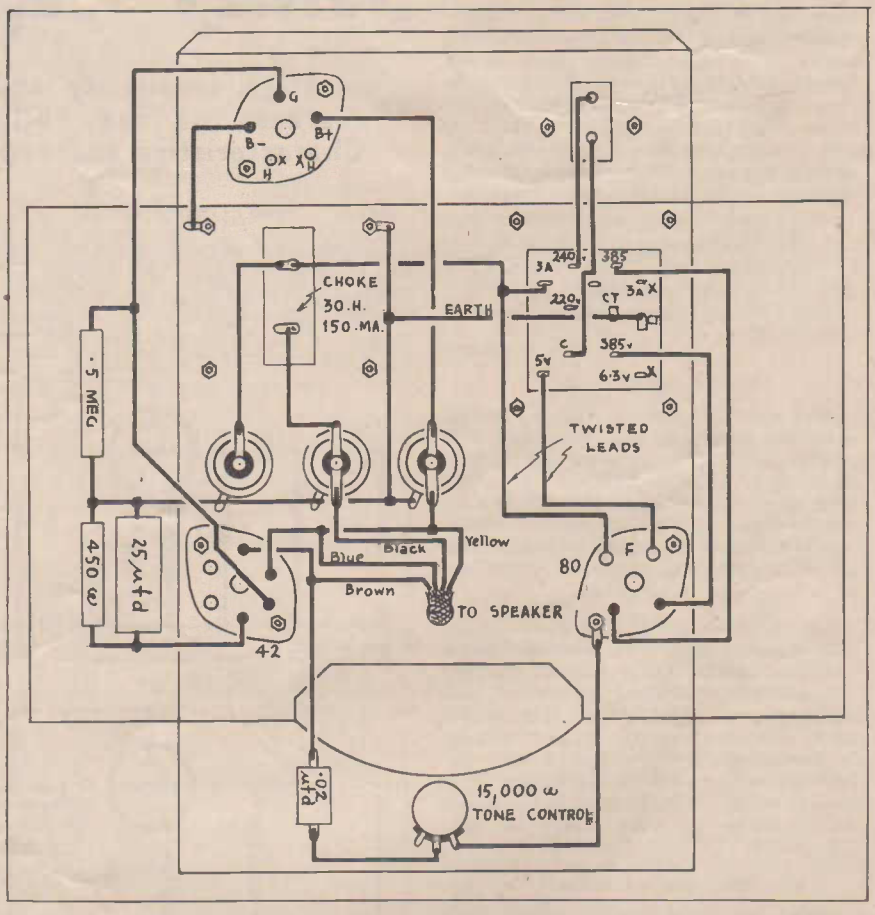
The transmitter consists of a rack and panel using a 59 as exciter in a tri-tet circuit with crystal switching. The buffer or doubler stage uses a 6L6G which is link-coupled to the final amplifier, a Taylor T20. The panel contains all the necessary meters and controls to make operating and band changing as easy as possible.

Two power supplies deliver the necessary voltages, 400 and 750 volts, and remote control is a feature of the station. The antenna is a zeppelin —supported by two 40-foot masts and has 50-foot feeders.

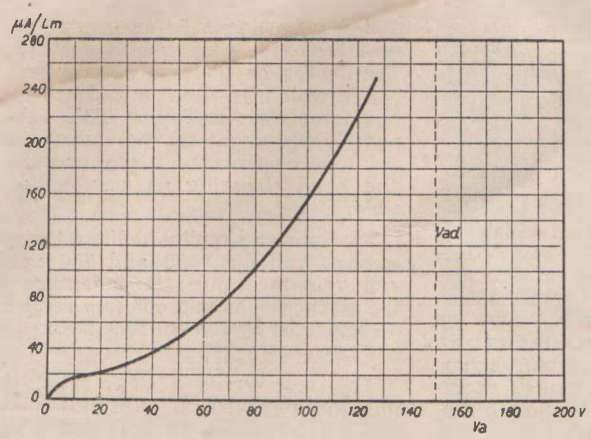
The receiver is a t.r.f. type, the line up of which is as follows:—58 t.r.f., 57 detector, 56 first audio and 2A5 output.

All reports and contacts will be appreciated by the club, and will be acknowledged.

"EMPIRE" POWER-PACK WIRING PLAN



Shown above is a complete wiring plan of the power pack and amplifier unit used for the A.C. model of the "Empire All-Waver," described in the January, 1938, issue of "Radio World." One of the most useful pieces of equipment that could be built by experimenters, this unit can be used to operate all types of A.C. receivers drawing up to 80 mills. "B" current at 250 volts.



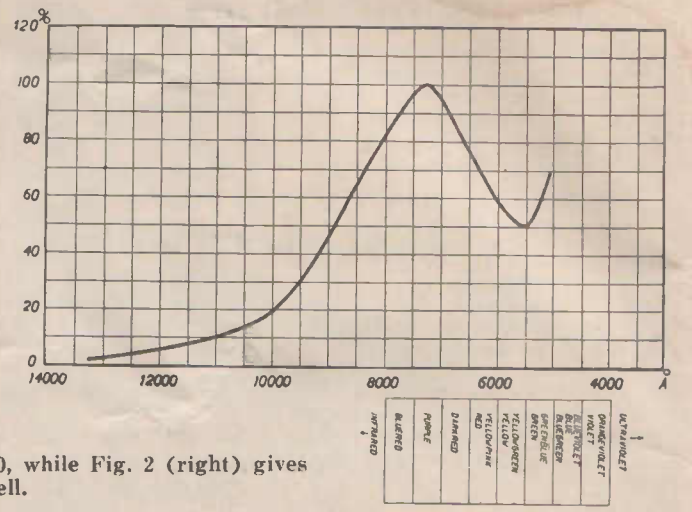


Fig. 1 (left) shows the sensitivity curve of the 3540, while Fig. 2 (right) gives the spectral sensitivity of the Philips type 3540 photo-cell.

Philips Photo-Cell Has Many Applications

High sensitivity and low background noise are features of the Philips type 3540 photo-cell. Characteristics and applications are given below.

THE photo electric cell is an electronic device of considerable importance and interest to experimenters and engineers associated with sound film reproduction and light-operated relay systems. Philips have specialised in the manufacture of photo cells for many years, and in this country market a gas-filled cell designated type 3540. The important characteristics of this cell are:—

(1) High sensitivity
(2) Low background noise
(3) High sensitivity to red light
(4) Stable operation
(5) Long life and solid construction.

High Sensitivity.

The sensitivity curve (fig. 1) shows that the sensitivity of the 3540 cell reaches 160 micro-amperes per lumen. This high value is achieved by means of a special process in manufacturing the cathode. The cathode is made from a complex mixture containing metallic caesium, which is deposited as a result of absorption.

The sensitivity curve is based on an incandescent tungsten filament at a temperature of 2327° C. At the recommended operating potential the sensitivity is 120 uA/Lm. The sensitivity increases as the anode voltage is increased. In the event of the voltage exceeding 100 volts, a low discharge occurs which must be avoided as otherwise the cell may be destroyed.

Background Noise.

The breakdown voltage of the 3540 cell is 150 volts. The high sensitivity permits operation at a considerably lower voltage, and at the reduced potential the background noise is negligible.

Red Light.

The spectral sensitivity for the 3540 cell is given in fig. 2, which shows the percentage sensitivity as a function of the light spectrum (Angstrom units). This curve indicates that the 3540 photo cell has an active response to the red section of the spectrum. This sensitivity to red radiation is based on an exciter lamp giving high output at comparatively low filament temperatures.

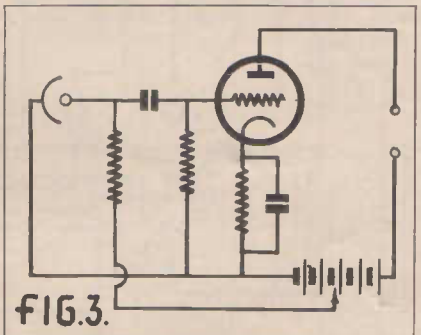


FIG.3.

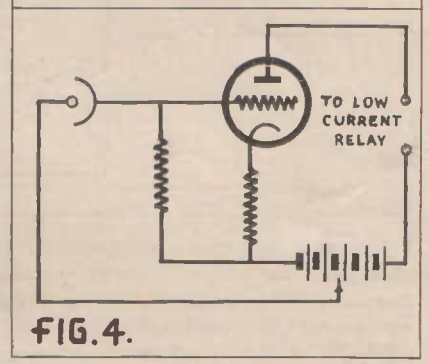


FIG.4.

Stability.

Every cell is aged after production to ensure that the sensitivity will be maintained throughout the life of the cell and as a result of the ageing process a drop in sensitivity is avoided when the cell is first put into operation.

Dimensions.

Overall length (max.), 2⅞ins.
Max. diameter of bulb, 1¼ins.
Aperature diameter, 1½ins.

Ratings.

Normal anode voltage, 90-100 volts.
Sensitivity (Va = 90v.), 100 uA/lm.
Coupling resistance (min.), 0.1 megohm.

Limits.

Max. applied voltage, 100 volts.
Breakdown voltage, 150 volts.
Max. current, 3.0 uA.
Max. temperature, 50° C.

Applications.

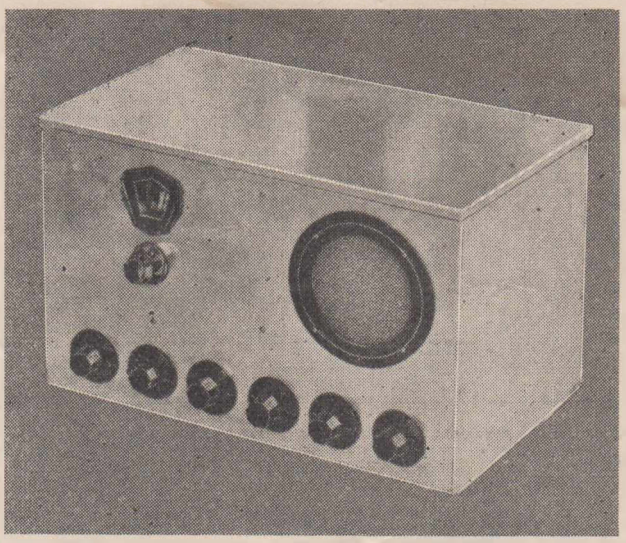
Philips 3540 photo cell is primarily intended for sound film reproduction, but it may also be used in a wide field of applications, including burglar alarms, counting systems, timing

(Continued on page 40.)

Assembling And Wiring The . . . . .

Air-Ace Communications Four . .

Hints on the assembly and operation of the "Air-Ace Communications Four" described last month are given in the article below.



Housed in a cabinet of frosted aluminium, the completed receiver has a particularly attractive appearance.

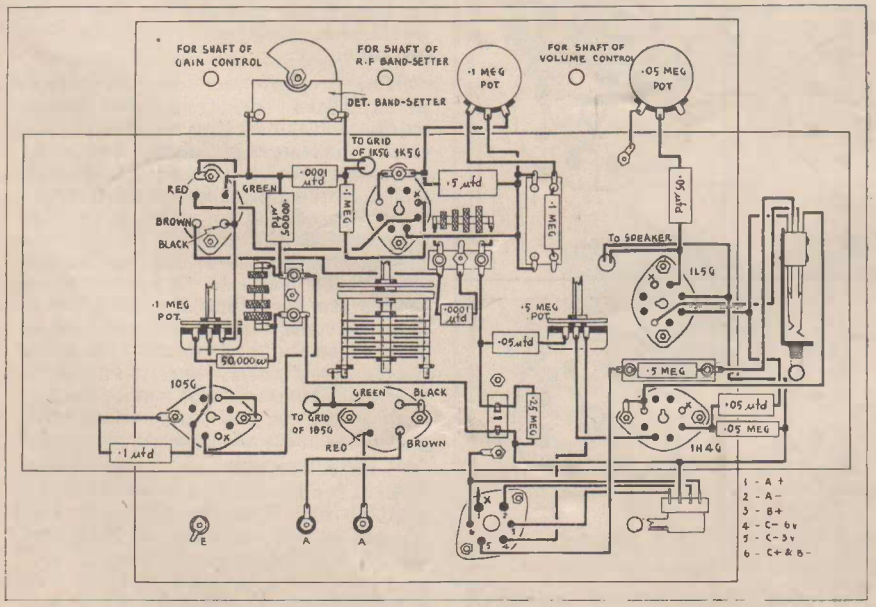
THE assembly of the "Air Ace" is commenced by mounting the seven sockets—four octal types for the valves, two 4-pins for the coils, and one 6-pin for the power supply. Next, the aluminium cabinet can be bolted in place and the partitions fitted. At this stage the audio choke can also be mounted, together with the two band-spreading condensers, which are ganged, and the two-speed tuning dial..

Other components that can also be mounted now comprise the rotary on/off switch, aerial and earth terminals, 'phone jack, tone control, audio volume control, detector regeneration control, r.f. and detector band-setters, and r.f. gain control. The three extension shafts and couplers should not be fitted to the three controls located near the centre of the chassis until the wiring has been completed.

The speaker can be mounted last of all, the two leads from it being taken down through a hole in the chassis.

The Wiring Outlined.

The filament wiring should be put in first of all, and then, commencing with the aerial terminal, wire the first coil socket, r.f. valve socket, detector coil socket and so on, until the wiring is completed. For those who find difficulty in following a circuit, the complete under-chassis wiring has been given in a sketch elsewhere.



The complete under-chassis wiring is shown in this sketch.

Two Minor Circuit Additions.

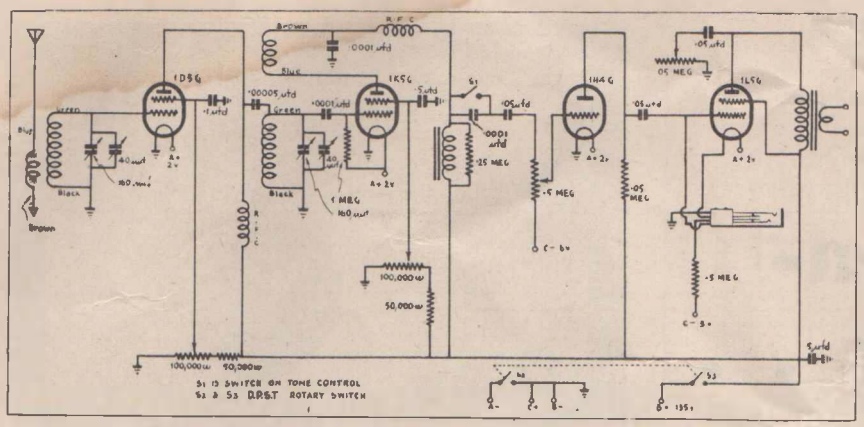
The circuit published elsewhere this month contains two minor amendments. The first is that the wiring of the double circuit jack is shown in full. The second is an optional refinement that will be found particularly handy for clearest reception of the 1000-cycle c.w. note. It consists of a .0001 mfd. fixed condenser wired in series with the .05 mfd. first audio coupling condenser, a switch "S1" being placed across it to enable the condenser to be cut in and out of circuit at will. This switch, incidentally, can be included on the tone control potentiometer.

The First Test.

When the wiring has been completed and checked, the hinged lid can be bolted in place, the grid clips fitted, coils and valves plugged in, and the control knobs fitted. Next, the batteries, aerial and earth leads can be connected up, and the set switched on.

The r.f. and audio gain controls should now be turned full on, and the detector band-setter turned about half-way out. The regeneration control is now advanced a trifle, and the r.f. band-setter turned slowly until the resonance point is obtained, or in other words, until the set sounds "lively." The regeneration control is then advanced until a hissing sound is heard, increasing in intensity as the knob is rotated. This denotes that the set is on the verge of oscillation. The tuning knob can now be rotated to bring in stations.

For local and semi-local broadcast stations the speaker alone can be used, though for general shortwave DX it is far simpler to locate the stations



This amended circuit shows the method of wiring the double-circuit 'phone jack.

on the headphones. In this way it is not only easier to pick up weak, distant transmissions, but also there is an appreciable saving in "A" and "B" current, as when the 'phones are plugged in the output pentode is put out of action. Withdrawing the headphone plug automatically connects the speaker.

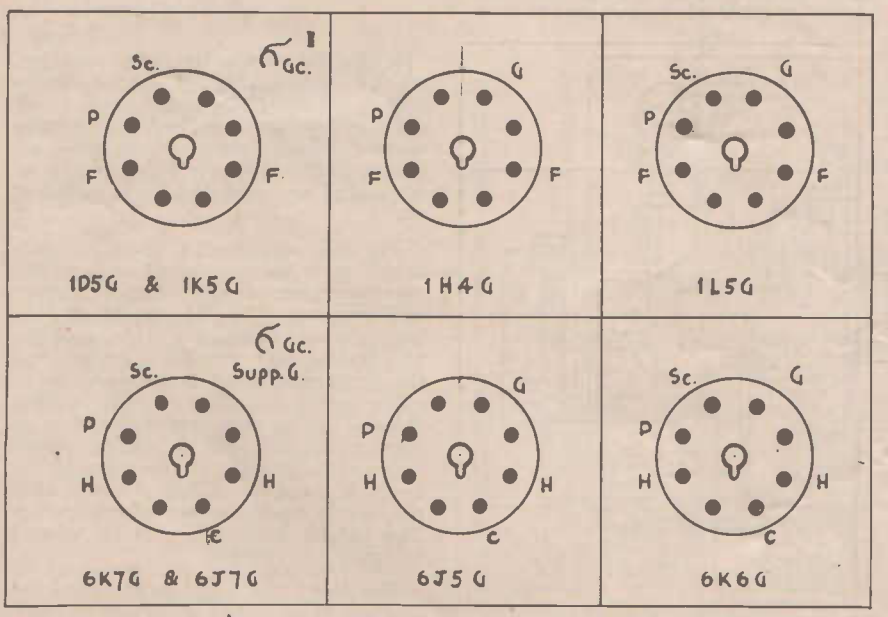
A.C. Version Of The "Air-Ace."

Several requests have already been received for an a.c. version of the "Air Ace." This will be described in a forthcoming issue, but in the meantime, those who are anxious to build the a.c. model without delay will find the amendments necessary are very simple.

Below will be found a sketch showing the under-socket connections of the four battery valves, underneath them being the under-socket connections of the corresponding a.c. equivalents. As octal-based types have been used throughout, it will be found that the connections for both battery and a.c. types are identical, except for the extra cathode connection required for the latter. In the a.c. model, the cathode of the 6J7G detector is earthed, and appropriate bias resistors with by-pass condensers provided for the other three valves.

Power Supply Requirements.

Any power pack delivering about 50 mills. at 180 to 250 volts "B" supply, and 1.5 amps. at 6.3 volts for the heaters, would be quite satisfactory. One point that should be borne in mind is that if the "B" supply is of 200 volts or over, the two 50,000 ohm resistors in series with the two 100,000-ohm potentiometers should be replaced by 75,000 ohm resistors. A simple and effective alternative here would be to include a 25,000-ohm voltage divider under the chassis, tapping off at about 100 volts for the r.f. screen and at 90 volts for the detector screen.



Under-socket connections of the valves used in the battery model are shown above (top row), with the a.c. equivalents below.

Philips Photo-Electric Cell

(Continued from page 38.)

devices, light measurement, etc. For sound film work where the cell is required to respond to rapid light variations, the circuit arrangement of fig. 3 is recommended. For other applications where slow variations of light intensity occur, or where the apparatus must respond to an appearing or disappearing light beam, as is the case in alarm systems, the alternative circuit of fig. 4 is to be preferred.

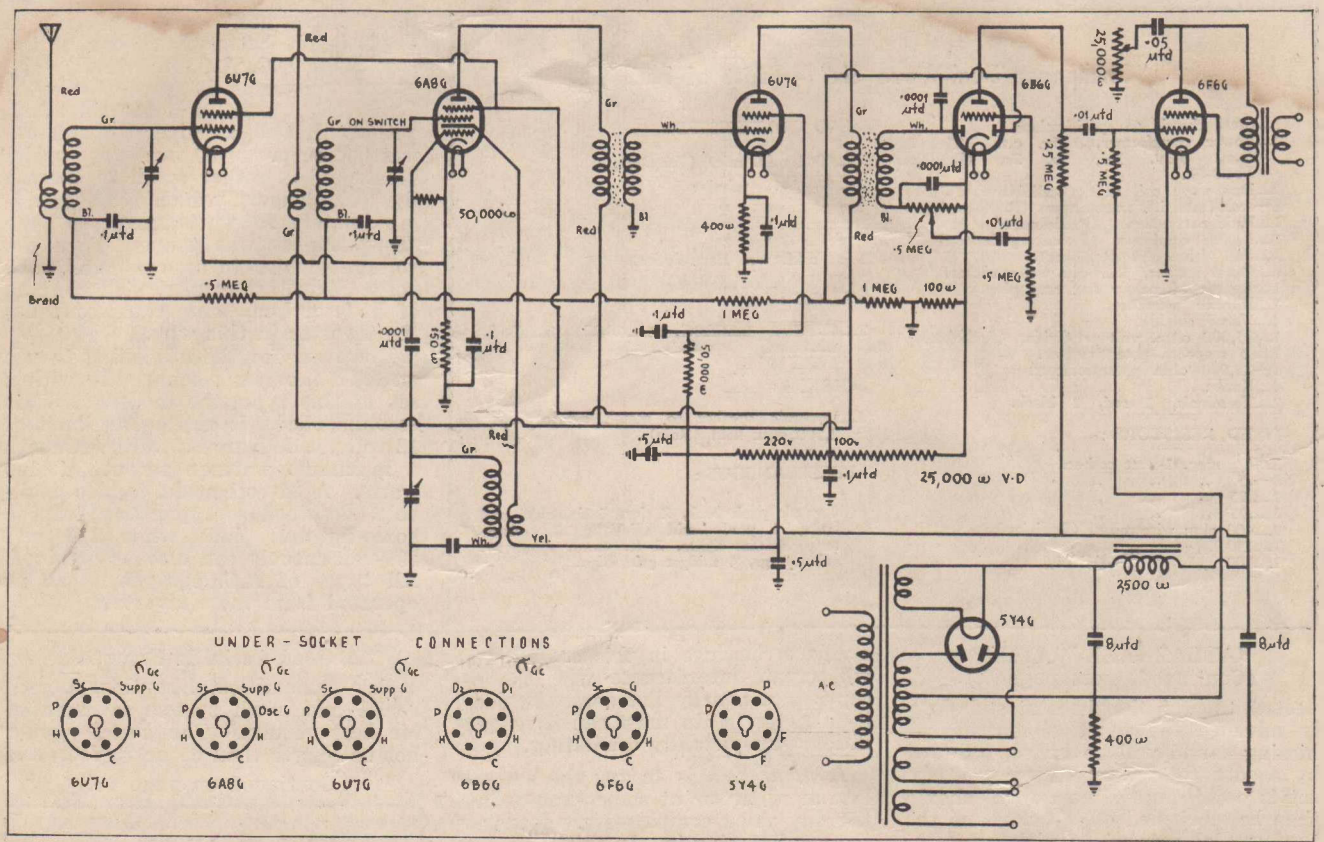
Daventry Verifications—Chief Engineer Explains B.B.C. Point Of View

The BBC's attitude towards the verification for listeners of their reception of Daventry was defined by the Corporation's Controller of Engineering, Sir Noel Ashbridge, in a recent talk to oversea listeners.

After emphasising that any kind of real experimental work on shortwave reception is not only an extremely interesting pastime, but of very great value to short-wave broadcasting organisations, Sir Noel expressed the BBC's view that the giving of a verification is not worth while because it is impossible for anyone at the transmitting end of a broadcasting service to say definitely that a certain listener, somewhere on the other side of the world, has received a certain programme.

"The programmes from Daventry," he explained, "are frequently relayed by local broadcasting stations. Another difficulty is that our programmes are published in advance, and it is quite possible for anyone who wished to do so to make some kind of guess at the contents of a programme without ever having heard it at all. To write to the listener and confirm to him that the programme from Daventry did contain the particular item he had mentioned would not in itself verify the listener's reception. It would only verify the fact that Daventry had transmitted that particular piece of music on that day."

"I hope this will not be regarded as lack of courtesy," he added, "and I want to say that we still want your reports on the reception of Daventry. We take great pleasure in acknowledging them all, and in dealing with any specific technical point which may be raised."



The circuit of the "Challenger," with colour coding and full constants.

"Challenger Dual-Wave Six"

(Continued from page 16)

hum is heard coming from the speaker, the volume control can be fully advanced and the tuning dial rotated. when a station should soon be picked up.

The Alignment Procedure.

The alignment is commenced in a station towards the high frequency end of the band, such as 2SM. The oscillator trimmer can now be adjusted until a station is brought in; then the aerial and i.f. trimmers are carefully adjusted for peak volume.

Next, swing over to the other end of the band to a station such as 2FC. Adjust the padder screw and at the same time rock the dial backwards and forwards over the station till the point of maximum volume is obtained.

On the short waves, tune in London on the 19-metre band, and adjust the aerial and r.f. trimmers for maximum gain.

Correctly built and aligned, the "Challenger" has exceptional gain, the original model giving a sensitivity of under one micro-volt on both bands.

ATR Inverter Will Operate "Challenger"

The photograph at the head of this article shows a general front view of

"Challenger Dual-Wave Six" — List of Parts

1—Steel chassis to specifications.
1—Power transformer, 385v. c.t., 385v. 80 m.a., 6.3v. 3a., 5v. 2a. (Radiokes M-80-6).
1—Dual-wave coil unit (Radiokes DWU3).
2—Iron-cored i.f. transformers (Radiokes TIC).
1—Padder condenser (Radiokes type IP-7).
1—3-gang condenser (Stromberg-Carlson).
1—Full vision dial (Radiokes).
6—Octal sockets, 1—4-pin wafer socket.
1—Length of power flex and plug.
1—Rubber grommet.
4—Valve shields.
1—25,000 ohm. voltage divider (Radiokes).
1—.5 megohm potentiometer.
1—25,000 ohm potentiometer.
4—Knobs.
2—Terminals, 1 red, 1 black.

FIXED RESISTORS :

2—1 meg. 1-watt carbon.
3—.5 ,, ,, ,,
1—.25 ,, ,, ,,
2—.05 ,, ,, ,,
2—400 ohm wirewound (Radiokes).
1—150 ,, ,, ,,
1—100 ,, ,, ,,

FIXED CONDENSERS :

3—.0001 mfd. mica (Simplex).
2—.01 ,, tubular
1—.05 ,, ,,
6—.1 ,, ,,
2—.5 ,, ,,
2—8 mfd. wet electrolytics.

VALVES :

2—6U7G's, 1—6A8G, 1—6B6G, 1—6F6G, 1—5Y4G.

SPEAKER :

1—Dynamic speaker to match single 6F6G, 2,500 ohm field (Rola).

MISCELLANEOUS :

6 yards push back, 2 doz. 3-8in. nuts and bolts, 1 yard braid shielding, 1 resistor strip, 4 dial lights, 2 ft. 4mm. spaghetti, solder tags, 4 midget grid clips.

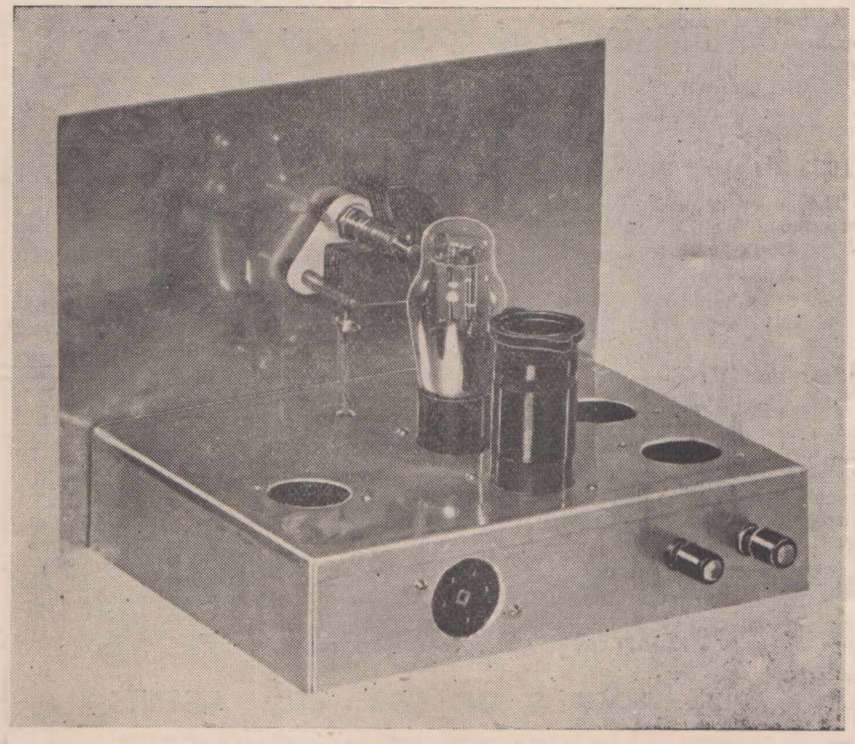
"ATLAS ALL-WAVER"

(Continued from page 6.)

nected, turn on the rheostat and slowly advance the reaction control. A hissing sound will be heard, followed by a soft "plop," indicating that the set is oscillating. The control should then be slackened off a trifle, and the tuning dial rotated to pick up stations.

The set should never be allowed to oscillate, because in this condition it will create interference with the reception of nearby listeners. Besides, it is never in its most sensitive condition when actually oscillating.

A good idea is to try the set out late at night, or at some time during the day when comparatively few people are listening-in. In this way, you will get the "feel" of the set without annoying anybody.



A rear view, showing thte holes punched for the r.f. valve and coil sockets (right) and output pentode (left).

the "Challenger," together with a Vesta 6-volt battery, and one of the new ATR D.C./A.C. inverters. The model illustrated is type "6S" with 6-volt D.C. input and 230-volt A.C. output. Rated to deliver a maximum wattage output of 50 watts, the model illustrated is rather small to operate the "Challenger," which requires approximately 70 watts, and so the "B+" supply was tapped down the voltage divider to approximately 180 volts. Excellent results, with no trace of hash or hum, were obtained using the inverter in this way.

However, for those wishing to use an ATR inverter permanently with a set of this type, the model "12S" is recommended. Requiring an input of 12 volts, it delivers 230 volts A.C. with a maximum wattage output of 100 watts. A 32-volt model is also available, designed for operation from a home-lighting plant, while 110 and 230-volt models can also be obtained. All types of A.C. equipment can be operated from these inverters.

A Good Aerial Is Essential.

For a small set like this, a good aerial and earth system is essential for best results. The aerial should not be longer than 65 or 70 feet, and

(Continued on page 48.)

"Atlas" All-Waver

List Of Parts Covering Single-Valve Model.

1—Aluminium chassis, 9in. x 6½in. x 2½in., with aluminium front panel, 7in. x 10in.
1—.00016 mfd. midget variable condenser (Raymart).
1—.0001 mfd. midget variable condenser (Raymart, Radiokes).
1—4-pin, 1—6-pin, 1—octal wafer socket.
1—30 ohm rheostat (Radiokes).
1—'Phone jack (with insulating washers,, if required).
1—Midget vernier dial.
1—15-600 metre amateur all-wave coil kit (Rayway).
2—Spring type terminals (1 red, 1 black).
1—Pair of headphones (S.T.C.).

FIXED CONDENSERS :

1—.0001 mfd. midget mica (Simplex).
1—.005 ,, mica (Simplex).
1—.01 ,, ,, ,,

FIXED RESISTORS :

1—10,000 ohm (1-3, ½ or 1-watt carbon).
1—.1 megohm ,, ,, ,,
1—.25 ,, ,, ,, ,,
1—3 ,, ,, ,, ,,

VALVES :

1—Type 1J6G or type 19 (see text).

BATTERIES :

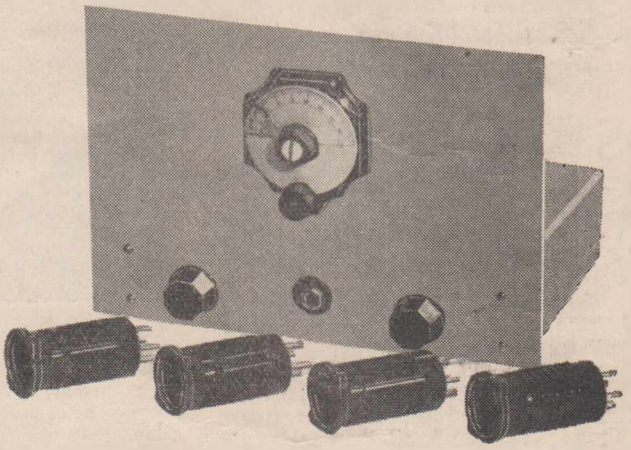
1—Aluminium chassis, 9in. x 6½in. x 2½in,
2—45 or 60-volt light-duty "B" batteries (Ever Ready). (Two heavy-duty 45v. "B" units are recommended where it is intended to build the 3-valve version).
1—2-volt accumulator (Vesta, Clyde) or 2—1½-volt dry cells (Ever Ready).
1—4½-volt "C" battery (Ever Ready).

MISCELLANEOUS :

1 doz 3-8in. bolts and nuts; 1 doz. solder tags; 1—1in. bolt and nut with ¾in. pillar and 1in. x ¾in. bakelite strip, with double-ended solder lug mounted at one end; 1 yard of insulating flex and hook up wire; 2 black knobs.

"ATLAS All-waver" Can Be Built As 1, 2, Or 3-Valver

"Add-A-Valve" Scheme Enables Parts To Be Bought In Three Kits.



The "Atlas All-Waver" described elsewhere this month can be built first of all as a single-valver, and then r.f. and output pentode stages can be added as desired to the same chassis, making a magnificent three-valve all-waver capable of bringing in dozens of broadcast and shortwave stations at full speaker volume.

WRITE FOR DETAILS OF OUR SPECIAL PROGRESSIVE PURCHASE PLAN, COVERING THE THREE KITS OF PARTS REQUIRED.

"Meissner Five" Features New Micromatic Touch Tuner.

Automatic or manual tuning is instantly available in this 4/5 push-button superhet. Features include inverse feedback for improved fidelity of reproduction, four watts output, iron-cored aerial coil and i.f. transformers.

Complete Kit Price, £11/10/-
Less Valves £9/5/-

★

"Meissner Communications 14."

Tunes from 5 to 550 metres, and includes noise silencer, crystal filter, beat frequency oscillator and full bandspread.

Write for further details.

★

"Meissner All-Wave Seven."

The most modern low-priced all-wave kit-set, covering from 7.5 to 500 metres. Gives outstanding results on all bands. Uses metal valves and ready wired and aligned Meissner coil assembly.

Complete kit, including speaker and valves, £19/10/-

Alpha Centurus Five.

A modern band pass circuit giving remarkable sensitivity. Uses latest semi-telephone dial.

Complete Kit Price, £11/17/6

★

"1938 Battery Pentagrid Four."

The most popular battery kit ever introduced—performance equals that of most six-valve receivers.

Complete kit of parts, with speaker £9/5/-

★

Hammond Precision Condensers

A wide range of Hammond precision transmitting condensers is available, designed for both base and panel mounting. Features include isolantite insulation, rigid stator construction, ample rotor contract, and long leakage path.

Write for full details.

★

"HAM" BARGAINS.

LATEST TRANSMITTING TUBES.

We have the widest range of transmitting tubes available in New Zealand, at the keenest prices. Here is a selection of popular types:—

EIMAC 35T 65/-
AMPEREX HF 100 .. 90/-
R.C.A. 809 .. .. 27/6
TAYLOR T 55 .. .. 65/-
(All above prices are nett)

DUAL SPEED CROWE DIAL.

The latest Crowe type 525 Front-O-Panel dial, two speeds, 165 to 1 and 30 to 1, with planetary drive.
Nett price complete .. 35/-

B.P.O. 37 STANDARD KEY.

The finest key ever offered in New Zealand is the B.P.O. 37 Standard Key as used by the British Post Office. Finished in heavy brass, with teak base and perfect balanced action.
Nett Price 52/6

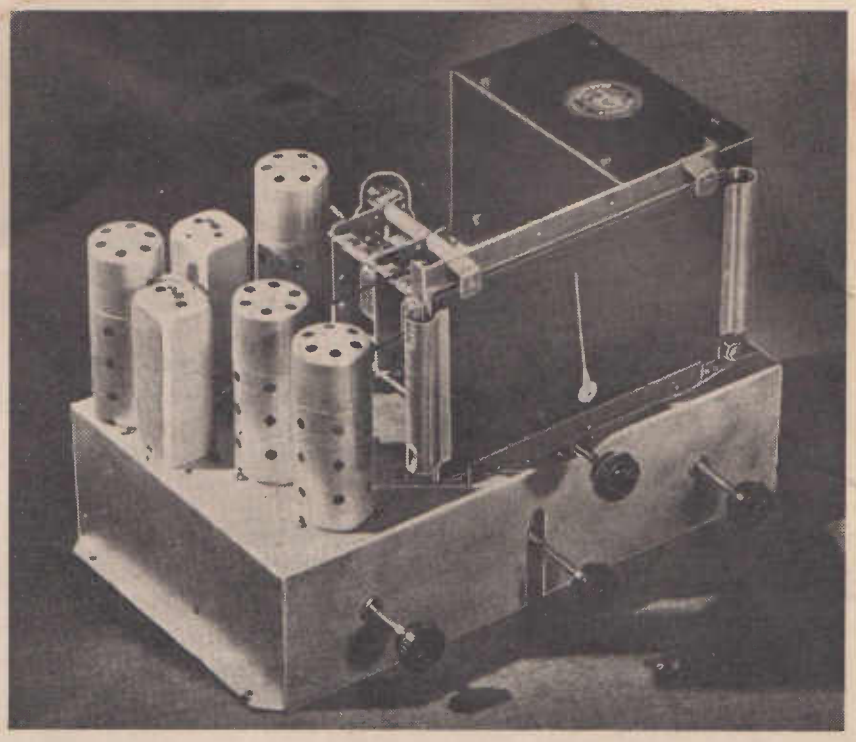
CRYSTAL MIKES AND PICK-UPS.

Select your microphone from the products of America's leading manufacturers, and ensure highest quality 'phone transmissions.

Shure Model 70H (less stand) £5/15/-
Shure Model 70SW (with stand) £6/10/-
Shure Model 700A (less stand), £7
Astatic Model T-3, with chrome stand £7/15/-
Astatic Model D-104 (less stand) £6
Desk Stand only £1
A new low-priced crystal pick-up by "Shure," excellent response curve .. .. net £2/5/-

The . . . . VIBRA Dual-Wave Five

A vibrator-operated five-valve dual-wave superhet using the new 6.3-volt .15 amp. valves throughout.



SOME months ago a new series of heater type valves was announced by Amalgamated Wireless Valve Co. Pty. Ltd., but so far these have not been widely used by set-builders. This was the 6.3 volt .15 amp series, of which there are eight popular types available.

They are designed specially for use in receivers operating from a 6 or 12-volt supply where a reasonably heavy current is practicable, but where economy is desired over the heavier drain types commonly used in a.c. receivers. Thus it has been possible to design the five-valve receiver above, drawing a total heater current of only .75 ampere at 6.3 volts, making the receiver an ideal one for many locations where charging facilities are available.

The "Vibra Dual-Wave Five" is a five-valve receiver using 6S7G's in the r.f. and i.f. sockets, a 6D8G pentagrid converter, 6T5G duo-diode high mu triode for detection, a.v.c. and audio driver, and 6G6G output pentode. As the circuit shows, the design throughout has been kept as simple and straightforward as possible.

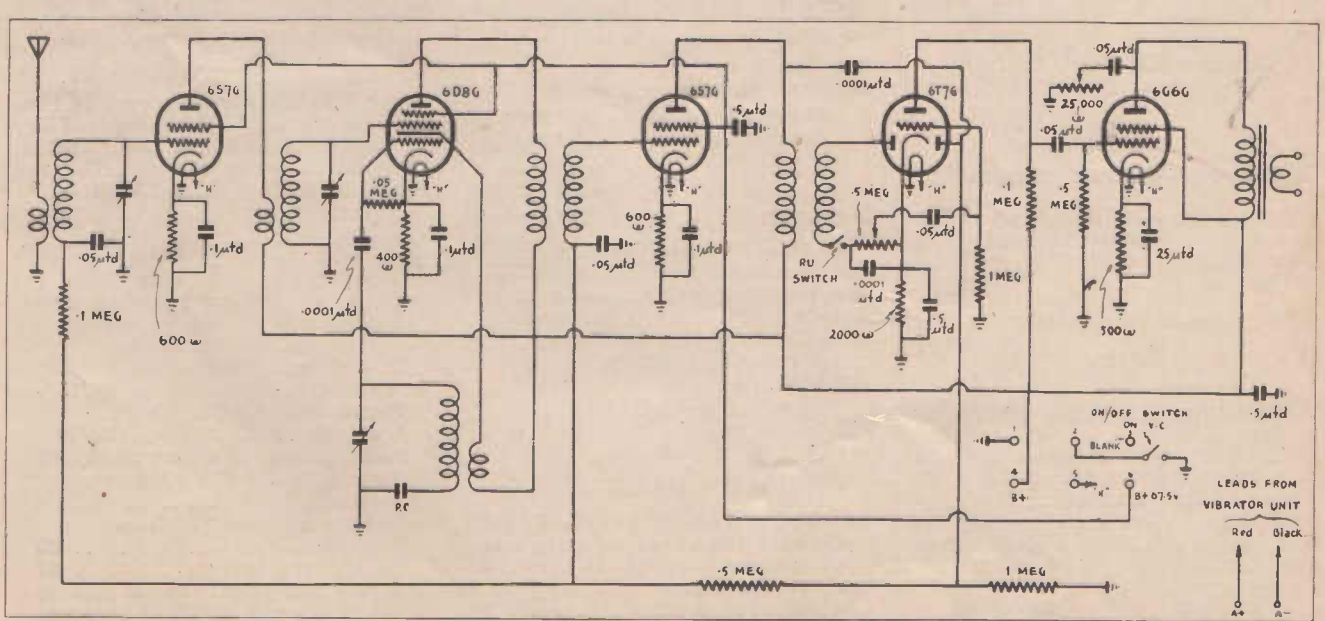
The receiver is powered by the Radiokes type VB-25 vibrator unit, which is mounted on the receiver chassis. Delivering 25 mills at 130 volts, it nicely fulfils the power requirements of the receiver. An output of over 500 milliwatts is obtainable which, when fed to one of the new Rola high sensitivity permanent magnet speakers, gives more than adequate volume. Tone also is surprisingly good.

Full Description Next Month.

Next month a full description will be featured of this receiver, with further photographs and an under-chassis wiring diagram.

Rola Speaker—A Correction

In a review of the new Rola model 8-20 PM speaker published on page 32 of this issue, the retail price is incorrectly quoted as 27/6. This should be 35/-.



The circuit of the "Vibra Dual-Wave Five," which is shown fully assembled and aligned at the head of this page.

Conditions On The Improve ★ Ultra-High Frequency On The Up-Grade And Will Continue So ★ Victorian Observer Submits American Police Verifications ★ Full Reports From Observers In All States ★ Latest Station Information

All India Radio Broadcasting System.

VUD-2, 9590 k.c., 31.3 m., 10 k.w.
4995 k.c., 60.0 m., 10 k.w.
Schedule: 11.30 a.m.-1.30 p.m.; 4.30-6.30 p.m.; 10.30 p.m.-3.30 a.m.

VUD-3, 1516 k.c., 19.8 m., 5 k.w.
Schedule: As for VUD-2

VUB-2, 9550 k.c., 31.4 m., 10 k.w.
4905 k.c., 61.0 m., 10 k.w.
Schedule: 12.30-1.30 p.m.; 4-6.30 p.m.; 10 p.m.-3.30 a.m.

VUM-2, 4950 k.c., 60.6 m., 10 k.w.
Schedule: 10 p.m.-3 a.m.

VUC-2, 9530 k.c., 31.48 m., 10 k.w.
4880 k.c., 61.48 m., 10 k.w.
Schedule: 5.06-7.06 p.m.; 9.36 p.m.-3.06 a.m.

Soviet Morse Broadcasts.

Mr. Payten (observer for N.S.W.) forwards the following communication from Moscow:—

The following broadcasts in Morse Code will be transmitted by Tass, Soviet News Agency. Your reports are solicited, to be sent to the Department of Morse, Radio Centre, Moscow.

RNE, 24.88 m., 10.15-11.15 a.m., in French; 11.15 a.m.-12.15 p.m., in English; 3.20-4.10 a.m., in English.

Japanese Transmissions.

For Europe: JZJ, 25.42 m., and JZK, 19.79 m., 5.30-7 a.m.

For South America: JZJ and JZK, 7.30-8.30 a.m.

For Eastern North America: JZK, 11-11.30 a.m.

For Western United States and Canada and Hawaii: JZK, 3.30-4.30 p.m.

For Eastern North America: JZJ, 10-10.30 p.m.

For South Seas, Neth. East Indies, etc.: JZJ, 11 p.m.-12.30 a.m.

Address all communications to the Overseas Section, The Broadcasting Corporation of Japan, Tokyo, Japan.

Ultra-High-Frequency Station List.

With the UHF bands giving every indication of good DX in the fairly near future, the latest list of UHF broadcast stations will prove of assistance to SWL's whose receivers cover the 9-11 metre bands.

31,600 k.c., 9.49 m.

W1XKA, Boston; relays WBZ, 8 p.m.-3 p.m.

W1XKB, Springfield; relays WBZ, 8 p.m.-3 p.m.

W3XEY, Baltimore; relays WFBR, 7 a.m.-3 p.m.

W2XDV, New York City; daily, 8 a.m.-1 p.m.

W9XHW, Minneapolis; relays WCCO, midnight-3 p.m.

W3XKA, Philadelphia; relays KYW midnight-1 p.m.

W5XAU, Oklahoma City; Mondays, 3-4, 9-10 a.m.

W4XCA, Memphis; relays WMC.

W8XAI, Rochester; relays WHAM, 10.30 p.m.-3.05 a.m.

W8XWJ, Detroit; relays WWJ, 9 p.m.-3.30 a.m., Sundays 11 p.m.-3 p.m. (Mon.).

W9XPD, St. Louis; relays KSD.

11-metre band.

26,450 k.c., 11.33 m.: W9XA, Kansas City; testing since August 15.

26,400 k.c., 11.36 m.: W9XAZ, Milwaukee; relays WTMJ from 4 a.m.

26,300 k.c., 11.4 m.: W2XJI, New York; relays WOR, 11 p.m.-4 p.m.

26,100 k.c., 11.49 m.: W9XJL, Superior; relays WEBC.

25,950 k.c., 11.56 m.: W6XKG, Los Angeles; relays KGFJ, 24 hours daily.

★

Jottings From Here And There

Panama City is being heard via a new station HP5G, on 25 metres. Originally on 25.4 m., HP5G is now believed to be on 25.2 m. Address is Box 1121.

W8XAL has been granted permission to use two new frequencies—15,270 and 11,830 k.c., or 19.65 and 25.36 m.

The "Pillar of Fire" religious sect has sought permission to build a 5 k.c. transmitter for transmissions on the 49, 25 and 16 m. bands. If permission is forthcoming the new station will be at Zarephath, N.J.

EAQ is on the air again on 30.4 m., with English news at 10.30 and 11.40 a.m. EAR are also used (31.6 m.) at times, but apparently carries no English session now.

Denmark is now testing on 19 m. (19.77 to be exact). Call is OZH; schedule from 11 p.m. Sundays till 4.30 a.m. Mondays.

HJ7ABD, Bucaramanga, Colombia, previously on 31.14 m., is now understood to have shifted to 50.25 m.

LZA is another station reported on a new frequency—8480 k.c., approximately 35.5 m. This station will be remembered on 20.1 m.

Bechuanaland has a number of very low-powered transmitters. ZNB uses 200 watts on 50.84 m., and transmits programmes of recorded music from 4-5.30 a.m. and from 9-10 p.m. The following stations occasionally contact ZNB: ZNC, Maun.; ZNF, Ghanzi; ZND, Isabon (all 40 watts); and ZNG, Gaberones, only 7½ watts. Address communications to The Director of Public Works, P.O. Box 106, Mafeking, Mechuanaland Protectorate.

It is reported that plans are being made for the construction of a 25 k.w. station at Tehran, Iran. If this is so, many SWL's will be on the look-out for a new country to add to their logs.

Two American UHF stations reported overseas, but not as yet definitely listed, are W9XTC, Minneapolis, 11.5 m., said to relay WTCN; and W9XUP, St. Paul, relaying KSTP on 11.56 m. (same frequency as W6XKG).

ZHP, Singapore, broadcasts on the schedule below:—

Monday to Saturday, 7.40 p.m.-12.40 a.m.; Wednesday, 3.40-4.40 p.m.; Saturday, 3.25-4.40 p.m.; Sunday, 1.40-4.10 p.m.

★

Watch For These . . .

Stations not elsewhere mentioned in this section:—

YV1RL, Maracaibo, 50.59 m.; YV5RC, Caracas, 51.72 m.; YV1RB, Maracaibo, 51.3 m.; and YV1RD, Maracaibo, 49.42 m. (all in Venezuela).

A new Japanese station on 50.84 m. Call uncertain, may be JJC.

The new Italian ICC, 47.2 m.

★

For Those Who Wish To "Swap" SWL Cards.

More and more SWL's desire to increase their file of cards by "swapping" with similarly inclined dxers. Below is published a list of overseas SWL's who will be pleased to hear from VK and ZL listeners:—

Mr. Desmond Reed, 281 Queen Street, Kingston, Ontario, Canada; Mr. S. Clarke, 468 Bourgeois Street, Montreal, Quebec, Canada; J. D. Gallivan, Balboa, Canal Zone; Sergio Gonzalez, Calle 21 No. 552, Vedado, Habana, Cuba; Johan P. Curiel, Curacao, Netherland West Indies; Mr. C. G. Tilly, 95 Chesterfield Road, St. Andrew's Park, Bristol 6, England; Mr. L. Marsh, 132 Walmer Road, Fratton, Portsmouth, England; Mr. G. J. Glasspool, 30 Duke Street, Southampton, Hants, England; Mr. W. E. Metzler, 604 S Street, Bedford, Indiana, U.S.A.; Mr. A. J. Schwartz, P.O. Box 695, Albany, New York, U.S.A.; Mr. J. Doyle, 319 East 2nd Street, Florence, Colo., U.S.A.; Mr. J. Ballin, 40 East 66 Street. New York, N.Y., U.S.A.

★

Reports From Observers

Mr. G. O. La Roche (West Australia):

Mr La Roche reports a slight improvement in conditions, most noticeable during the evening hours.

A disappointment was the fact that the Test broadcasts were no good at all. Delhi on 31.28 m. and ZHP, Singapore, 30.96 m., both relayed Daventry, and very well, too; but it was too short for any cricket fan.

The most noteworthy loggings for the month were:—

1. "The Voice of China," Hankow, on 25.65 m. At 1 p.m. and 8 p.m. Lady announcing in English.

2. ZHP, Singapore, regularly at R 7-8 on 30.96 m., every evening.

3. A slight improvement of conditions on the 20 m. amateur band. Best loggings include: HS1BJ, VE5FO, XE1GE, HI7G, PK2WL, PK1VY, PK3DV, PK1MX, PK3GD, PK6XX, KA1ZL, KA1BH, K6BNR, K6OQE, K6ILW and K6NZQ.

Regular stations:—

A.M.: SPW (22), W8XK (25), W2XE (25), 2RO-3 (25), JZJ (25), PLP (27), ORK (29), IRF (30), EAR (30), PCJ (31), W2XAF (31), COCH (31), COBC (32), COBZ (32), OLR2C (49), VQ7LO (49), YDL-2 (62).

P.M.: PCJ (19), JFK (19), YDC (19), RNE (25), OLR4B (25), CR7BH (25), PLP (27), JVN (28), JDY (30), COCQ (30), JFAK (31), Delhi (31.2), KZRM (31), VPD-2 (31), ZBW-3 (31), RAN (31), XEWW (31), XGU (32), PMH (44), VPB (48), W8XAL (49), Rangoon (49), PMY (58), Indian station (61.1), YDL-2 (62), RV15 (70), YDG-3 (86), YDA (98).

Mr. W. H. Pepin (West Australia):

Generally speaking, DX conditions have been all that a listener could wish.

Interesting receptions from America included progress reports of the Hughes flight around the world, given over stations W2XE and W8XK on 19 m. Late in July a real surprise came when W3XAU (31), were logged in a broadcast from San Francisco over the Columbia network of the arrival of 63 vessels of the Fleet, including destroyers, submarines and aircraft carriers. The commentary was given from 120ft. up the mast of another vessel and at times would change to several other points.

From Europe 2RO-4 and IRF (30.5) —directed to America—are still running excellent signals here daily. SPW, 22 m., are also quite regular from 7.30 a.m. (Perth time).

The N.I.R.O.M. stations all come in at good strength at different times of the day. PMH are especially powerful, carrying a native programme.

ZHP, Singapore, 30.96 m., have been very active of late.

COCQ, 30.7 m., has been a nightly visitor for some time now, running an R9 signal around 8 p.m. (Perth time); they are also logged in the mornings up till 9 a.m., when they sign off. COCD, 48.92, comes in well too at 7 a.m. (Perth time) with some snappy Spanish airs.

Three Russian stations are good—RV15, RAN and RKI.

Amateurs on 20 m. band:—

....G2XY, G5PP and G6BW; FB8AH; VU2BG; VS2AE; PK1LZ, PK1AI, PK1MX, PK1EI, PK1VY, PK2WL, PK3RI, PK3CD, PK4CB, PK4JD, PK4WS; KA1ZL, KA1KR, KA1AF, KA1BH, KA1JM, KA1YL, XU8ET, J5CC, K6ILW, K6BNR, K6OQE, K6KGA, K6KEW, K6GQF, K6CMC, K6NBA, K6IKQ.

Also logged the Sydney to Rabaul 'phone (VLK-6) on 18 m.

Mr. R. S. Coggins (South Australia):

Mr. Coggins reports conditions most erratic during the past month. On occasions conditions were extremely good, whilst at other times the whole S.W. band was "dead."

An interesting amateur logging was that of HC1FG on 40 m. The 20 m. amateur is best around 5-6 p.m. (Adelaide time), when the Americans are very good. The Europeans are very poor at present, in fact practically none have been logged since the middle of June.

Best loggings include:—

VE2HN, VE5OT, VE5VO, VE5NY, VE5AEJ, VE4ZK, VE5ACN; K4EMG, K4FAY; YV5AG; VU2DR; KA1AA, KA1FH, KA1ZL, KA1YL; PK3WI, PK1GW, PK1VY, PK2WL, PK1FE; K6AGI, K6ILW, K6KGA; XZ2ZZ.

Mr. A. E. Bruce (South Australia):

Since last writing Mr. Bruce has carried out a number of alterations and improvements to his receiver. In its present form it is a 7-valve superhet. The results already obtained are very promising.

Conditions have gradually been improving, quite a number of stations being heard now which were previously inaudible. The higher frequency bands are best—13, 16 and 19 metres.

The amateur bands are better, too. 20 m. conditions are pretty good from 5.30 to 10 p.m. (Adelaide time). Loggings include:—

K6FKN; KA1BH, KA1ZL, KA1AF; PK3ST, PK3ST, PK4JD, PK2WL, PK1RL, PK3AA, PK1ZI; NY2AE; XU8RB, XU6TL; and VE5NY.

Mr. J. C. Linehan (South Australia):

Conditions this month have been a good deal better on all bands, more especially between 10 and 20 m. I think that within the next month the 10 m. band will be in full swing as each week-end it is noticeably improved. The 13 m. band is also considerably better with DJS (13.99) and GSJ (13.93) good around 9.30 p.m. (Adelaide time). FZE-8, Djibouti, were logged early in August on 17.36 m.—a good catch indeed, although they were rather weak and difficult to copy. W6XKG, 11.56 m., are beginning to come in very strongly, up to R8: on a recent Sunday they were held at speaker strength until 1.30 p.m. KGU, 19.8 m., relaying KQH, are heard from 1.30 p.m.

Recent verifications to hand: VUD-2, ZHP and YDH-4 (90.36 m. using 30 watts); W4DLH, VE2IL, XYO (Radio Burma), HC1FG; W5GGX and VK6SA, 10 m.; K4EMG, ON4MZ and G6GO.

The 20 m. band is good till midnight, after which it fades out till about 3 a.m., when the Europeans are logged at good strength.

Calls heard, 10 metres: ZL1GZ, ZL1HY, ZL3AJ, ZL2BE, W6MSQ, W6OHC, W6PNO, K6OTH, ZL4AF, ZL4GM, ZL3DJ, VK6SA, W2TP, W9CXU, W5FUS, W5HDK and W7BEU. 20 metres: CO2WM, VK4HN (Papua), KA3KK, PK6XX, YR5AA, and PQAEO.

Mr. J. Ferrier (Victoria):

Mr. Ferrier forwards three verifications from American police stations just recently to hand. Extracts from these letters make interesting reading.

QSL Card Contest Won By O.G.Washfold (AW257DX)

Over forty entries were received for the QSL Card Contest, the winner being Mr. O. G. Washfold (AW257DX), of 59 Radnor Street, Camberwell, Melbourne. The winner's card, and a selection of others that were highly commended, will be reproduced next month.

Owing to heavy pressure on space in this issue, we regret it has been necessary to hold over several articles, including contributions from readers. These will be included in an enlarged DX section next month.

From W5XB, Fort Worth, Texas: "I have checked your report against our log, and find that they coincide. We must be putting a fair signal into Australia, as we have had several previous reports from Melbourne. The transmitter is 350 watts power into the antenna."

From W4XK, Durham, North Carolina: "Your report is verified from our log of police calls. Your report is very flattering and although it is not the first report we have had from Australia, we are proud to receive it. Enclosed is a clipping from the local evening paper, 'The Durham Sun': Our station is a Collins type 150C, crystal controlled, 100 watts, with a half wave vertical antenna. Our first report came from Mr. Alan Graham, of Rosanna, Victoria. This report was received in October, 1937, and although it was correct we never verified it. I would appreciate it if you notified him of the verifications of the report." (Certainly a roundabout way to get such a good veri.—S.W. Editor)

From Los Angeles: "I have checked our log sheets and can verify your report of having heard our station. We are operating on a 250 watts power output from the main transmitter. The portable mobile jobs in the police cars operate on 15 watts power output. I was very surprised to hear that you heard from one of our cars with portable mobile equipment. (Surely an amazing feat of DX to log a 15-watt sig. on 9.9 m.).—S.W. Editor.)

Mr. H. A. Callander (Tasmania):

Mr. Callander has been in Melbourne for some months past, and has been unable to forward a report until this month.

Up till the beginning of August the 20 m. amateur band had been rather dead, but since then it has improved very considerably. 20 m. loggings over the past six weeks or so:—

PK6WS, VS7JW, XZ2DY, VR6AV, CT1KW, CN8AV, YA5AH, G8HN, VQ4KTB, G2QT, ON4PA, G8NJ, PY2CK, YV5AK, VN1AP, HK5AR, G2XV, XE1BT, K6KND, HC1JW, K6OQE, LA1F, ZS1R, PK2WL, ZS6BT, XU8RB, VE5ACN, ZS2AH, G6DT, EA9AH.

80 metres: ZL1ML, ZL2RT, ZL3AY ZL2BE, ZL2BN, W7AQX, ZL2SY and ZL4BK.

Broadcast station loggings include RNE, 25.0 m., very good at 7 a.m.; TGWA on 30.96 m.; VUD-2, heard extensively during the Test cricket, broadcasting relays from Daventry.

Latest verifications to hand are from the following: ZT6Y, G8MG, HI7G, PK1MX, NY2AE, VS2AK, G2IM, ZL1ML, ZL1KB, VK9DM, VK7KR and VK6WS. A very nice letter was received from G2IM, in which he stated that SWL's would get better results if they listened for European DX on the 28 meg. band (10 metres); he suggested that the best time would be between 1000 and 1900 GMT (8 p.m. to 5 a.m. E.S.T.).

Mr. V. D. Kemmis (New South Wales):

Mr. Kemmis, returning to DX-ing after an enforced spell of some weeks has found conditions very fair, and expects some good results in the near future.

Amateur calls heard (20 m.): CE1AO; F3HL, F8AM, F8RV; G6DT, G6PC, G8MA, G8MX, G8TX; HC1JW; KA1BH; K6FAB, K6GAS, K6ILW, K6KGA, K6OQE, K6OJI; NY2AE; ON4JN; PK1ZZ, PK6XX; PAOMZ, PAOBE; OA4AW, OA4C; VE5VO, VE5NY, VE5OT, VE1TR, VE3AHN, VE5ACN; VP3AA (British Guiana; XE1G and XE1LK.

On the broadcast bands conditions are good, and quite a few interesting stations have been logged.

16 m.: W2XE and W3XAL.
19 m.: W2XE, RKI, and HAS.
20 m.: LZA and HBJ.
25 m.: CJRX, SBP and XTJ, China.
30 m.: ZHP, Singapore.
31 m.: VUD-2, HP5J, TGWA and OZF.
34 m.: COJK.
49 m.: HP5K.

Mr. A. R. Payten (New South Wales):

Generally speaking, conditions have been only fair; indeed the last few weeks have been most disappointing. Any improvement noticed has been on the lower frequency bands 40-50 m.) and possibly on 16 metres.

Best loggings for the month are as follows: TI4NRH, 31.02 m.; JVP, 39.95 m., at very good strength, with English session of war news; and KQH, 20.11 m., relaying a programme of Hawaiian music.

With an improvement in reception on 49 metres. two stations have been logged, of whose identity I am not certain. The first was heard on approximately 49 m., with a musical programme and news session in two languages, closing at 6.45. The second was on 49.9 m., with a programme in English, closing at 6.30; noise-level was very high, but I thought the station was a South African. (The first mentioned station would probably be YUA or OLR2C; the latter almost certainly ZRH, Roberts Heights, 49.92 m.—S.W. Ed.)

Mr. E. Neill (Queensland):

Conditions here are very changeable; generally speaking, reception is best in the early a.m. and during the afternoons. RNE, 25 m.; PMY, 58 m.: KZRM, 31 m.; HP5G; VUD-2; and OAX4T are the best stations in this locality. PCJ, 19 m., LKJ and ZBW, 31 m., are other recent loggings. The amateur bands are good, especially 20 and 80 metres.

Mr. B. Clarke, of Bowen, sends along some details of recention in the north. He reports that QRN is very bad at present owing to the unusually hot weather for this time of the year. Not many stations are audible—the best being GSG; ZRK, 31.2 m.; and HP5G, 25.47 m. Two very interesting loggings are the 20 m. amateur station VR6AY; and the Cuban warship "Patria" on 6850 k.c., or 43.7 m.—logged at R3-4, using a power of only 50 watts. The usual American and European broadcasters are coming in on the 19, 25 and 31 m. bands.

★

From Readers

Mr. C. Anderson, of Dumbleyung, West Australia:—

Reception conditions here during August have been very satisfactory. From 13 metres up to 19 metres is now providing good signals during the evenings. The Central Americans on 31 metres, however, have weakened quite a bit in the mornings, and are not nearly as good as at the beginning of the month. 49 metres continues to be very noisy—a number of stations are there but cannot be identified on account of the QRN.

From SPW I have heard details of two new experimental Polish transmitters, namely, SP-19, 19.84 m., and SP-25, 25.55 m. I have logged the former of these, but only at very weak strength.

A Spanish speaking station on 25.1 m. is being heard here in the mornings from 7 a.m. I am not sure of the call, but think it is CXA. (There are three CXA stations listed near this wavelength—CXA-1, 25.1 m., CXA-10, 25.2 m., and CXA-12, 25.15 m.—S.W. Ed.)

I have noticed that HP5G has shifted down from 25.4 to 25.2 m. (just below TPA-3).

Stations logged during August:—
11 metres: W6XKG.
16 metres: JZL, TPB2, PHI-2.
19 metres: SP-19, GSI, JZK, TPB-6, OLR5A.

20 metres: HBJ.
22 metres: SPW.
25 metres: CXA (?), HP5G, HP5A, COGF, TPA-3, W8XK, W1XAL, W2XE, 2RO-4, TPA4, OLR4A, CR7BH

26 to 29 metres: COCX, HBO, SPD, ZLT-4.

31 metres: COBC, COCM, COCQ, COCH, TGWA, FZF-6, IRF, CSW, RAN, W1XK, W2XAF, W3XAU, ZHP, TI4NRH, VUD-2, Saigon, XEWW, HS8PJ, EAR, JFO.

32 metres: COBX, COBZ.

49 metres: HILA, W9XF, W4XB, COCO, W3XAU, Rangoon, W8XAL, VQ7LO and FIU.

50 to 100 metres: PMY, VUC-2, VUM-2, RV-15 and YDA.

Amateurs, 10 metres: ZL1GZ, ZL1HY, ZL2BT, ZL3AJ; K6LCV and K6ILW. 20 metres: XU8RB; TI2RC; PK6XX; KA1ZL; KA1JM; K6FKN; G6BW, G2TR, G2KG; J5CC.

New Release By Brimar.

(Continued from page 8)

Power output . . . . . 4.25 watts
* Taken at plate and screen voltages 100, grid volts — 0.
† Taken at plate and screen voltages 250, grid volts — 6.

Approximate Operating Conditions.

Plate volts	250	200	150
Screen volts	250	200	150
Plate current (m.a.)	51	31	30
Grid bias (volts) . .	-6	-4	-2
Cathode resistor . . (Automatic bias)	150	100	60
Load impedance . . (ohms)	8500	8700	8900

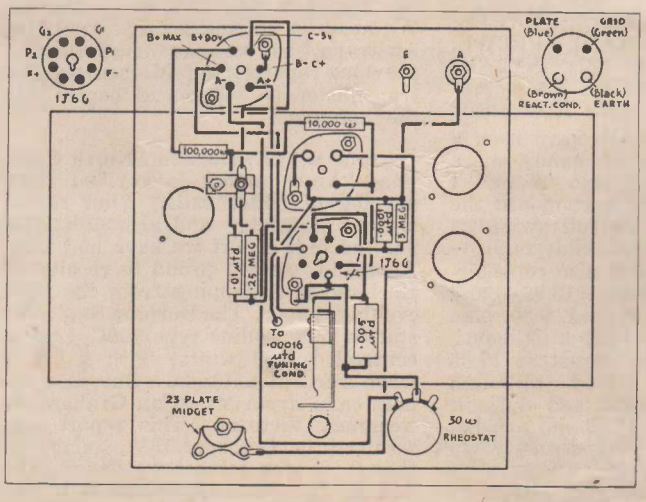
Can Drive From Diode.

The 6AG6-G is particularly useful where it is desired to dispense with an initial audio stage such as in a straight four-valve receiver. Its full output of 4.25 watts is easily obtainable, and its reproduction is characterised by great clarity and good low note response.

Designed Specially For Australian Conditions.

The construction of the valve is very rugged, the elements being firmly anchored at all necessary points. It is mounted in a fairly large envelope with a standard octal base.

The 6AG6-G has been developed specially for the Australian market. It provides for great flexibility in design, while enabling a higher undistorted output than is usual with output pentode valves. The filament is particularly strong, thus ensuring long life and satisfactory operation.



"Atlas All-Waver"

(Continued from page 42)

if possible should be 30 to 35 feet high, unshielded by trees or buildings, and well insulated from the far end right to the aerial terminal of the set.

Two-Valve Model Next Month.

Next month the addition of an r.f. stage to the "Atlas All-Waver" will be described.

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