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VOL. 11 ..... NO. 3

AUGUST 15, 1946

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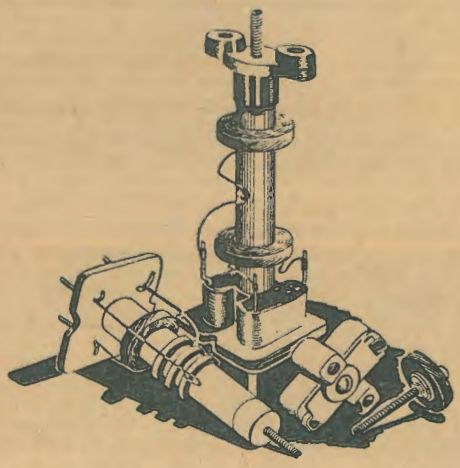

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VOL. 11 AUGUST, 1946 No. 3

CONTENTS

EDITORIAL

Further to last month's editorial, the progress of the radio trade is not very rapid in regard to peak production of new components. Apart from one or two real battlers, the rest seem to be happy enough to jog along with their old-style components, and with a comparatively limited production rate of even those.

There are so many obstacles to the production of new lines; so many hurdles to be overcome in order to obtain big quantities of raw materials and so little encouragement (from an income tax point of view) that it is not surprising that we find considerable difficulty in getting bright articles to fill our issues.

We had a big stunt lined up for this month's issue, but production difficulties held it up at the last minute. Fortunately, however, another interesing receiver urned up on time and so we are able to have a main feature article well up to standard. With rgard to the support, too, we managed to find a way out of the difficulty which seems to have proved a lot better than we first expected. This takes the form of a trip into the past; a review of some of the articles which were published in Volume No. 1 in 1936 and 1937. These circuits were all popular in their time, proved themselves capable of giving splendid results and are just as useful today as when they were first published.

Since our circulation figures are four times greater today than they were when these circuits were published it is certain that they will be new to many of our present readers, and even to our long-time supporters they should not lack interest.

—YOUR EDITOR.

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OUTLOOK FOR THE "HAM" MARKET

FAR from being treated as an afterthought in the field of radio manufacturing as in pre-war days, the Australian transmitting radio amateur is likely to merit much more consideration in the years to come. As the "Electronic War," recently concluded, progressed in technical intensity, the Ham came into his own. In every phase of warfare where communications were involved, hams were

By
DON B. KNOCK (VK2NO)
Experimental Radio Equipment Dept., Philips Electrical Industries of Australasia Pty. Ltd.

to be found. In the ranks of the service trained operators with no pre-war ham experience more than 80 per cent of them have since proved to be potential hams. In short, numbers of pre-war VK's is likely to be multiplied many times during the course of the next ten years. Very few Australian manufacturers really catered for transmitting amateur requirements prior to September, 1939 — and nobody could blame that apparent indifference. The demand wasn't large enough — yet I know of concerns, today very large industries, the foundations of which were definitely laid in the home constructor market between 1927 and 1939. There has always been a fair return for the manufacturer willing to supply popular lines for home constructors, but such a demand has only been created by the technical radio Press. Without publications such "Australasian Radio World," the maker of parts off all kinds would have been hard put to it to sell his goods. Intervention of the war undoubtedly saved a lot of people from trade doldrums by reason of war contracts at a time when anybody with a machine tool or two and a few feet of space could turn out items of value to the war effort. Now — that is all a thing of the past, and one of the brightest stars on the radio trading horizon is undoubtedly Amateur Radio. I say this despite the era of "disposals" gear. The seller of partially complete ex-Service equipment and "bits and pieces" caters very nicely for the inveterate constructor Ham — which comprised nine-tenths of the pre-war breed. But a new generation of Hams is on the way — and the wise manufacturer will recognise that face. Prior to the war Australian amateurs were often compelled to buy overseas components, for the simple reason that the products were not made locally. It wasn't so much a question of price — the Australian manufacturers just didn't make some items essential to the make-up of Ham stations. It was unwisely assumed that the Ham market wasn't worth consideration. Despite the fact that by the time duty had been taken into account, also exchange rate, there were many Australian Hams, and, for that matter, SWL's, who paid out lots of money for receivers of the type of the RME69, National HRO, Hallicrafters and others. I knew one SWL who paid no less than A£250 for a much boosted overseas receiver of massive appearance, and incidentally, that receiver had plug-in coils — not band-switching! He could have done just as well from a technical constructional article in this and other magazines for less than £30, but he and others considered that they were getting good value for money by paying for a Name. Then, of course, there were the unregistered receivers of overseas origin that found their way about in one's and two's by diverse means. There was not a single Australian manufacturer producing a receiver designed expressly for Ham needs because there was not the proportionate demand.

Components were certainly fairly well represented — nevertheless — many of these gradually vanished as manufacturers concentrated more and more on the ready-made broadcast receiver-buying public. A vast increase in Australian amateur numbers is predicted for the following reasons:

(*Continued on next page*)

The station operated by Don B. Knock in 1926. This was A2NO, Cremorne, N.S.W. — a quarter KW affair with two T250's in paral'el in a S. E. Hartley Rig. This picture of station and operator was taken at 3 a.m. during a "DX session" on "32 metres." Don says: "Those were the days — and nights — no phone — all CW and practically no inter-station QRM."

TECHNICAL BOOKS

1. Complete Radio Manual—
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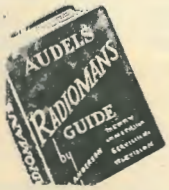

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..... (Tech. R.W.1)

HAM MARKET *(Continued)*

(1.) The majority of the newcomers are ex-servicemen who possessed no pre-war experience of the hobby, but because they were in close association with so many who *did* know the thrills of DX and everything that goes with private communication, are determined to get their "tickets" and break in to this fascinating field.

(2.) The increased popularity of radio in general by reason of press reports of war-bred achievements in the way of FM, television, and Radar.

(3.) The young generation — youngsters who can read for themselves in magazines such as this — and will undoubtedly "catch the bug." It can be taken for granted that the Australian, in common with British and American amateurs will run into a big family — with a healthy appetite for components and complete equipment. Components will be in big demand because the genus Ham is at heart an experimenter — even if only so in a modest way. But, in contrast to pre-war days, there will be a family of people who know more about actually operating equipment than constructing it personally. They will sail through operating examinations, and will acquire enough fundamental theory to take care of that side of it, and thus will obtain their license. With money put on one side for the purpose, these operator-hams will be in the market for ready-made gear such as receivers, transmitters, and test equipment for all purposes. The point to emphasise is that Amateur Radio in this country as in others, will definitely outgrow its former swaddling clothes — the demand will be there — and the wise manufacturer will not ignore the facts. But, he will be faced with a problem — that of producing an admittedly popular line of goods for a prolific, but low, or medium priced market, with materials supply as the aftermath of war a formidable obstacle. Despite such hurdles, they will be overcome, and amateur radio in the new Era will be amply supplied, to the mutual benefit of consumer and supplier.

A HANDY MULTI-METER KIT

It may not be generally known that kits of parts with which to assemble a multi-meter can be readily obtained. The kit for building up the meter shown here was obtained recently from Vealls.

THIS versatile instrument has a wide range of application. It will measure voltage, current and resistance values accurately, and the design incorporates an efficient output meter. Following is a description of how the various sections are used. There are further and wider applications for this instrument which will manifest themselves as the operator becomes more familiar with the Multimeter.

Unless the operator understands the voltage and current readings of various circuits, it is advisable to always use the highest range available to obtain an approximate reading, and then choose a lower range which will be more suitable for an accurate reading. This will prevent damage to the meter from excessive overload.

D.C. Voltages

Turn the central selector switch to the desired voltage range and make sure that the right-hand switch is turned to that position marked "D.C." The negative, or black, test lead is inserted in the negative jack on the instrument, and the red test lead inserted in the positive jack. The two test prods are then touched to the necessary parts of the apparatus under test, and the meter will read the difference in potential between the two points touched, which is actually the voltage. It is necessary to remember that voltage is the difference in potential between any two points.

If it is desired to measure the voltage on the elements of a valve, the metal chassis of a radio receiver or amplifier is usually regarded as forming the negative side of the circuit, and the elements concerned as forming the positive side of the circuit. For instance, if it is desired to measure the plate voltage of a valve, the appropriate range would be selected, the test lead placed on the plate contact of the valve, and the negative test lead placed on the chassis. The meter would then read the valve's plate voltage. This method does not apply to the measurement of negative grid bias.

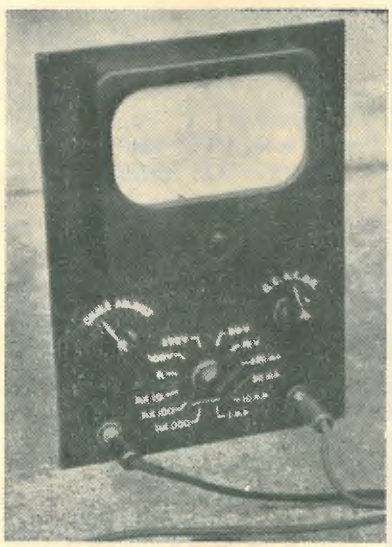
To measure the negative grid bias, the negative test prod is placed on the negative filament or cathode contact. The negative bias will then be indicated on the meter. This method will be inaccurate if a high value of resistance is included in the grid circuit, such as a resistance capacity coupled stage. In this case, the negative test prod should be placed on the end of the grid leak resistor, which does not connect to the grid.

When making voltage measurements, it is not necessary to remove or disconnect any wires.

A.C. Voltages

To measure alternating voltage, the only rearrangement of the controls on the instrument is to turn the right-hand switch to that position marked "A.C." The appropriate voltage range is then selected in the ordinary way on the range selector switch, and the test prods, when plugged into the instrument, can then be connected to the two points between which it is desired to measure the voltage difference. Since alternating voltage has no fixed negative or positive potential, the negative or positive test lead from the instrument can be placed on either of the two points which are under test. However, to form a safety habit, it is always wise to place the negative lead on the low potential side of the circuit or that side of the A.C. voltage which is connected to earth. If this is inconvenient, the operator need not worry any further.

When measuring alternating voltages on the 10 volt range, the lowest meter scale marked "10 V. A.C. only" should be used. When using the 50, 250 and 1,000 V. ranges, measurements should be made on the upper set of voltage graduations.



The multi-meter which is assembled from the kit.

D.C. Currents

In making current measurements, it is necessary to break the circuit and insert the test leads so that the meter is placed in series with the circuit. For instance, to measure the plate current of a tube, the wire on the plate contact would be removed and connected to the positive side of the meter. The negative meter lead would be connected to the plate contact and the selector switch would be turned to the desired range, and then the set switched on. The plate current of the valve would be registered on the meter. This procedure also applies to any other circuit in which it is desired to measure current in milliamperes. The circuit is simply

(*Continued on next page*)

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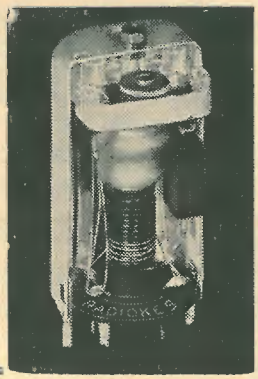

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MULTI-METER KIT

(*Continued*)

broken and the meter inserted in the break to complete the circuit again.

Where the current value is unknown, it is always wise to commence on the highest range, and then turn the selector switch down to that range which gives the most convenient deflection of the needle on the meter.

It is essential when making D.C. current measurements, to make certain that the right-hand switch is turned to the position labelled "D.C." The instrument is only intended to measure alternating milliamps on the 1 m.a. range, in which case the upper voltage graduations are used. This range can be used in conjunction with a suitable current transformer for the measurement of higher values of alternating currents in excess of 1 m.a. without the use of a current transformer.

Resistance

This instrument will measure values of resistance in four convenient ranges. 0-1,000 ohms, 0-10,000 ohms and 0-1 megohm.

To measure values of resistance below 1,000 ohms, the selector switch is turned to the position marked "R X 1." The test leads are inserted in the instrument, and then the test prods are touched together so that the meter needle will swing right over to the position marked "O" on the upper meter scale. If it does not exactly reach the "O" mark, the ohms compensator, at the left-hand side of the instrument, is turned until the needle indicates zero resistance. The meter is then ready for use.

To measure resistance, one side, or both, of the resistance or other part, should be disconnected from the rest of the circuit, and the test prods placed on its terminals. The value of resistance will be shown on the ohms range.

For values up to 10,000 ohms, the switch is turned to the position marked "R X 10," and the scale figures must be multiplied by 10 to give the correct resistance. For example, if you are measuring a resistance of 4,000 ohms, and the switches are turned to the correct position, then the meter needle will indicate 400. Multiplying this by 10 gives 4,000, which is the crorect reading, assuming that the resistor is in good order.

When measuring in the range of 10,000 ohms, it is necessary that the produs are touched together again and the needle adjusted for zero resistance by use of the ohms compensator.

For values up to 10,000 ohms, the range switch is turned to the position, marked "R X 100," and the procedure is carried out as explained previously. For measurements up to 1 megohm, turn switch to "R X 1,000," and proceed as before.

In measuring resistance, it is necessary that the right-hand switch be turned to the position marked "D.C." Always, before measuring resistance, make certain that the test prods are touched together and the ohms compensator adjusted, so that the meter reads zero before operation. The purpose of this ohms compensator is to compensate for any variation in battery voltage, which will enable you to obtain a maximum life from the built-in batteries.

CAUTION.—Before attempting to measure the resistance of any part of radio or electrical apparatus, be sure to switch off the power, or to disconnect one wire from each battery in the case of battery operated equipment.

Output Meter

In addition to measuring ordinary A.C. voltages over a wide range, the Multimeter can also be used as an output meter. The right-hand knob on the instrument is turned to the position marked "OP," and the range selector is turned to an appropriate voltage range. The test leads are inserted in the instrument, and one lead is attached to the chassis, while the other lead is touched to the plate off the output or power valve in the receiver or amplifier under test.

Small push-on clips are provided with the instrument. These easily and conveniently fit on the test

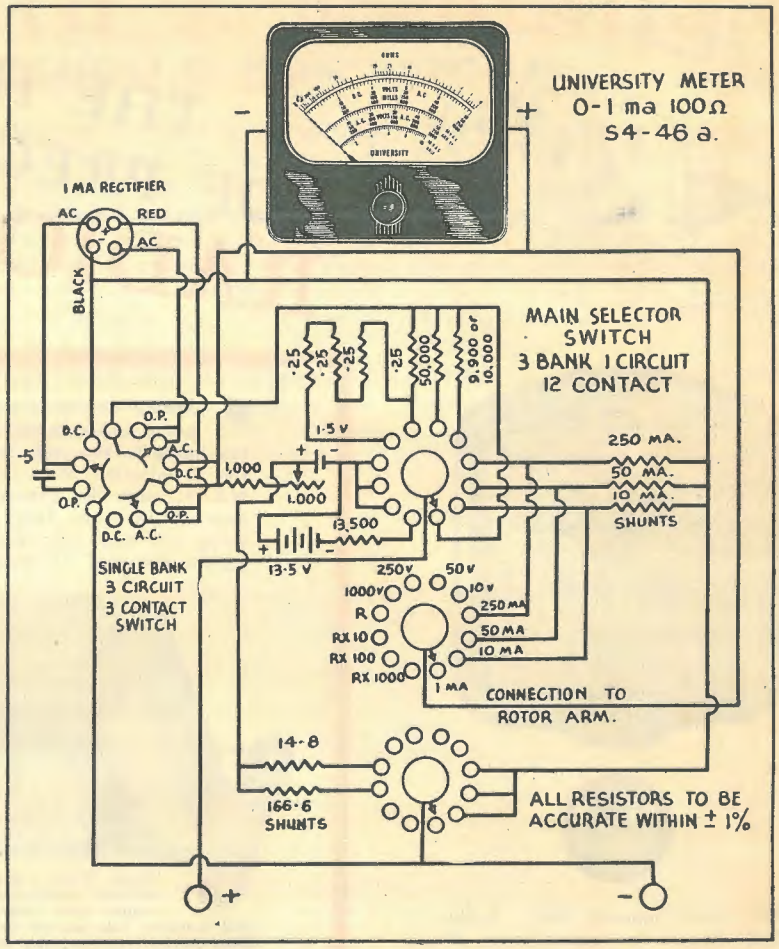
leads, so that it will not be necessary for the operator to hold these on to the point under check in the chassis. They can be clipped on to any convenient wire or terminal, leaving the operator's hands free for alignment of the set.

If the range selector is turned to 10 volts when using this as an output meter, it will give a very sensitive reading. However, it will be found necessary for the volume control of the receiver to be kept low, so as not to damage the meter. This 10-volt range is recommended for aligning sets. If the output meter is required for a purpose other than alignment, the 50-volt or 250-volt will be found quite suitable.

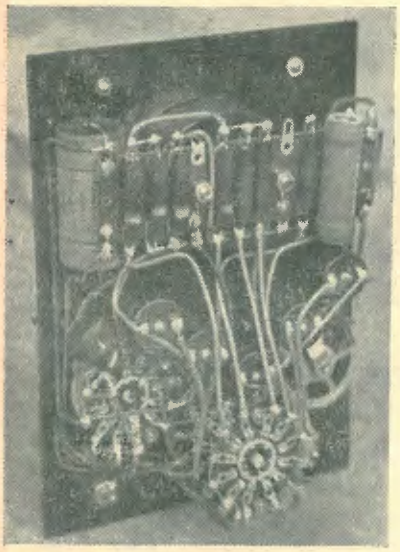
Used in this manner, the instrument will facilitate the alignment of a receiver, especially when a modulated oscillator or signal generator is used as the source of signal.

Battery Replacement

The resistance measurement section of this instrument utilises a standard 1.5 volt 950 dry battery cell in conjunction with three type 703 dry batteries. These usually last up to nine months without replacement. It will be known when the battery is due for replacement



Circuit of the meter, showing the switching arrangements.



Rear of the panel. The builder makes his own case of wood or metal to suit his requirements.

by the fact that the ohms compensator on the panel will not enable the pointer of the meter to be brought right to the zero mark.

To replace batteries, remove the four screws on the edge of the instrument, and the batteries will be seen in special clips inside the case. Unsolder the leads from each end of the 703 batteries and replace with new batteries in exactly the same position. Make sure that the lugs are soldered on to the new batteries in the same manner as they were to the old batteries. The type 950 battery is held in a clip at the side of the meter. To replace, first remove the four screws in the upper battery panel. Loosen the meter terminal nuts several turns, and clip in new battery in the same position as the original. Be sure to tighten the meter nuts before replacing the upper battery panel.

General

The primary purpose of this instrument is to measure D.C. voltage, currents and resistances, as well as A.C. voltages and output voltages. The instrument is accurate, and is easily portable.

It will cover nearly all of the routine checking required in a radio receiver, and in general radio equipment. It must be remembered that voltage measurements in a receiver will not only indicate that there is voltage available, but if they are measured through any of the components in the receiver, they will indicate whether that component is open circuit or otherwise by the indication of voltage on the meter.

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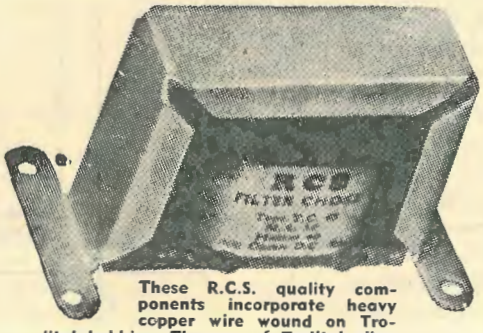

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SPLENDID EXAMPLE OF "HAM" ANTENNA

Consistent workers and observers of VK doings on the "Ten" metre band from the time the "all clear" was given early this year have noticed that one of the stations to which DX from places far and wide has a habit of responding is that of VK2AKR. The phone signal from this station, resulting from only a 45 watt rig, is probably the best known of all VK's on "Ten." Reason for the consistent performance is pictured here in the shape of the well-designed and engineered two-element rotary array; sufficient answer in every way to any arguments that multi-element arrays are essential if you want results. Owner-operator of VK2AKR is Jack Lindsay, and his location is to the West of Metropolitan Sydney, in the suburb of Lidcombe. Ex-Army hams may recall it on the rail service to Liverpool, Ingleburn, etc. — but no such beam would then have been visible from the train windows. Since then, however, its presence has been enough to make a few G hams, RN visitors to VK, hop off the train and call to see what goes with the beam in the shack!

DESIGN DATA

Located at the top of a sturdy, well-braced tower, this rotatable array, controlled from the operating position, is in practice a simple arrangement fundamentally. Jack makes no claim for originality; and refers enquirers for practical details to the 1938 Edition of the old "Radio" Handbook, page 119. There is a difference, however, in that the director is not adjusted by means of the small centre stub in that description, but by means of telescopic tubing. Tenth wave spacing is used between radiator and director. Most important item is, naturally, the method of feed. From the centre of the radiator, a length of 70 co-axial line — 5 feet 5 inches, is followed by a quarter-wave Q bar section, thence into a 600 ohm line to the shack. So successful has this beam been on "Ten" that with the opening of "Twenty," VK2AKR is now planning a similar structure above the present one, and at right angles, cut for the lower band. As he is also more than casually interested in "Six" for local QSO's, a ground-plane antenna will be added. The moral is one that we've always stressed: "A good antenna is more than half the battle."

—D.B.K.

CANADIAN FM

Canada's first broadcast FM transmitter started operating a few months ago from Mount Royal, Montreal. The transmitter, employing a frequency of 48.8 Mc/s with a power of 25W, uses the call VE9CM.

28 M/cs. Beam Array of VK2AKR, Lidcombe, N.S.W.

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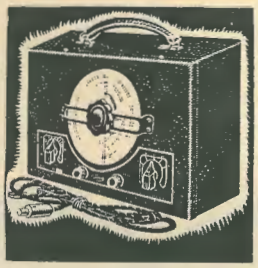

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A Page from the Past

"ALL-WAVE BAND-SPREAD TWO"

A two-valve battery receiver using a 19 twin triode as combined detector and audio amplifier, resistance capacity coupled to a 1D4 output pentode. Has bandspread tuning, and covers both the shortwave and broadcast bands.

FOR set builders who want to get the utmost in enjoyment from their hobby at the lowest cost, the "All-Wave Bandspread Two" is an ideal little receiver. With a handful of parts, two valves, some batteries, and a pair of 'phones — representing a total outlay of a few pounds — a set can be put together that will bring in shortwave stations in all parts of the globe, and give speaker reception from broadcast stations besides.

Originally described in midget form in the May, 1936 "Radio World," the "All-Wave Two" has proved widely popular with readers, many of whom have built it and found that it can do all that is claimed for it.

The Circuit

Briefly, the "All-Wave Bandspread Two" uses a type 19 twin triode class "B" valve to perform two jobs. One triode section acts as a leaky-grid detector, with reaction, and is resistance capacity coupled to the secon dsection, acting as first audio amplifier. The latter is in turn resistance coupled to a 1D4 output pentode.

The Coils

To tune continuously from about 17 to 90 metres and from 220 to 540 you will need five plug-in coils.

Number 24 enamelled wire is used for all short-wave secondaries, and 28 d.s.c. for all shortwave reaction windings, with 32 or 34 gauge enamelled wire for the broadcast coils.

Each shortwave reaction winding is put on below the secondary, with $\frac{1}{8}$-in. between the two windings. The accompanying sketch shows the method of winding, and the pin connections, which are numbered correspondingly on the circuit and under-chassis diagrams.

The reaction windings for the broadcast coils are put on over, and not below, the bottom end of the secondary in each case. The two windings should be separated by a layer of Empire cloth or oiled silk.

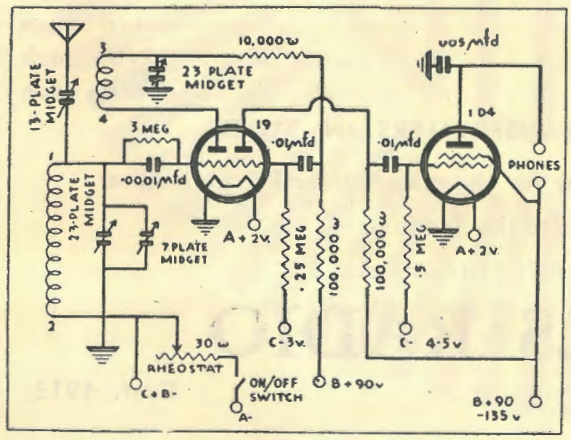
About the Construction

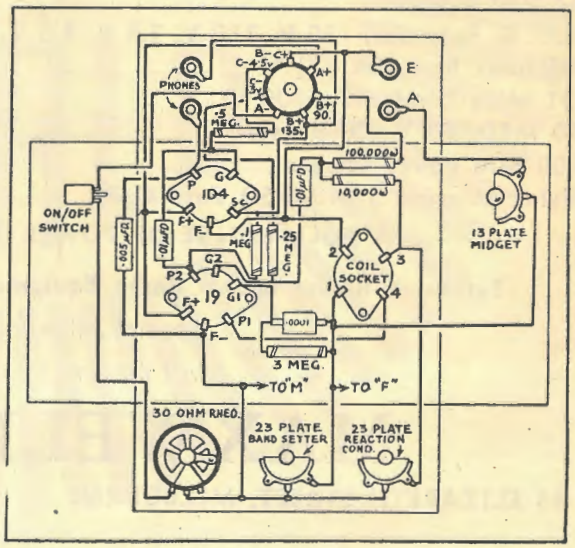
The coil, valve, and battery sockets, four terminals, aerial series condenser, and on/off switch are mounted first. Remember that the "A", two "P" terminals, and aerial condenser must be insulated from the chassis.

Then place the front panel against the chassis, and mount the tuning, band-setting, and reaction condensers, and the rheostat. Before the tuning condenser is mounted, however, a lead should be soldered to the fixed plates terminal. This passes down through the chassis and is soldered to the corresponding terminal on the band-setting condenser. Also, if the set tends to be at all noisy when the dial is rotated, another lead should be soldered to the moving plates terminal and to the earth line underneath the chassis.

(*Continued on next page*)

Schematic circuit and wiring diagram for the "All Wave Band Spread Two" for battery operation.





ALL-WAVE 2
(Continued)

Either 18 or 20 gauge tinned copper wire, covered with spaghetti, can be used for wiring the set, or ordinary "push-back." Solder all joints, and test them by giving each a tug. The various fixed condensers and resistors are mounted directly by their pigtails.

The wiring will not be given word for word, as it is plainly shown in the diagrams. One detail that should be noticed is that all earth points are bonded together and taken to a 16 gauge tinned copper wire earth line, running direct to the earth terminal. This is to ensure that all earth connections will be of low resistance.

Wiring the Battery Plug

Next wire the battery cable to the 7-pin plug, and identify each pin, jotting down the colour of the lead running to it, and its designation.

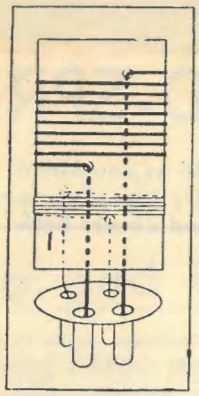
Some Operating Hints

After everything has been given a final check, plug in the valves, 80-metre coil, and the headphones, connect up the aerial and earth leads, and finally the battery plug. Switch on, and adjust the rheostat until two volts are applied to the filaments.

Next, set the aerial pre-set condenser about half-way out 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 near-by listeners. Besides, it is never in its most sensitive condition when actually oscillating; for best results it should be just on the verge of oscillation.

For a small set like this, a good aerial and earth system is essential for best results.



This sketch illustrates how the windings are put on the three plug-in coils that are needed to cover from 19 to 90 metres. Details of the number of turns for each coil are given elsewhere.

"BANDSPREAD TWO"
COIL WINDING DETAILS

BAND	Grid	Reaction
17– 30 metres	7	7
28– 51 metres	15	10
48– 90 metres	22	13
220–360 metres	136	32
360–540 metres	182	36

NOTE.—All reaction windings should be put on in the same direction as the grid windings, as shown in the coil sketch. Windings spaced $\frac{1}{8}$-in.

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The speed should be checked when the pick-up is actually in working position on the record for the best results.

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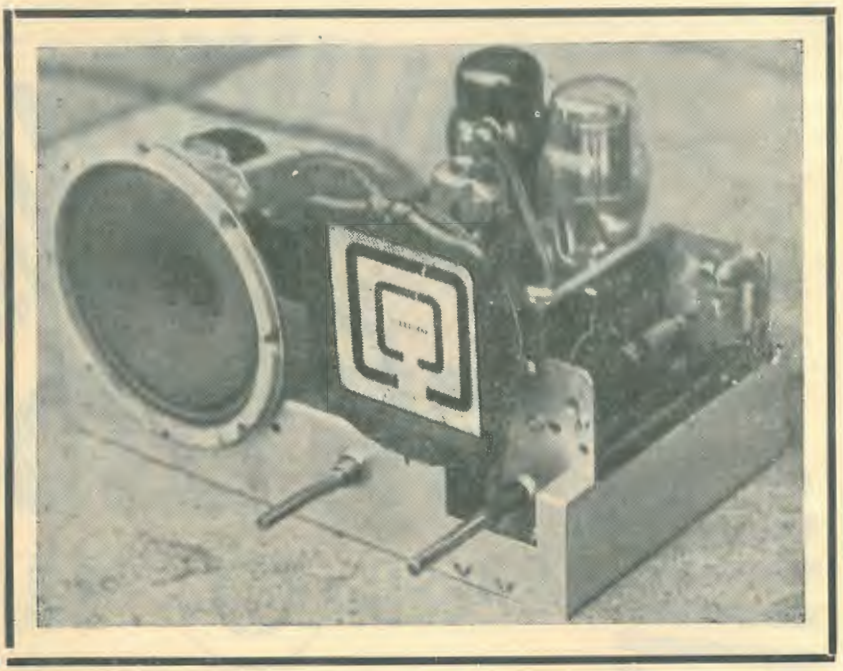
The KFT2 foundation-kit is now coming off the production-line and will be available shortly.



Owing to the keen demand for all types of KINGSLEY FERROTUNE units and the limited production which is due to the shortage of essential materials, there may be some delay in delivery — but KINGSLEY'S on the job doing all it can to speed through your favourite radio supplies.

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This Month's Feature :-

THE "FERROTUNE" REINARTZ

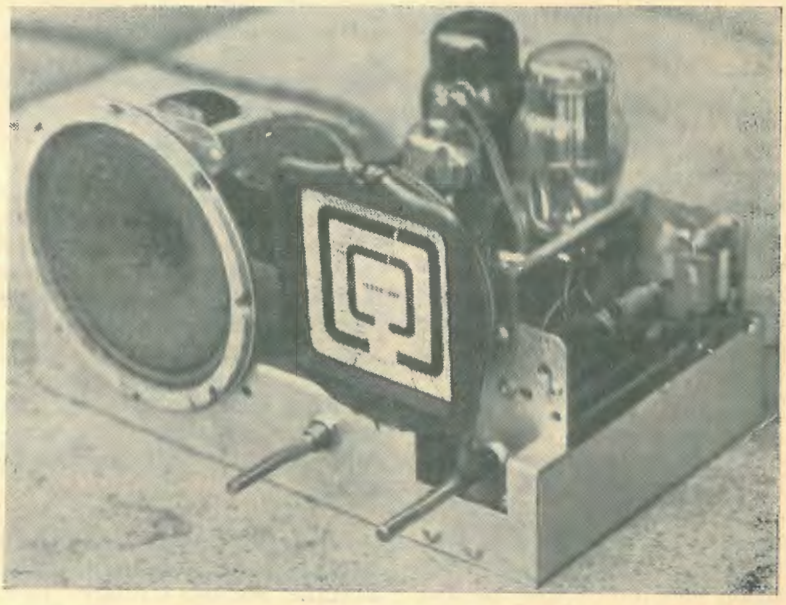
JOHN L. REINARTZ is a prominent radio "ham" and technician in America. I met him at Hartford when I was there in 1936. The name of Reinartz was applied to a receiver with regeneration in the early days of broadcasting, and somehow or other it seems to have stuck as a

By
A. G. HULL

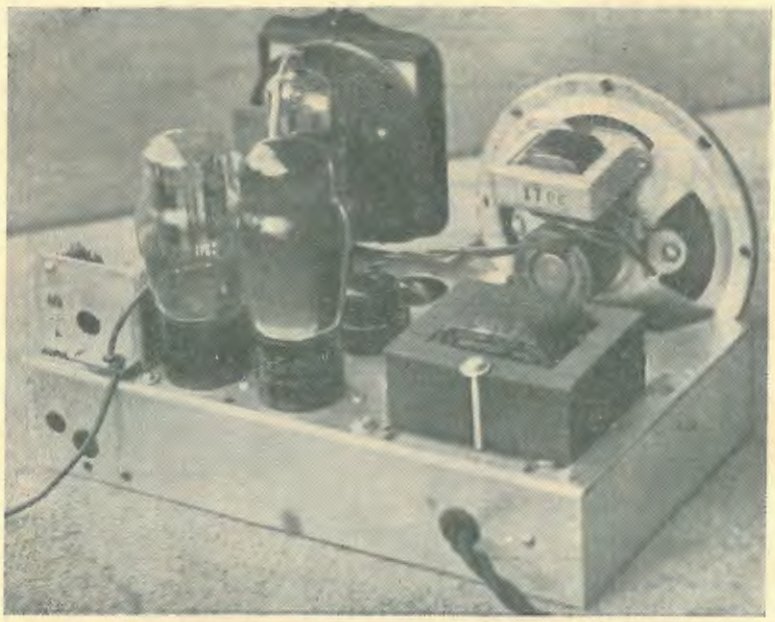
general name for any set with a regenerative detector, and so I have no hesitation in again applying the title of Reinartz to this latest of baby receivers, a regenerative set featuring Ferrotuning.

Superhets may come and superhets may go, but these little Reinartzy sort of sets always seem to find general favour with a certain class of set builder.

They are exceptionally easy to build and as soon as they are built they can be expected to give immediate satisfaction without any alignment worries or other messing about. Operation of the regeneration control calls for a certain amount of intelligence, but of all the Reinartz circuits this latest one is the simplest in this regard, as the use of permeability tuning makes the regeneration control so constant that it works more like a volume control than a reaction control. In any normal locality where the signal strength of the various stations is anything like level it is possible to set the regeneration control and simply tune stations in one after the other almost like a superhet.



Front view of the chassis.



Rear view of the chassis.

Permeability Tuning

Those of our readers who have studied recent issues will know all that there is to know about this latest innovation, but in case anyone hasn't grasped the idea we may as well run over some of the main points.

In order to tune in signals from a station on a given wave-length you need to have a circuit tuned to the frequency of that station. In order to have a tuning circuit you need inductance and capacity, and in order to be able to vary the resonant frequency you must vary

(*Continued on next page*)

FERROTUNE REINARTZ

(Continued)

either one or both of these factors. Up till now the normal practice has been to use a coil with a fixed inductance and a condenser which can have its capacity varied by moving the rotor plates. Now with permeability tuning we have a fixed condenser, and we vary the inductance of the coil by the movement of an iron-cored slug down the centre of the coil.

Kingsley Radio Company has been doing the pioneer work in connection with permeability tuning, and soon recognised the inherent advantages of this method over the normal gang condenser tuning.

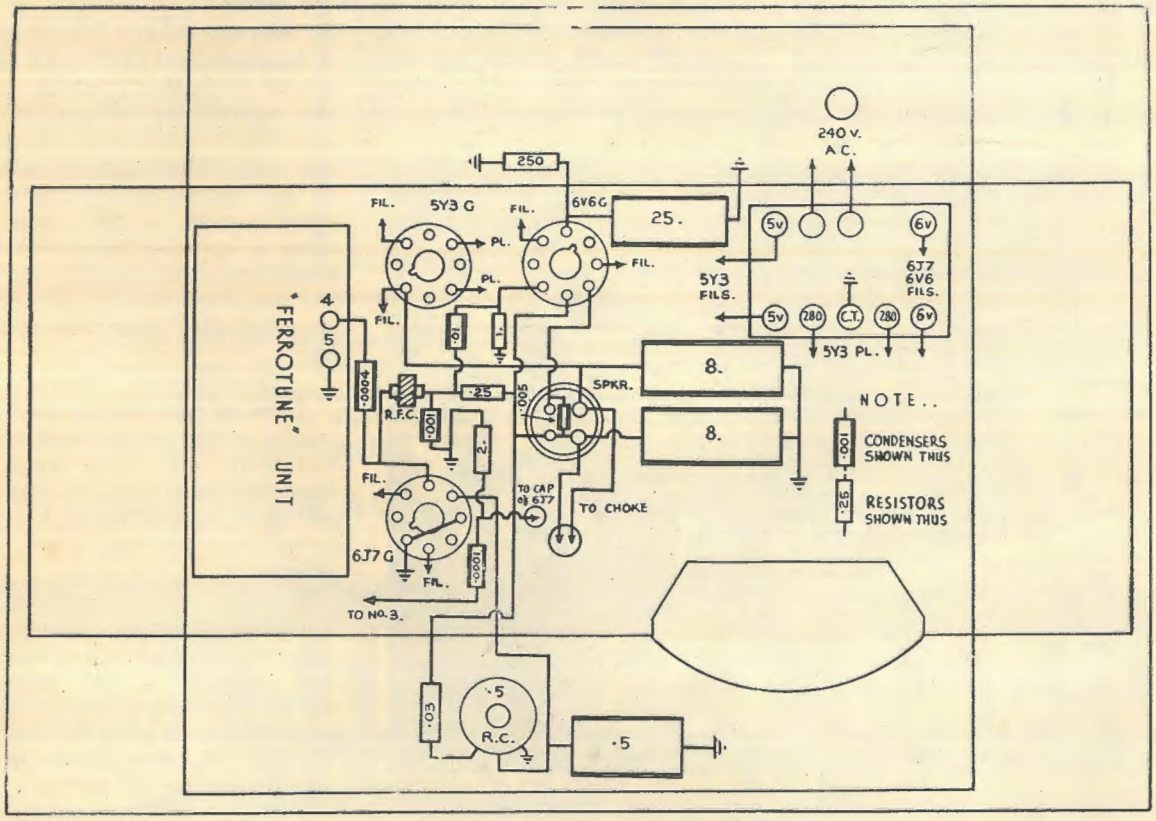
Extensive research was carried out by them to apply permeability tuning to all types of circuits formerly using gangs. Therefore it is not surprising that as soon as they got the superhet tuning units into production they turned their attention to the use of permeability tuning for the simpler little sets. Results are improved to the extent expected, and so it should not be surprising if permeability gives a new lease of life to the popularity of these little sets.

We had an opportunity of being at a demonstration of this little set one Saturday afternoon recently, and the performance was exceptionally good. Although operating in a fairly difficult location, it made easy work of separating all the local stations and brought in 3GL (Geelong) quite cleanly in between them. Volume was just the same as though the set had been a powerful superhet and the tone, if anything, slightly better. It will be readily appreciated that the set offers exceptional value at its modest cost and thoroughly deserves the popularity which it will undoubtedly enjoy.

The Tuning Unit

The tuning unit is supplied in a boxed up form, with five numbered terminals and two trimmers. There is no gang condenser to worry about and the control knob works directly into the unit, with a cord drive to an indicator dial only. The action of the knob is smooth and the drive to the iron slug is so arranged internally that the movement of the knob shifts the tuning frequency as just about proper frequency to knob turns ratio, so that a turn of the knob means just the same frequency change at one end of the dial as the other. Most important of all, the movement of the iron slug does not appreciably vary the capacity factors in the tuned circuit, so that the reaction control is not more critical at one end of the band than at the other. As we mentioned above, the operation of the regeneration control, on this account, is not nearly so critical as with the old-style sets.

There is no need to get scared at the mention of the trimmers, for neither of these is at all critical and no matter how they are adjusted the unit should still give good results. One is for the setting of the

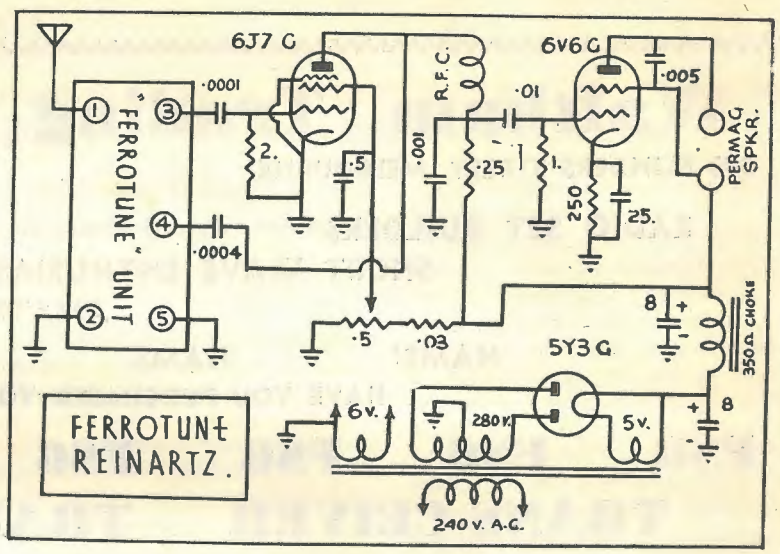


Compare this diagram with the photo opposite and the wiring is easy.

dial calibrations, while the other is a series capacity in the aerial lead-in, thereby adjusting the aerial loading to compensate for different lengths of aerial which may be used with the set. To a certain extent it gives a control over the effective selectivity and sensitivity of the set. It is extremely easy to adjust and can be set by ear to the position which appears to give the greatest gain at the same time as adequate selectivity for the particular location in which the set is being used.

The Kingsley "Ferrotune" kit for this receiver is known as type KFT2 and comprises the metal chassis, tuning unit complete with calibrated dial and also the r.f choke.

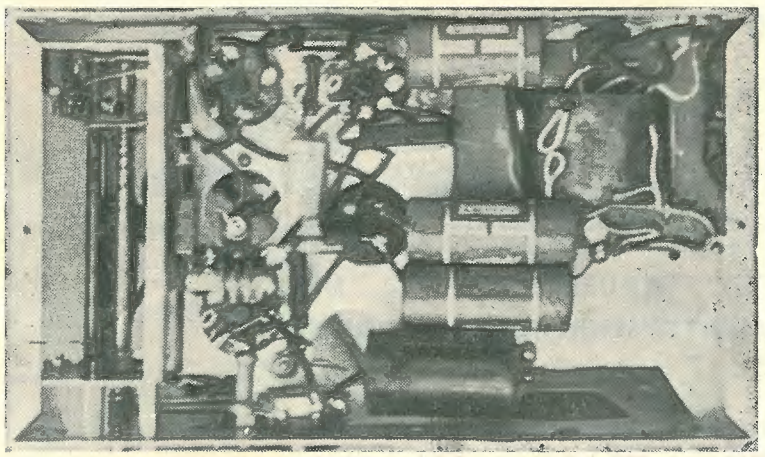
The use of the complete foundation kit, as listed above, ensures that the lay-out will be correct, and is strongly recommended. The KFT2 foundation kit is in production, but as it is likely that orders will overwhelm the production rate there may be some delay with deliveries.



The circuit diagram.

It will be found that as it is screwed in (clockwise) this trimmer control will give greater volume, other things being equal, but with less selectivity, so that the limit is reached when stations start to overlap. The setting may also have some effect on the reaction control. In certain difficult locations it may be found necessary to pay attention to the length of the aerial used, but in most cases the trimmer will provide sufficient control over the aerial loading.

To those who have never operated sets with regeneration it is necessary to point out that the set gives its best performance at the setting of the reaction control just back a shade from where the set bursts into a squeal. Operated at this point a regenerative set has far greater gain and far sharper selectivity than without reaction. Advanced too far, the reaction control causes a squeal which not only makes reception impossible, but also re-radiates to cause interference with sets in the neighbourhood over a large radius, so the set must never be left in an oscillating condition.



A photograph of the wiring.

With Other Circuits

It should be clearly understood that the circuit we give is simply one suggestion. There are dozens of other circuit arrangements which could be used, such as the popular old "Direct Coupled Two" of 1931 vintage, or with a circuit using an audio transformer for coupling. The unit can also be used for one-valve headphone sets, or one-valve sets using a twin-triode like the 6SN7GT. In fact it can even be used for tuning a lowly crystal set. In this latter case the exceptional efficiency of the tuning unit can be expected to result in improved performance with a set of this type.

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The Set is supplied with Palac 0-1 Thermo-Ampmeter priced at	4	4	0
The Power Pack is a separate unit and entirely self-contained, works off a 6-V battery and gives 290 Volts at 50 mil. or 175 Volts at 40 mil. The Pack would cost at least to build	15	0	0
The Vibrator is an A.W.A. gas-filled job, priced at	2	13	0
Army type Key, valued at		12	6
The Trans-ceiver is built with the finest components and cost the Government over £100. Chock a-block full of condensers, valve sockets, carbon and wire wound resistors, tuning condensers, coils, dials, volume controls and I.F.'s, Morse Key, etc., etc.	25	0	0
TOTAL	£56	3	1

REMEMBER! REMEMBER! REMEMBER!

The total value of these parts as listed in all retail shops is approximately £56/3/1 for the parts only. The completed Receiver cost the Government £100.

OUR PRICE COMPLETE FOR THE WHOLE LOT IS:

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REMEMBER! REMEMBER! REMEMBER!

The Price includes: (1) The Trans-ceiver
(2) The Valves.
(3) The 0-1 Therma Ampmeter
(4) The Power Pack
(5) The A.W.A. Gas-Filled Vibrator
(6) Best Quality Morse Key

The Receiver is an excellent short wave Receiver in itself and works from a 6-Volt Battery. It is ideal for country use. The transmitter uses 2 valves. 8 valves in all.

HURRY! HURRY! HURRY!

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A Page from the Past

SKY-CRUISER BATTERY FOUR

High sensitivity and low running costs are features of this four-valve T.R.F. type battery set. It should bring in interstate and overseas stations at full volume.

IN city locations, where the presence of high-powered locals makes high selectivity the first essential of any powerful set, the superheterodyne is a universal favourite, because fundamentally it is much more selective than the tuned radio frequency type of receiver.

In country districts, however, the need for high selectivity is not so acute, and as a result, sets of the t.r.f. variety are more widely used. The "Sky-Cruiser Battery Four" will give excellent result in such locations. Using only four valves, the set is nevertheless remarkably sensitive, and will pull in interstate and overseas stations at full volume and with fine tone.

A smooth-working reaction control is, to a large extent, the secret of the "Sky-Cruiser's" punch, and it makes a tremendous improvement to selectivity as well.

The "Sky-Cruiser" uses a pair of 1C4's as r.f. amplifiers, followed by a third as leaky grid detector. This is resistance coupled to a 1D4 economy output pentode.

"B" Class Audio can be Added

The chassis has been planned so that any time a powerful "B" class audio system can be substituted for the output pentode.

To do this, the battery and speaker sockets are shifted to the holes marked "Not used" on the sketch showing chassis dimensions. The sockets on the right-hand side of the chassis are then re-arranged so that valves and components (from front of chassis) are: 1C4 detector, 30 driver, "B" class input transformer, and 19 "B" class output valve.

The Construction Outlined

Dimensions of the chassis are shown in a sketch accompanying this article. If Radiokes coils are used, then all the large holes stamped in the chassis can be 1-3/16th ins. diameter. For Crown coils, however, holes of 1½ inches diameter are required.

The components mounted on the chassis are as follows: "A" and "E" terminals (former should be insulated from the chassis), on/off switch, fuse-holder, valve sockets, potentiometer, reaction condenser, coils, and condenser gang. The dial is mounted last of all, to avoid damaging it when the chassis is inverted to put in the wiring.

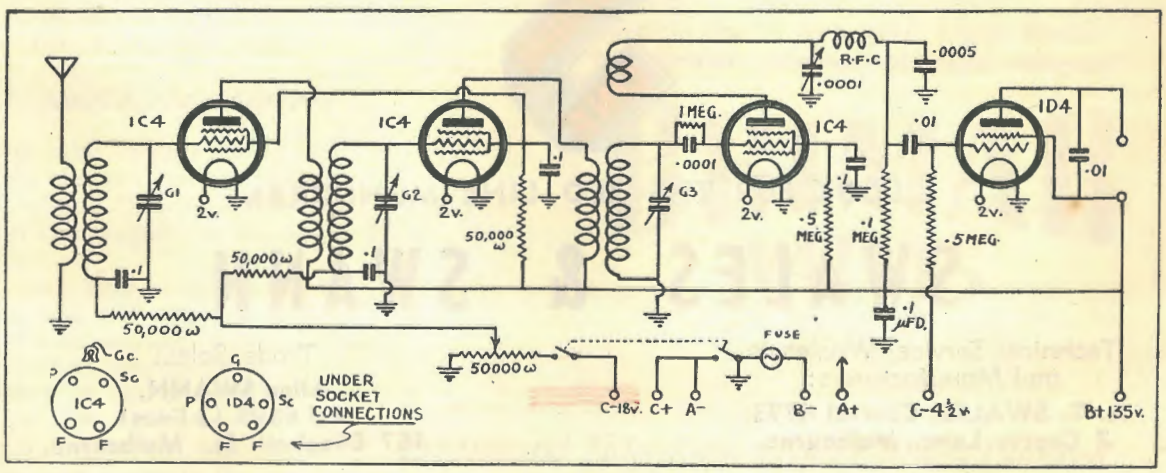
The condenser gang and fuse-holder are mounted away from the chassis by means of 1¼ inch bolts and nuts, and some ¾ inch lengths of hollow brass tubing. Before the gang is mounted in place, solder a 6 inch length of push-back to the fixed plates terminal of each section. These leads pass through the chassis to the coils.

Rotors Earthed Directly

In the original set, the brass wipers in contact with the three rotor sections of the gang were also earthed direct to the earth line running to the "E" terminal. These connections, covered with spaghetti, can be seen in the under-chassis photograph, though they have been omitted from the wiring diagram.

Though the moving plates are earthed through the condenser

(*Continued on page 23*)



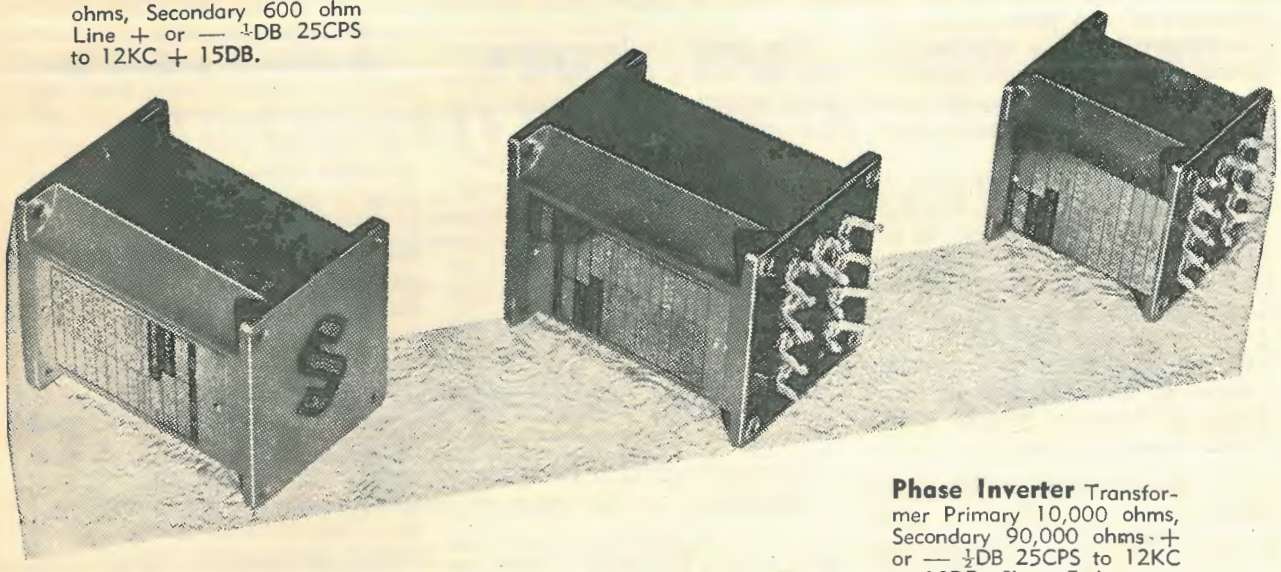
The "Sky-Cruiser" circuit, showing all values. Three 1C4's and a 1D4 are used.

RED LINE

WIDE RANGE AUDIO EQUIPMENT

Intervalve Driver Transformer Primary 20,000 ohms, Secondary 20,000 ohms Max. Unbalanced DC 6 MA + or — ½DB 25CPS to 10KC + 21DB.

Low Level Output Transformer Primary 20,000 ohms, Secondary 600 ohm Line + or — ½DB 25CPS to 12KC + 15DB.



Phase Inverter Transformer Primary 10,000 ohms, Secondary 90,000 ohms + or — ½DB 25CPS to 12KC + 10DB. Shunt Fed.

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SKY-CRUISER
(*Continued*)

frame, a direct connection is safest, particularly if coils with high-gain primaries are used.

COMPLETING THE WIRING

The filaments can now be wired up, and the remainder of the wiring put in systematically, starting from the "A" terminal and working through to the loud speaker socket. When wiring in the .1 mfd. by-pass condensers, connect them as closely as possible to the coil or valve socket lugs they are by-passing. Also, in each case be sure to take the end marked "outside foil" to earth. The connections for the coils are supplied by the manufacturers.

A small strip of bakelite about 1 inch long, and with a solder lug mounted on one end, is bolted to the front of the condenser gang, as shown in the photographs. A lead from the fixed plates terminal from the top of the front section of the gang is run to the lug, to which is also connected one side of the grid leak and condenser. A short lead with a grid clip on the end is soldered to the other.

A ½-watt leak and midget fixed condenser were used in the original set, but a 1-watt resistor and standard size condenser can be used equally well.

When the wiring is completed, it should be carefully checked over. Next, the battery cable leads can be soldered to the pins of the six-pin plug, and the speaker plug wired as well.

THE LINING UP PROCESS

The batteries can now be connected, the valves and speaker plugged in, and the aerial and earth leads attached. Switch on, and with the volume control turned full on, slowly advance the reaction control until a hissing noise is heard, denoting that the set is on the verge of oscillation. Next, rotate the tuning control, and a station should soon be picked up.

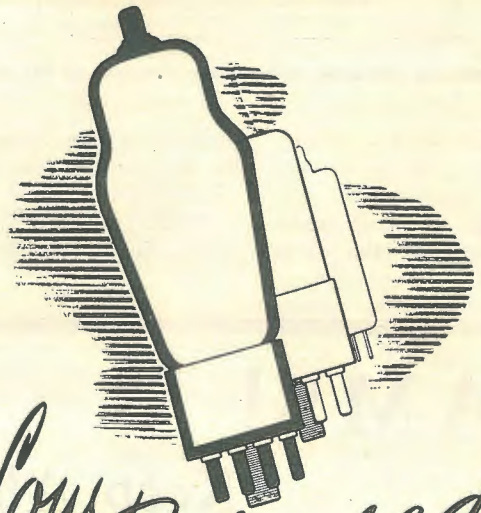
To align the "Sky-Cruiser," set all three trimmers about half-way out, and tune in a station near the centre of the band — one that requires a fair amount of reaction

ENGLISH MINIATURE SUPERHET

A four-valve superhet in a moulded case 8¾-in. x 3-⅝-in. x 3⅝-in. has been designed by Vidor Ltd., Kent, and will be on the market shortly; the price will be in the region of £12. It operates from 1½-volt L.T. and layer-built 120-volt H.T. and grid-bias batteries. The case is provided with a leather carrying strap and the action of opening the lid switch on the set.

U.S. AMATEURS IN GERMANY

American amateurs in the Army of Occupation in Germany, like their British counterparts, are to be allowed to operate transmitters with 25 watts in the aerial. They will be allocated D4 calls and will be permitted to operate in the 21-21.5, 29-30 and 58.5-60 Mc/s bands.



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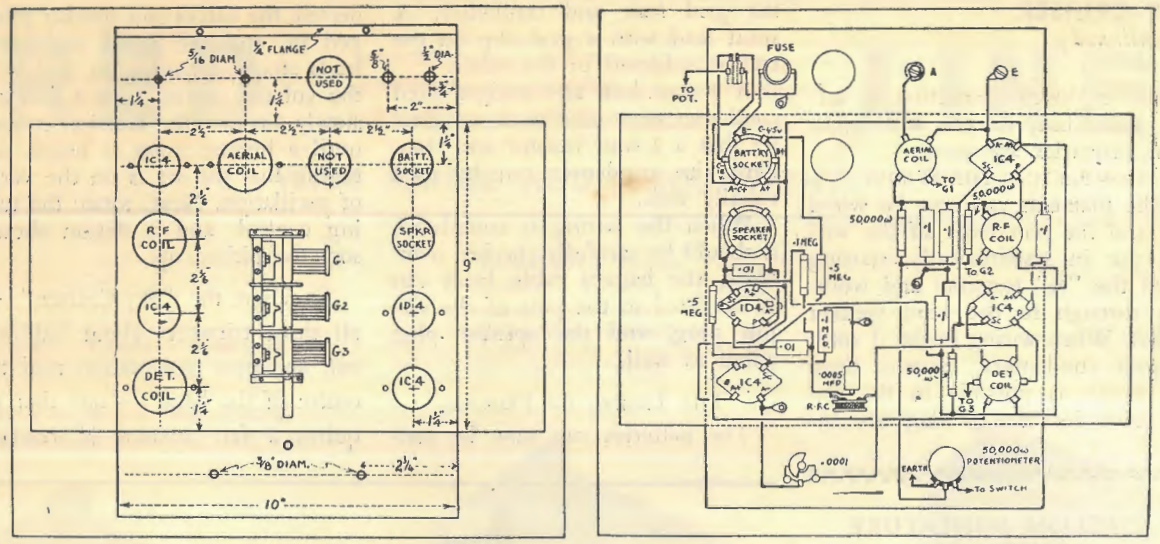

Base lay-out plan and picture diagram of the wiring for the "Sky-Cruiser" battery set.

SKY-CRUISER

(*Continued*)

to bring it up to quiet room strength. Now adjust the three trimmers in turn, commencing with the detector, for loudest volume.

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A Page from the Past

THE FIDELITY BROADCAST 5

IN the "Fidelity Broadcast Five" pentode sensitivity is combined with triode quality to give well over three watts of output, with a tonal quality equal to that of de luxe receivers costing many times the amount.

Listening tests on the receiver more than substantiate every claim made for it. Both on radio and records, orchestral music is a pleasure to listen to. The timbre and resonance of the strings, combined with real low-note response of the bass instruments, are reproduced with a tonal fidelity that is startling to those accustomed to the ordinary receiver with single pentode output.

Some Performance Figures

In laboratory tests also the receiver showed up to excellent advantage. Before quoting figures it should be mentioned that all measurements on fidelity and distortion were taken across the primary of the speaker input transformer.

While tests of this nature are usually taken with the output valve working into a purely resistive load, this does not take into account distortion actually arising in the speaker transformer, and so the connection used gives a far more useful guide to the performance of the receiver.

Checked on the cathode ray oscillograph, linearity to 10,000 cycles is perfect up to 3.2 watts output. Audio fidelity also (from pick-up terminals to speaker) is exceptionally good. The total harmonic distortion increases steadily to 3.5 per cent at full output — a figure that would be very difficult to improve upon, even with the most expensive of equipment.

On the radio side, response is far superior to that of the average commercial receiver on the market today.

Sensitivity over the entire waveband is under 5 microvolts absolute — an excellent figure that very few commercial receivers of similar type can equal.

Selectivity is not exceptionally good, but for fidelity reproduction from locals this is an advantage rather than otherwise.

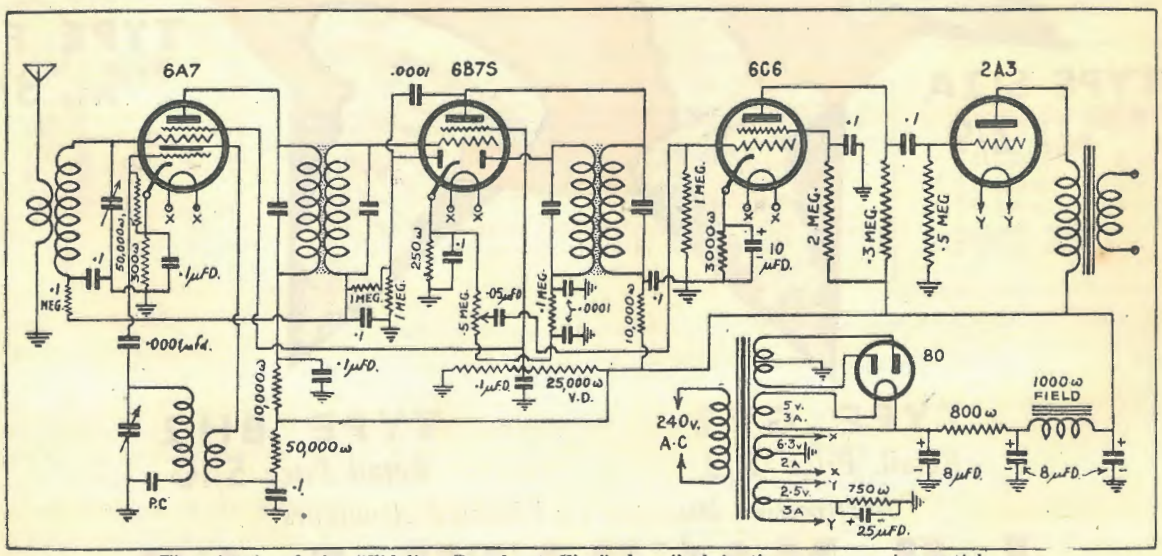
With regard to linearity on the radio side, the frequency response is down 13 decibels at 5,000 cycles, which again is far superior to the response given by the average commercial set. Also, compared with the average response taken for every American receiver released during 1936, which is down 27 db. at the frequency mentioned, the performance of the "Fidelity Five" in this respect is excellent.

Tone Compensation

It is a simple matter to fit this set with an effective tone compensation arrangement.

The need for tone compensation arises from a failing of the human ear, which at low volume levels becomes rather more insensitive to low frequencies than to high. The result is that when a receiver that at normal volume sounds well-balanced is turned down, an apparent lack of bass response becomes evi-

(*Continued on page* 27)



The circuit of the "Fidelity Broadcast Five" described in the accompanying article.

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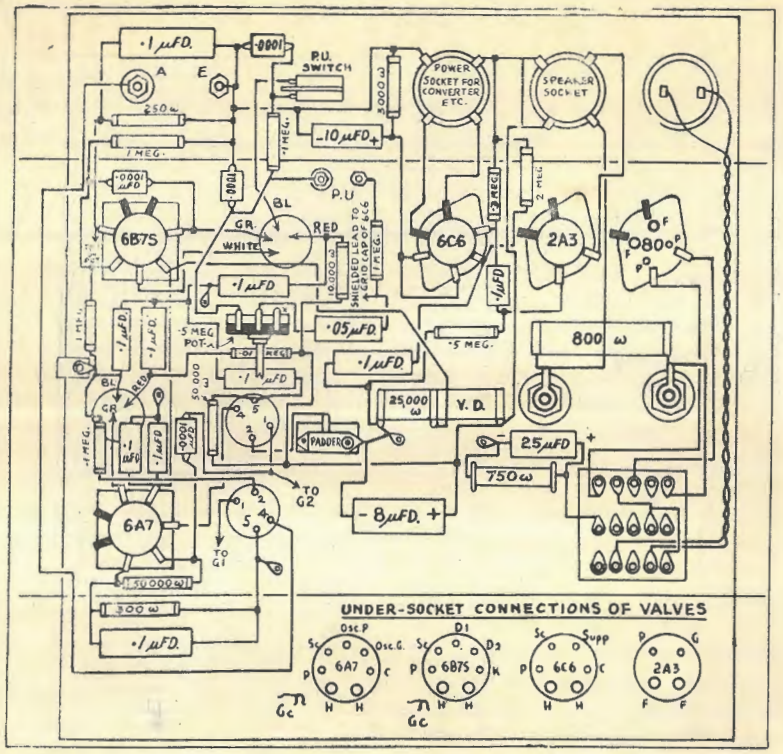
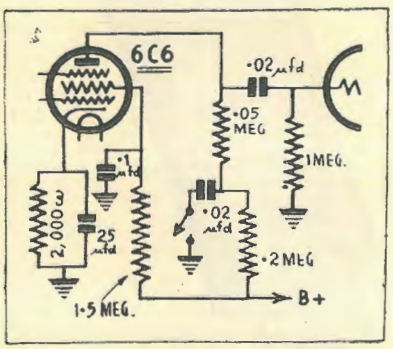


FIDELITY
(Continued)

dent. One way of overcoming this effect is to apply tone compensation in the form of bass boosting.

The circuit used is illustrated in the accompanying sketch. The single .3 megohm plate load resistor used for the 6C6 in the original circuit of the "Fidelity" is replaced by two resistors in series, with values of .05 and .2 megohm. From the junction of the two a condenser of .02 mfd. is taken to earth through a switch. With the switch open, all frequencies are amplified uniformly, but with it closed the higher audio frequencies are bypassed, thus giving greater response to low than to high frequencies.



In the original receiver provision has been made on the front of the chassis for the mounting of a single-pole single-throw switch of the rotary type.

The important point to notice is that this refinement should be brought into use *only at low volume levels*, where it provides more correctly balanced tone than would otherwise be obtained. With outputs from about 500 milliwatts upwards, the bass boosting should be removed by rotating the switch, or reproduction will be seriously out of balance, suffering from over-accentuation of the bass.

Curing a Motor-Boating Tendency

If it is found that there is a tendency towards motor-boating in the "Fidelity Broadcast Five," then this can easily be cured by connecting a 10 or 25 mfd. dry electrolytic condenser in parallel across the .1 mfd. paper condenser by-passing the 6B7S 250-ohm cathode bias resistor.

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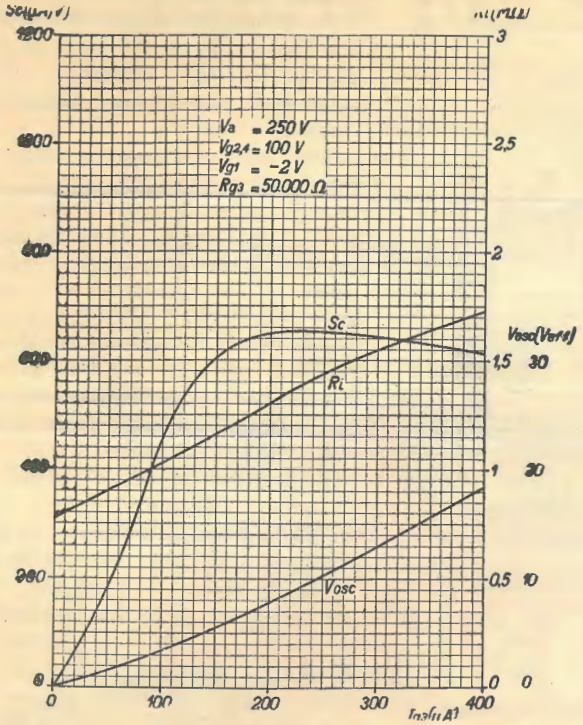

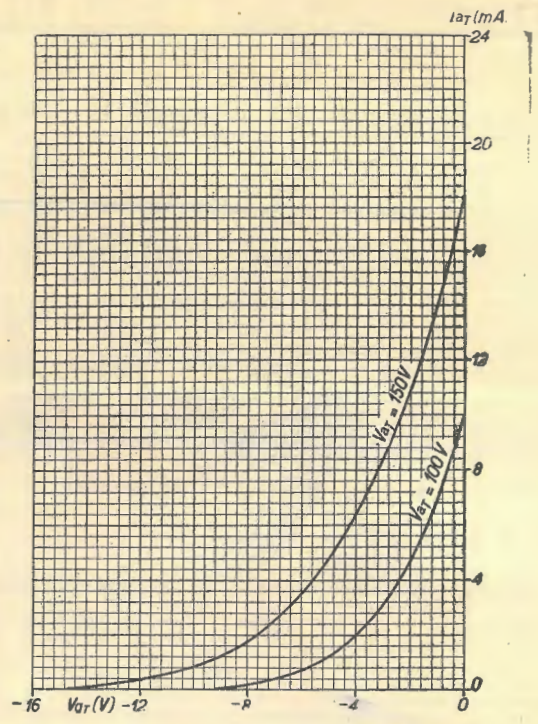

Philips Announce

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Heater Current	0.3 amps
Plate	250 volts
Plate Current	3.0mA
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Grids 2 plus 4 (screen)	100 volts
Screen Current	3.0mA
Conversion Conductance (micro-ohms)	-650
Plate Resistance	1.3 meg.
Osc. Anode	100 V — 3.3mA
Osc. Grid Current	0.2mA
Osc. Grid Resistor	50,000 ohms
Osc. Slope	2.8mA/V

ECH35—a new mixer valve by Philips —has been designed to "measure up" to modern requirements in the following receivers:

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- **DUAL WAVE**
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★ **These ECH35 graphs show: (left) conversion slope, internal resistance and oscillator voltage as functions of oscillator grid current; (right) plate current as a function of grid bias for triode section.**

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GETTING STARTED AT SET-BUILDING

ONLY those who have actually built a radio receiver, switched it on, and heard it work, can know the thrills that lie in the hobby of set-building. Even the cheapest and simplest of sets can give endless hours of enjoyment. For example, with a few simple tools to assist in mounting and wiring a handful of parts, anyone can in several hours put together a receiver that will bring in stations all over the world. This is not an exaggeration, for there are two such sets described in this issue.

Again, there is no end to the variety of receivers that can be built. Simple crystal and one-valve sets are best for a start, to gain experience, but even with these are dozens of different circuits to experiment with. After that, multi-wave receivers can be built, for short-wave, dual-wave and broadcast operation, of tuned radio frequency or superheterodyne types, and powered by batteries or from the electric mains.

The limit in radio experimenting and research work is never reached, even by the world's cleverest engineers. There is always "something new" in radio.

Pitfalls Beginners can Dodge

There is no royal road to a theoretical knowledge of radio, but on the practical side there are many useful tips that can be passed on to help those breaking into the radio game to avoid the little pitfalls that crop up from time to time.

The commonest of these will be dealt with in this article, and a further instalment will be published next month.

Choosing and Using Radio Tools

There is almost no limit to the tools that CAN be bought, and which at some time or other will be found useful. At the same time, to build a kit-set only a pair of long-nosed pliers with wire-cutters, a screwdriver, box spanner, and a soldering iron are required.

However, most, if not all, of the following tools will be found on the average set-builder's bench: Soldering iron, tin of flux and resin core (NOT acid core), solder; long and blunt-nosed pliers; side cutters; hand-drill (with an assortment of about half a dozen hardened steel bits, ranging in size from $\frac{1}{8}$-in. to $\frac{1}{2}$-in.); steel rule (graduated in inches and centimetres); reamer (to enlarge holes up to an inch in diameter); flat and three-cornered files; pocket knife (Boy Scout type); screwdrivers (large and small); hammer; and vice (small 4-in. size is suitable).

Choosing a Soldering-Iron

The first thing any set-builder must learn to do is to solder efficiently, because half the secret of success in set-construction lies in making good joints. A single dry joint can result in noisy reproduction, and can cut hundreds of miles off a receiver's range.

The type of iron used depends on whether mains power is available or not. If it is, then an electric iron is the only wise choice. Provided it is of good make, it will be trouble-free, clean, and will always maintain the same correct temperature.

Otherwise, an ordinary iron with a medium-sized bit can be used, heated by gas or a small spirit lamp. A fire is not very satisfactory, but if one has to be used, then a simple way of keeping the iron clean is to slip it inside a five or six inch length of metal tubing before placing it in the fire.

Six Simple Soldering DONT'S!

DON'T try to solder with a warm iron; it must be hot.

DON'T try to solder a joint that is not clean.

DON'T fail to tin the iron and the work.

DON'T fail to heat the spot with the iron before applying the so'der.

DON'T melt the solder an inch or two above the work and expect it to drop into the joint and make a good job; it won't.

DON'T jar a joint until the solder has had time to cool.

Getting the Correct Temperature

The average electric iron is rated from 50 to 85 watts, which will produce the correct temperature at the end of the copper tip. A coarse file should never be used to clean or to remove pits from the tip, by the way, as this shortens it, which restricts the heat dissipation and makes the iron too hot. A good indication of an undesirably high temperature is obtained if a coat of black carbon forms on the tip every few minutes. If this happens, a new and longer tip is needed.

The best way to prevent the iron from becoming dirty and pitted is to wipe the tip occasionally with steel or asbestos wool, or a small wire brush. Also the iron should never be dipped into the flux tin.

With an iron that is heated by gas or a spirit lamp, a good indication of the correct temperature is obtained when a blue flame appears round the tip. If the flame turns yellow, the iron is overheated. If it is too cold, the solder will not flow freely, and a poor joint will result.

Tinning the Iron

The preparation of an iron for soldering, or "tinning" the iron, as the process is called, is simple. After the tip has been cleaned and heated, a little flux should be rubbed over the faces. These should then be cleaned, leaving them glistening as if plated. The shine will soon disappear, however, and will be replaced by a dull silver coating. This is the normal appearance of the tip during use.

Any pits that form should be

(*Continued on next page*)

STARTING

(Continued)

carefully taken out with a fine file or fine emery paper. The object is to have the tip faces flat, smooth, and tinned all over.

Too Much Flux Means Trouble

The two surfaces to be soldered should be spotlessly clean, and well tinned. If un-tinned copper wire is used for connections, each end to be soldered should be scraped until it is shiny. Then smear on a trace of flux with a wooden match-stick, hold the iron to it, and apply a touch of solder.

The tinned wire can then be overlapped on to the terminal or lead to which it is to be soldered, the iron applied to the joint and a little resin-cored solder run in. The joint is made when the solder flows freely and evenly over it, but when removing the iron be careful not to jar the new joint until the solder has hardened.

Resin-cored solder (NOT acid-core) which is supplied in reels of various weights, is the handiest to use. If ordinary solder is preferred, a tin of flux is necessary as well. Under no circumstances should an acid flux be used, because of the danger of corrosion.

In radio wiring particularly, flux should always be used very sparingly, or a carbonised iron and dirty joints will be the result.

Preparing a Chassis

Nowadays steel is nearly always used for commercial chassis, but constructors will nnd that aluminium is quite hard enough to work with makeshift tools.

At the same time, aluminium is so soft that it marks easily, and also, it tends to clog a drill. To avoid this, turpentine should be used as a lubricant, particularly when large holes are being cut. A wood bit is best for this job. The $1\frac{1}{8}$-in. size is the most useful, being suitable for almost any coil or valve socket on the market.

To drill a hole with a bit of this kind, rest the chassis on a block of wood so that the bit point can pierce into it. After a few turns of the brace handle, the hole will be grooved out, and at this stage a few drops of turpentine should be applied, otherwise the centre piece will be torn out rather than cut, and a poor job will be the result.

Any rectangular hole such as that needed for a power transformer should be marked out, and a few small holes drilled along the lines from the corners. A jig-saw or a hack-saw blade held with a cloth will finish the job.

After any cutting at all has been done, the edges of the hole should be cleaned up with a pocket-knife or a fairly coarse half-round file.

Smaller holes are required for other components, such as wet electrolytic filter condensers ($\frac{3}{4}$-in. diam.) and large bushes ($\frac{1}{2}$-in.). To make these, first drill a hole in the chassis to take the point of a plumber's reamer, which will then complete the job.

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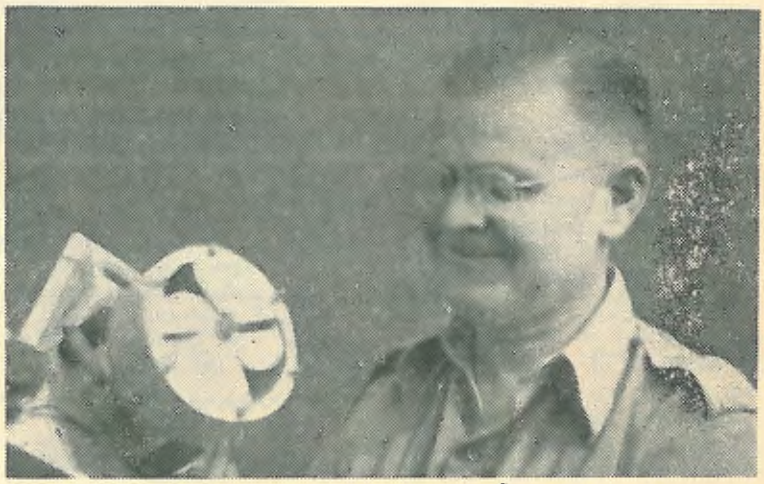
CALLING CQ!

By Don Knock, VK2NO

When the "balloon went up" recently on "Forty" and "Twenty," Sydney VK2's learned of the occurrence more or less by the "grapevine," plus the fact that the word speedily got around on "Ten." Efforts were made by local prime-movers to have the news broadcast through the National or other stations, but for some reason nobody rose to the occasion. Sydney's "Great Dailies" were conspicuous by their reticence to say anything about Ham radio; although, should war ever strike again, they and their satellites will be loud in their lauding of the key-punching amateur, and will no doubt wave flags as he marches off to the gunning show.

But they didn't say anything about the doling out of crumbs from the table of the frequency annexers. How different to Melbourne's newspapers, every one of which carried a story about the Australian radio amateur and his status quo! Particularly helpful was one lengthy inspiration which included this: "he is still by far the most illiberally treated of the amateurs of the world. He has only part of the operational facilities now available in Britain, America, South Africa, and New Zealand." Orchids for the gentlemen of the Press — Yarraside version! One paper carried a sub-heading reading: "Babel on 20-40 metres." How true *that* is, at least on "20."



Don Knock smiles as he looks over a butterfly h.f. tuner which he picked out of some salvage gear.

* * *

If any Ham reader of these Notes can supply information regarding the circuit details of an American receiver, a Wells-Gardner BC-348N, such information would be appreciated by old-timer Phil Levenspiel (VK2TX) of Wyong, N.S.W.

* * *

One can well imagine how an important subject for constant discussion among Ham POW's during their enforced stay as "Guests of the Enemy," would be one very prominent in their thoughts. Dick Rees, VK2APW, whom we referred to recently, sent up a sketch — the original drawing done by a G6 Ham who was a POW with Dick in Germany. Unfortunately it is not suitable for reproduction without redrawing and by so doing much of the original sentiment would be lost. It is a scheme, and

(*Continued on next page*)

INTERNATIONAL CONTEST BY W.I.A.

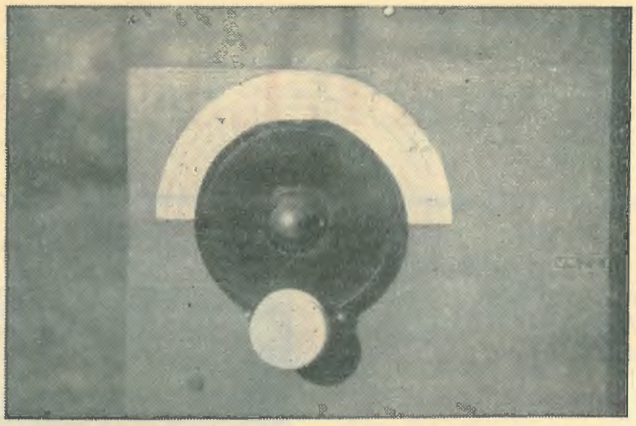
Federal Executive of W.I.A. is organising an International radio contest for transmitting and receiving amateurs in Australia some time during the current year. Many will remember the very popular 1934 Centenary Contest, upon which the proposed contest will be modelled.

A feature will be inclusion of VHF channels, and this should be a decided stimulus in the populating of bands such as "Six" and "One and Three-quarters." It is anticipated that radio manufacturers will donate much valuable equipment for awarding as prizes. We shall have much more to say about this contest in the near future. Contest Manager is Bob Cunningham (VK-3ML) who can be reached at Box 2611, G.P.O., Melbourne.

a very workable one, for a combination Straight Crystal/Tritet/ECO functioning from a ganged switch. There is provision for indicator lights in the switching—says Dick, "Green for Safety . . . that's ECO; Red for 'watch your step' . . . that's Tritet; and White for 'plain crystal'." There is a lot to commend the idea, worked out in captivity, and "Anyway," says VK2APW, "it gave us a week's pleasure. If any readers are sufficiently interested, we will get the scheme drawn up as a circuit diagram and run it in some future issue.

* * *

A Danish Ham, a member of the "Short-wave Clan," writes to BSWL998, Gordon J. S. Hepburn, 10 Mc'Gregor Street, Croydon, New South Wales, asking for the name and address of any Australian amateurs interested in corresponding with amateurs in Denmark. The idea is a good one as distinct from the usual quest for QSL cards, and pen friends in other countries can become material friends in times of travel. The OZ's are recovering from a bad time during the Nazi Occupation and overseas friends would do much to boost morale and life in general. Mr. Hepburne will pass on the details to any interested reader — Ham or SWL.



MODERNISING AN OLD 0–100 DEG. DIAL

Direct calibration is easily provided for by cementing a card scale with inked arcs in different colours to a rubber wheel-driven metal dial of the old "instrument" kind. A "Perspex" or celluloid indicator projects over the new scale and, if this has small holes with an inked centre line, direct indicators can be made on the scale. The original 0-100 degree engraving on the edge of the dial is retained for quick reference.

ON THE DX BANDS

With the lid partially off on "Forty" and three parts so on "Twenty," the latter band in particular sounds like a bad case of "the devil take the hindmost." No doubt things will even themselves up a bit later, but just now there is only one word for the din and that is "Chaos." As from the evening of June 30 last, the G's and others in the European scene made a start on the two bands (officially). The afternoon of July 1, from 3 to 6 p.m. E.A.T., was remarkable for the number of un-QRM'd Europeans on "20." In that time I noted Englishmen, French, Swiss, Dutch, Norwegians, and a station in Greenland, all merrily toting along on CW QSO's. At this time VK's hadn't received any word that the lid would be lifted, so it was a case of listening only at this end. The picture changed a few hours later when the Americans got the green light from their F.C.C. and then it was "ON" with a vengeance. Meanwhile, VK's got the OK — and thence onward the story becomes one of struggle through the terrific QRM, not so much from our own locals, but from the seething mass of W phones. There is nothing unreal about the picture — it was just what I expected.

Everyone to their own liking in

CHANNEL ECHOES

Consternation is rife among some Sydney VK2's as a result of official correspondence from the licensing authorities to individuals, stressing the need for the suppression of Harmonics. Idea prevalent with some of the recipients of the warnings is "What *does* it matter about harmonics hitting 56 M/cs. anyway?" Answer is, unfortunately, that it matters a great deal in these progressive times. The old amateur stamping ground of 56-60 M/cs. is likely to become a very important television or FM channel in the not-so-distant future, and the effect of powerful harmonics, etc., from DX hunters and "rag-chewers" is not difficult to visualise. There is nothing formidable about the cure — Handbooks deal amply with the subject. A good scheme is the use of a Faraday shield between final "tank" and antenna coils, where direct inductive coupling is employed with a single-ended PA. Also, push-pulling the final link-coupling to the antenna circuit is a big help, especially where a direct earth connection is used. Therein can be inserted a tuned trap to absorb the unwanted harmonic and to take it to earth out of harm's way. In U.S.A. harmonic suppression is a "must" for B.C. stations, and has been so for a long time. We surmise that with crowded occupancy of "20" and the allocation of the old "Five" metre band for new Services, amateurs everywhere will need to clean house a little on the harmonic family.

amateur radio — but for me — I have a warmer spot in my heart than ever for the VHF's! Thank heaven we have "Six" and the next VHF band for a different, but equally satisfying phase of the game.

* * *

Readers shouldn't deduct from the foregoing remarks that I am "agin" the DX bands — far from it — in fact, I like 'em. So much so that I have already been and broken the ice on "Forty" and with soul-satisfying result. With only 50 Kc/s to play around in, the prospect is, of course, quite grim for the immediate future, unless those who hold the sword of Damocles relent and widen the band. But — having a crystal that puts me in the snippet of the band — also a handy little 6V6G crystal test oscillator in the shack — an idea was born and went into effect. A small power supply — a two turn link around the little "tank" to the antenna coupler on the wall — a key in the cathode circuit — and there we were! One brief CQ and back came ZL2AO with a 589 report, followed by similar ones from ZL1LZ and then VK4SN. Input power? — all of 5 watts — and the antenna an end-fed W3EDP "hybrid." If that antenna is no great shakes on "Ten" it is a wow on "Forty!" You'll find it in the RSGB Handbook — sheer simplicity. Main thing is that this old band is as useful as ever for QRP CW rigs . . . at least until the QRM situation looms . . . as it surely will.

* * *

I had a rather unexpected experience on the evening of July 4, (maybe the "Independent" feeling accounted for it) and one which emphasises just how careful tuners up of ham gear should be to ensure operation in the correct band. Using my Philips R163 Communication receiver I had been listening on "80" to phone conversations between ZL's — and the receiver happened to be left switched on that range. Deciding to seek a key QSO on "40," I sent preliminary "T-E-S-T- de VK2NO" on 7175 Kc/s. and was considerably surprised to hear a strong phone on "80" calling VK2NO — a VK2 located about 200 miles from Sydney. Expecting that this was a remarkable overtone from "40," I hurriedly tuned the receiver to the band, but nary a sign could I find of the VK2 there. Thinking that there must be something queer about the whole thing, I called CQ on the key on 7175 Kc/s. and lo, and behold this VK2 phone again answered my on "80." With that, I answered the call, hooked up with the station and asked, "How come?" — inasmuch as, at the time of writing, (July 5), we haven't been given any OK on "80." I told this station that he was getting out fine on "80," but where was his sig. on "40"? Whereupon he thanked me for the tip, reckoned there must be something wrong, and decided to close down and look into things. There is a moral in this incident, my friends: Don't take things for granted — keep a "Spotter", a calibrated absorption meter in the shack — and make sure, if you are using a crystal at "80", that your final, or whatever stages follow the CO, is tuned to the correct band! Not everybody is "Frequency Conscious" regarding relation of L/C ratios in tank circuits, and the humble "Spotter" is then indispensable.

(*Continued on next page*)

FINE RECEIVER

Best example we have seen in the receiver line is an effort by VK2AZ, who put together a compact high-gain super with 6AK5 R.F. ahead of 9001, 9002 mixer-oscillator combination. Nevertheless, we feel that our 955/955 Converter with EF50 at 21 mC/s into a Philips R163 receiver is an ideal arrangement. With too much R.F. pre-selection as may be produced by a 6AK5, car ignition and other noises are predominant. The Converter pulls in all the stations well, and much of the electrical QRM is avoided by the receiver.

Special "wonder R.F. pentodes" such as 6AK5's are applicable to full advantage at frequencies higher than 50 mC/s. They provide a fine answer to effective R.F. amplification at 166-170 mC/s. No, brother, I have NO 6AK5's and haven't been lucky enough to meet any other than in the pages of "QST."

SLAUGHTER OF VALUABLE GEAR

Our feelings about the wholesale destruction of valuable radio and electronic gear under the Lend-Lease ruling are those of any person with a liking for the ingenious products of clever brains and hands.

We cannot agree that such senseless action is imperative for the future welfare of this or any other country. Feelings of Service radio men at having to stand by and witness destruction of equipment are akin to a dream about QST's advertisement pages—an illustration that one possesses one of the superbly engineered receivers depicted therein—and then awakening to find that it was but a dream! Latest outburst comes from an ex-A.E.M.E. craftsman, who says: "I saw it happen many times on Bougainville during the last 16 months. When you have seen "Super Pros" and similar receivers, test equipment, cartons of valves, 1852's, "Acorn" valves, miniature valves and heaps of other material burned before your eyes, whilst you are held off at revolver point, your scruples about honesty vanish quickly. Not only Americans and R.N.Z.A.F. are guilty, but our own forces as well. I saw one salvage depot burn Philips signal generators, super testers, multi-testers, etc., until I almost wept with rage."

So it goes—the post-war crazy world in which many an ex-Service radio man would at least appreciate the right to purchase a quantity, however limited, of such equipment. This picture applies not only to radio—but every imaginable kind of equipment. Arguments that destruction is necessary to guard future trade and employment may be sound, but we feel that it would have been better to store the stuff against a rainy day! Or maybe it will never rain again!!

HAM NOTES

(Continued)

Several English radio publications carry a par about a G8 Ham who in February last "made the first international amateur contact since 1939" by QSO'ing a Norwegian. That's rather a sweeping claim, and we assume that it is meant to apply to Britain only. VK's were working W's and others **officially** from the turn of the year.

* * *

Talking of ZL's on "80," a letter to a VK2 from a ZL3, just to hand, says that the Maorilanders now have the whole of the band-widths back, and that the ban on overseas working on "80" has been tossed overboard. That's not all, they are promised definitely in a matter of months that the new 21 to 21.5 M/cs. band will be available; also they now get 50-54 M/cs. plus all the VHF and SHF allocations that the Americans get. Comparison with VK conditions is, at the moment, extremely odious.

* * *

In a previous issue I said something about an American ad in an overseas Mag lauding the properties of a new war-developed adhesive for general purposes, and commented that a practical Ham could no doubt find a lot of uses for such a commodity. Almost immediately after having said that, a business colleague told me that just what I had been referring to is now available, in fact, is made in Australia. Acquiring a tin of this new "stickum," it was put to test, and I must say that I think the makers are almost modest in their claims. This adhesive is a real bonder. It literally bonds together practically anything. "Bakelite" type mouldings and suchlike are "pie" for it, and after applying a little of it to a roughened piece of bakelite, and putting that on the surface of matt finish aluminium, the impression is that the two have been welded together. At the present time the new adhesive is available only in limited supply, and so is supplied only to industrial concerns where application is necessary for constructional purposes. The name of a great American industry is behind it, and I suppose the originators will commence to advertise their product at the appropriate time.

* * *

Talking of adhesives . . . the Ham is doing a lot with acrylic resins of the Perspex variety in these days, and I suppose more was done to popularise the use of these transparent plastics by the Digger, who fashioned all manner of trinkets from the cockpit covers of crashed planes, and sent them to his YL's back home. This material has lots of uses, and firstly, in Ham radio, the use is that of insulation. Be warned, however, that all that you can see through is not of the polystyrene family . . . some of the acrylics are composed of chemical constituents purely for light-passing qualities. Etholex-Polystyrene, for example, is a horse of a very different colour . . . tried and proved under rigid War specifications . . . . this is insulating material par excellence. Much can be done with most of the transparent acrylics in the way of reforming by applying heat or by immersing in hot water. They soften quickly and refashion easily, setting hard again very speedily. Pieces can be cemented together, but here it becomes necessary to apply the correct cement, not any haphazard dope sold in tubes at the "5 and 10" store under weird sounding names . . . but cement produced especially for the job. In Sydney I located a supply of genuine Perspex cement which virtually welds the material. Pieces joined thus appear to be equally as strong as one solid portion.

—VK2NO.

WORKING ON 166 M/cs.

What is doing in other States and locations I know not, but in and around Sydney the VHF channel of 166 M/cs. is coming in for an increasing share of attention, with pleasing results, despite difficulties. On the evening of July 4, 1946, VK2LZ, at Wentworth Falls, 60 odd miles from Sydney, copied VK2NO at R7 on phone, and VK2WJ at R6 on MCW whilst using a small transceiver under quite adverse conditions. As VK's 2NO and 2WJ are on the coastline at Waverley and Maroubra, respective, the reception comprises a bit of a record at the frequency of 166-170 M/cs. Two weeks previously VK2NP, of Gladesville, made a two-way QSO on this band with VK2KI operating mobile at Lawson, N.S.W. There is no doubt about it — ever since Eric Ferguson (VK2BP) and VK2NO started the ball rolling on "5 metres" in 1934, the Blue Mountains region has proved to be an Open Sesame for VHF's. We are finding snags about communication on 166 M/cs. in the form of complete local screening. Although the stations of VK2WJ and 2NO are only 4 miles airline apart, and both stations can be heard at good strength 60 miles away up in the mountains the two stations have not yet succeeded in hearing each other. There are two rolling elevations in between, to say nothing of buildings. Trees are found to be prolific absorbers of radiated energy at this frequency range. The answer will no doubt lie in the use of high gain directive arrays to push the signals through and the immediate consolation is in the compact nature of such arrays. Stations using 166 M/cs. intermittently in and around Sydney are: VK's 2YE, 2KI, 2AFH, 2AGL, 2DP, 2NP, 2WJ, 2ABZ and 2NO. There will be others. Some of the stations quoted are using transceivers as yet, but at the writer's station separate receiver and transmitter are in use — also at VK2NP and 2WJ. Let me be emphatic to those intending communication of the band — standard valves and practice definitely will not do — anybody that tries to get away with the usual "5 metre gear" is in for a first-class headache. VHF receiving and transmitting valves are essential—valves of the acorn and "horned" types.

—D.B.K.

HAM LINGO IS SNAPPY

As a heritage from the days when the code was universally used by the amateur, today he has a language of his own that to the uninitiated sounds meaningless. The commonest abbreviations are quoted in the article below . . .

HAM lingo — the language of the radio amateur — is snappy, and highly descriptive. It is made up of idioms, abbreviations, technical terms and phonetic words. It's Greek to the public and a source of distress to the beginner. It is enough to set anyone on his ear!

Some of the idioms used by the ham have their roots in the field of commercial wire and radio telegraphy. The old-time Morse telegraphists originated the word "bug" as a happy and brief tag for the semi-automatic code keys used then, and now, for high speed transmission.

The early type of hand keys were made of brass, and the operators of such keys were dubbed "brass pounders." If an operator worked his key well, it was said of him that he had a "good fist," just as one might say that a singer had a good voice. Hand key operators were often subject to a temporary or permanent loss of muscle reaction which affected their sending, in which case they were said to have developed "glass arms." Double acting keys were known as "side swipers." These and other idioms originating with the old-timers have been kept alive by the ham.

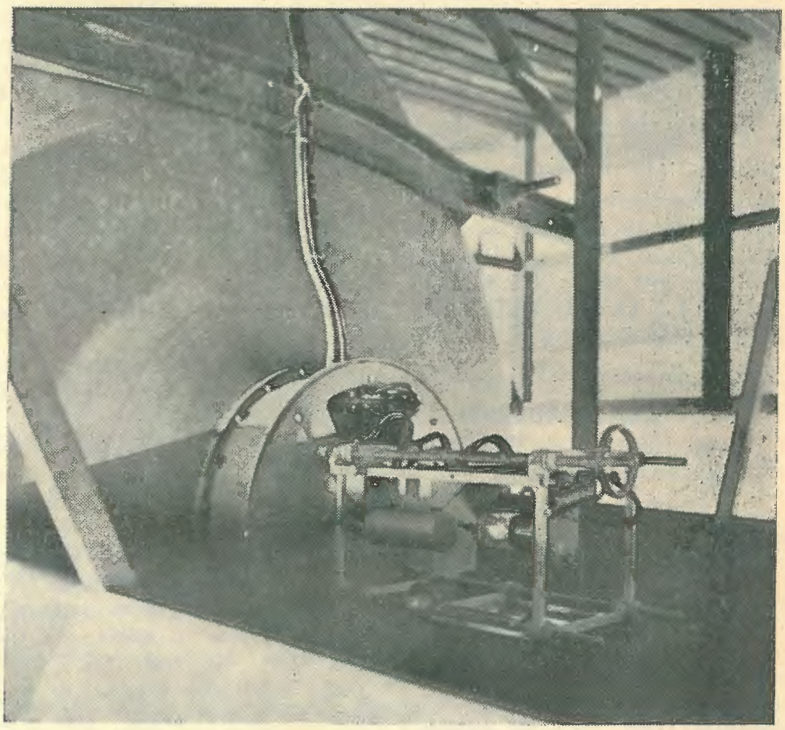
Many of the abbreviations had their origin in the field of telegraphy. Such short-cuts as "abt" for about, "ck" for check, "fm" for from, "hr' for here, "sig" for signature, and "tks" or "tnx" for thanks, are good examples of a few of the many abbreviations the early amateur radio telegrapher appropriated for his own use. The substitution of the letter "x" for parts of a word, such as "tnx" for thanks, "dx" for distance, "px" for press, and "wx" for weather, had also been taken up by the ham, and he has added a few others of his own, with the "x" tacked on to the front end of the word, such as "xtal" for A reversal in form is shown in the use of "rx" for receiver.

The ham also uses the International "Q" Code, together with a crystal, and "xmtr" for transmitter. few combinations of his own making. He employs such universal signs as "R," meaning okay; "K" meaning to go ahead; "SK" indicating the termination of a transmission; "73" meaning kind regards; and "88" meaning love and kisses.

Amateur Abbreviations

But ham lingo is far from being a borrowed language. When it comes to trick idioms and phonetic spelling, the ham has it all over the commercial crew.

It all started before vacuum tubes were in use, when powerful spark transmitters were called "rock-crushers," synchronous rotary spark gaps were called "sinks," and headphones were called "cans." The first continuous wave (c.w.) tube transmitters were cynically referred to as "peanut whistles" and their operators as ????! A particular



This might appear to be a modern example of application of a Magnetron oscillator and parabolic reflector for UHF's, but it isn't. This picture was taken at Lympne, (England) in 1936, and was the English end of a 60 centimetre telephone link with France. In Wellsian fashion it was truly a forerunner or "things to come."

HAM LINGO
(Continued)

type of transformer was called a "coffin," and an aerial became known as a "sky hook." When licenses came into being they were known as "tickets," and transmitting tubes were christened "bottles." The District Radio Inspector became the "R.I."

There were no radio-phone stations in those days, and it was a task for one ham to carry on lengthy "rag-chew" with another ham by means of telegraphy unless he resorted to various forms of abbreviation. It thus developed that laughter was registered by simply transmitting the letters "HI," and the natural enthusiasm the ham had for the game was aired every few minutes by merely sending the letters "FB" — which, to you, is "fine b u s i n e s s." Then, surprisingly enough, all hams, no matter their age, became old men, or simply "OM", over the air. Mother was referred to as "OW," which was alright since she couldn't decipher the code, and the girl friend became the "YL." If the ham married she immediately became an "XYL," which has never seemed quite complimentary, but the girls lap it up.

And then there was the phonetic spelling interspersed with abbreviations. Typical copy would read something like this: "SA OM IS TT UR YL I SAW U WID LAST NITE? SHE'S A SWL NO ES HW! HI!" Translated into English, this copy reads: "Say old man, is that your girl friend I saw you with last night? She's a swell number and how! (Laughter)."

The c.w. ham of today continues the use of the abbreviated form in his transmissions, but he is not, as a rule, apt to carry it to extremes. Aside from "es" for and "tt" for that, "hr" for here, "hw" for how, and a few other straightforward short-cuts, he sticks fairly close to phonetic spelling. A few examples are: "fone" for phone, "gud" for good, "cum" for come, "sez" for says, "cud" for could, "ur" for your, and "sed" for said. Some words are given the phonetic spelling and additionally abbreviated, such as: "Sked" for schedule, "freak" for frequency, and "sine" for sign or signature.

New Developments Brought New Terms

Improvements in vacuum tube transmitters brought a new group of words. High voltage, radio frequency currents were being used, and the word "hot," employed by electricians to denote a live wire circuit, came into use. Later on, high power radio-frequency current came to be known as "soup." This term is also used to denote background noise in reception, and if a signal is lost in interference, it is said that the signal is "down in the soup" or "in the mud."

When the ham commenced using radiophone equipment, such phonetic abbreviations as "mike" for microphone, and "fone" for radiophone, came into use. Some of the lingo of the c.w. ham was carried over, and it is far from uncommon today to hear a ham on fone use the abbreviation "HI" when he could just as easily laugh. It's just a case of habit. It's the same with "K" and "SK;" most 'phone hams have resorted to such terms as "take it away," "toss is to you," "come in somebody," "over," or some such phrase when they are turning it back to the other fellow, but some of the fellows hang on to the "K" of their code days, and to "SK" when they are signing off.

The "Q" signals used by the ham are identical with those established by the International Radiotelegraph Convention. Each signal can be formed as a question or answer. "QRA"? for example, means: What is the name of your station? The answer would be: "QRA . . ." with name of the station. There are a large number of these "Q" signals, many of which are of no use to the ham. Those he does use are often given a slightly different or broader meaning so that they may better fit conditions.

For instance, the original meaning of QSO? is: "Can you communicate with . . . . . direct (or through the medium of . . . . .)?" But the ham also uses QSO to mean a two-way contact or conversation. In talking to another ham, he may pass the remark that he had a fine QSO with such-and-such a station, and in this sense the signal has practically the same meaning as the word "talk."

The following list of "Q" signals is not complete, but it contains the letter combinations most frequently used in amateur communications. The interpretations given are those adopted by the hams and are not necessarily identical with the originals. Each one can be used as a question or an answer.

QRA—What is your address?
QRG—What is my frequency?
QRK—Are my signals good?
QRM—Man-made interference.
QRN—Static interference.
QRP—Shall I decrease power?
QRT—Shall I stop sending?
QRX—Stand by.
QSA—What is my s i g n a l strength?
QSB—Do my signals fade?
QSL—Please acknowledge our QSO.
QSO—Two-way contact.
QSY—Shall I change my frequency?
QTR—What is your time?

Everyone should know that CQ is the general call for any station, and DX means long distance. The familiar ham call of CQ DX is an invitation from any distant station to reply.

NEW ZEALANDERS!

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INDEX TO VOLUME 10

At the request of several readers we have published this index to Volume 10. Back numbers are available at 1/– each post free by sending postal notes to Australasian Radio World, 336 Waverley Road, East Malvern.

Shortwave Review

CONDUCTED BY
L. J. KEAST

NOTES FROM DIARY—

VOICE OF DX IN AUSTRALIA

Ern. Suffolk, Publictiy Officer of S.A. Australian DX Radio Club, writes: "The above Club has been able to inaugurate DX sessions from Radio Australia. Here is the set-up: Weekly sessions to the British Isles of 12 minutes duration commencing July 28 at 1.45 a.m.. EST from VLA-3, 9.69 mc, 30.99 m. Weekly sessions to U.S.A. and Canada from VLC-9, 17.84 mc, 16.82 m, commencing July 28 at 11.10 a.m. EST. This session to commence with will be of 20 minute's duration, and later may be extended to 30 minutes. The sessions will be scripted as Voice of DX in Australia, and not as a local club affair. Therefore will be grateful to have any "dope" on DX, (or time of hearing) wave-lengths especially on new call signs skeds or change of skeds for any known stations."

Well, this looks like an excellent opportunity to publicise Australian DX and congratulations go to those enterprising South Australians who have engineered this scheme.

Mr. Suffolk's address is Lobethal, South Australia, and he will welcome any information or suggestions listeners care to send him.

★

SAYS WHO?

Bill Wright, of Plympton, South Australia, writes: "SEAC, Ceylon, advises that they are now on the air on 15.12 mc 19.84 m from 10.30 a.m.—9.45 p.m., and on 6.075 mc, 49.38 m from 10.30 p.m. —3 a.m. The transmitter in use is 100 k.w. output. On Friday, June 7, and Saturday, June 8, the 10.30 p.m.—3 a.m. transmission was radiated on 9.52 mc as a test. This frequency was used in lieu of the usual 6.075 mc. Address: "Reception Report," Radio SEAC, A.B.-PO., 9, Colombo, Ceylon.

"New Zealand's first Police transmitter, ZLPK, Wellington, is heard in the evenings on 1.680 mc."—Cushen.

"TBILISI or AZERBAIJAN on approximately 11.96 mc is heard at midnight in native tongue and music; signs at 1.03 a.m. Azerbaijan frequently mentioned."—Edel.

Dr. Gaden forwards me a letter he received from Armed Forces Radio Service, Los Angeles. It reads:

Dear Shortwave Listener:

This will acknowledge and thank you for your recent letter reporting shortwave reception from one or more of the Armed Forces Radio Service/OIC transmitters.

We sincerely regret that since Armed Forces Radio Service shortwave broadcasts are produced solely for the listening pleasure of members of the armed forces overseas, we are unable to (grant requests for schedules) (verify listener reports from private sources.

However, we are pleased to know that you find our programmes worthwhile, and appreciate your kind interest.

Cordially,
(Sgd.) JOHN V. ZUCKERMAN
1st Lt., Sig. Corps
Shortwave Section.

Phil Byard has had some splendid sheets made for keeping track of schedules, and he has sent me a lay-out of the Crosley stations. A colour code has been used so you can tell at a glance whether transmission is to Latin-America, North Africa or Europe . . . A very nice job, Phil, let me know cost of sheets.

Rex Gillett in "Radio Call" reports hearing a Chinese station on 9.73 mc, 30.83 m, just after 11 p.m. which he thinks is no doubt KGOA. He says, "At the time entioned a relay of XGOY's programme was being taken. Following the relay which consisted of a talk in English, the stations continued with their own programmes. XGOA is the call-sign for this frequency, the station has not been reported for some time." (XGOA used to be on 9.72 mc, 30.86 m, and then jumped to 9.728 mc, 30.83 m, but according to latest advice from Washington, U.S.A. they are back on 9.72 mc . . . Perhaps crystal trouble again? — L.J.K.)

Arthur Cushen has a verification from OAX6E, Arequipa, 6.333 mc, 47.39 m. They verified with two postcards; one a view of the city and the other a picture of the main studio during a concert. (That was pretty good to log this Peruvian, as "Radio Continental" only has a power of 300 watts.—L.J.K.)

Bill Wright says a new station broadcasting Indonesian-type programmes has been heard at 12.30 a.m. on 5.61 mc, 53.48 m. (I have not heard this one, but "Radio Republic Indonesia," Djokjakarta is listed on 5.66 mc.—L.J.K.)

Rex Gillett recently received a verification for his report on Radio Italiana, 31.15 m. The location of Radio Italiana is Busto Arsizio, in province of Lombardy. Other veries received are: ZOY, 41.13 m; TAQ, SBT, Durban 48.62 m; WNRA; WNRI; WNRX; COBL; PY-11; LRX; VE-9A1, 31.45 m; VL3AE on 3090 kc. (Victorian

(*Continued overleaf*)

NEW STATIONS

CBFZ, Montreal, 15.19 mc, 19.75 m: This was inadvertently missed from June issue. Phil Byard of Launceston wrote me on May 23: "Heard this Canadian, which I think is a new one with news at 10 p.m. and morning devotional service at 10.15. Very good signal."

I also heard from Bill Wright, of Plympton, South Australia. "First heard at 9 p.m. when a bright breakfast session was being presented. CBS news heard at 11 o'clock."

(This 7,500 watt station has been listed for some time, but I think the above reports are the first in this country.—L.J.K.)

RADIO BANDEONG, 4.80 mc, 62.50 m: Arthur Cushen reports this one. Is well received 10.30 p.m.—12.30 a.m. All Indonesian-Dutch. Uses chimes as identification.

RADIO SOFIA, Pavlovo, 7.67 mc, 39.11 m: This new frequency heard as well as on 9.35 mc. (Evidently this Bulgarian has settled down on 7.67 mc; they had been testing on 7.64 mc. I think Arthur means 9.325 mc for the other frequency. They were on 9.345 mc for a little while and also on 9.30 mc., but eventually went to 9.325 mc. — L.J.K.)

CE—, ? Santiago, 6.22 mc, 48.23 m: And still another from the newly-wed. Arthur says: "Heard at 2 p.m. with bagpipe notes similar to the identification signal of CE-1173, which, by the way, has not been used lately, so it looks like a change of frequency."

(CE-117, Santiago, whose slogan was "Radio Soc. Nacional de Mineria," had a power of 5000 watts.—L.J.K.)

KZRH, Manilla, 9.64 mc, 31.12 m: This should not actually be in this category, although it will be new to some of those who have just taken up DX-ing. I am grateful to Leo Edel for bringing KZRM under my notice.

Announce: "Your station KZRH, The Voice of the Philippines." They are using the same frequency as pre-war. During the war the station was known as PIAM/N. Signal is best at 7 p.m., as later on it is badly interfered with by XGOY on same frequency. Reports are requested and should be sent to: Manila Broadcasting Co., Insular Life Building, Manilla. They could be relied upon before the war to verify correct reports with most attractive cards and often on Saturday nights would "call listeners."

NICO, Bikini, 9.14 mc, 32.82 m: Arthur Cushen reports hearing the station of the "Mt. McKinley," flagship of the Atomic expedition at 8 p.m. with a good signal.

NICO, Bikini, 5.625 mc, 53.33 m: Arthur Cushen also heard this other outlet of the "Mt. McKinley" on a Sunday at 6 p.m. with Church relay. Power is 300 watts.

NIGF, Bikini, 9.065 mc, 33.11 m: Mr. Cushen says this is the call of U.S.S. "Spindleye." Ask for reports to be sent to: NIGF, U.S.N.T. Spindleye, Navy 824

(*Continued on page* 41)

Forestry Commission); and CBFX for temporary outlet of 31.21 m. The veri. stated this outlet is no longer used, being replaced by CBFZ, 15.19 mc, since April 28.

The "Malanda Tiger" has been prowling around again whilst the paint on the Model Aeroplanes dry, and elsewhere in this issue will be found some of his loggings. By the way, his model planes are splendid and my little grandson gets a great lot of fun out of his "Catalina." Hugh tells me he has bought a motorbike — just afraid that with the planes and now the temptation for a spin after he has tended his fine Jersey herd, DX-ing may take a miss-in-baulk.

"A new 100 kilowatt transmitter at Shepparton was recently testing on 6.10 mc, and radiated Radio Australia programmes during the test. Advice from the P.M.G., Melbourne, states that this transmitter will soon be put into service under the call sign VLB.—Wright."

Arthur Cushen is experiencing housing troubles like the Australian home builders, but at last writing expected to be in the Love Nest by end of June.

His verifications now total: Shortwave 565 and Broadcast 400 — well, there's no love's labour lost about that; it represents the result of burning midnight oil and setting the alarm on multitudinous occasions.

"Moscow is heard with news in Russian at dictation speed at 1 a.m. on 6.02, 12.25 and 12.06 mc."—Edel.

HELP WANTED

Dr. Gaden wants to know who is on about a dead 50 metres at night. Sounds like a Chinese station . . . very noisy spot . . . Nothing heard to give a clue.

UNIVERSALITE

The last batch of subscribers' names was sent early in May, and copies should be forthcoming any time now, although I have found mail from **U.S.A. is very** erratic and sometimes arrives 2½-3 months after date shown on envelope.

SHORT-WAVE STATIONS OF THE WORLD

Compiled by L. J. Keast - - August, 1946

All Times East Aust. Stand.

As the purpose of this list is more to provide, as far as possible, an accurate compilation of Shortwave Stations in frequency order and to enable the whole of the 20-25 metre band to be listed, schedules are not shown.

Call Sign	Mega-cycles	Metres	Location
	14.947	20.06	Batavia
PSE	14.935	20.07	Rio de Janeiro
WVLC	14.85	20.20	Luzon
OQ2AB	14.828	20.24	Elizabethville
XBC	14.80	20.27	Dutch N. Guinea
IQA	14.736	20.37	Rome
PSF	14.69	20.42	Rio de Janiero
WBOS	14.55	20.61	Boston
WNRX	14.56	20.61	New York
HBZ-2	14.538	20.64	Berne
XDA	14.525	20.66	Chapultepec
	14.50	20.68	Bouganville
WDO	14.47	20.73	New York
HBZ	14.462	20.74	Berne
DZH	14.46	20.75	Berlin
	14.46	20.75	Moscow
	14.435	20.79	Malaga
	14.40	20.83	Tunis
	14.275	21.01	Nova Lisboa
SUZ	13.825	21.70	Cairo
	13.701	21.81	Morotai
	13.655	21.97	Moscow
SVQ	13.65	21.97	Athens
SPW	13.635	22.02	Warsaw
	13.61	22.04	Moscow
Radio Rabaul	13.515	22.20	Rabaul
KU5Q	13.39	22.40	Guam
	13.39	22.40	Moscow
	13.345	22.48	Dakar
HBJ-2	13.32	22.52	Geneva
	13.32	22.52	Omdurman
RV-64	13.19	22.74	Khabarovsk
WLXJ	13.115	22.87	Shanghai
	13.11	22.88	Moscow
NPM	13.065	22.96	
KNBA	13.05	22.98	San Francisco
WNRI	13.05	22.98	New York
WLWR	13.0225	23.03	Cincinnati
	13.02	23.04	Moscow
WLWR	12.967	23.13	Cincinnati
HBJ	12.965	23.14	Geneva
CNRI	12.83	23.38	Rabat
	12.71	23.60	Doula
	12.495	24.01	Baku
HI1N	12.49	24.01	Ciudad Trujillo
HCJB	12.455	24.09	Quito
CS2WI	112.405	24.19	Parede
	12.275	24.45	Batavia
CE1227	12.27	24.45	Punta Arenas
KU5Q	12.265	24.47	Guam
Radio Centre	12.26	24.47	Moscow
WXFG	12.555	24.49	Adak
TFJ	12.235	24.54	Reykjavik
	12.23	24.58	Moscow
XLPA	12.22	24.58	Changsha
Radio Wien	12.21	24.59	Vienna
Radio Centre	12.17	24.65	Moscow
	12.165	24.67	Hanoi
	12.126	24.74	Tananarive
THA1	12.116	24.77	Algiers
	12.115	24.77	Moscow
ZNR	12.115	24.77	Aden
HI3X	12.11	24.77	Ciudad Trujillo
GRF	12.095	24.80	London
	12.08	24.80	Moscow
PST	12.08	24.80	Rio de Janiero
	12.06	24.88	Moscow
GRV	12.04	24.92	London
CR-6R	12.024	24.95	Benguola
CE1180	11.997	25.01	Santiago
CSX	11.995	25.01	Lisbon
Radio Brazzaville	11.97	25.05	Brazzaville
HEK-4	11.96	25.08	Bern
GVY	11.955	25.09	London
ZPA-5	11.95	25.09	Encarnacion
GVX	11.93	25.15	London
XGOY	11.918	25.17	Chungking
	11.90	25.21	Saba
	11.90	25.21	Phillipsburg
	11.90	25.21	Moscow
CE1190	11.90	25.21	Santiago
OQ2AB	11.90	25.21	Elizabethville
CXA10	11.90	25.21	Montevideo
CKEX	11.90	25.21	Sackville
JVU3	11.895	25.22	Tokyo
WNBI	11.893	25.22	New York
	11.89	25.23	Moscow
KWIX	11.89	25.23	San Francisco
	11.886	25.24	Paris
VLH-4	11.88	25.25	Lyndhurst
LRR	11.88	25.25	Rosario
VLG-5	11.88	25.25	Melbourne
	11.878	25.27	Moscow
	11.87	25.27	Moscow
VUD-9	11.87	25.27	Delhi
WNBI	11.87	25.27	New York
WOOW	11.87	25.27	New York
VLC-3	11.87	25.27	Shepparton
ZPA-3	11.865	25.28	Asuncion
GSE	11.86	25.29	London
	11.858	25.30	Singapore
CE1185	11.85	25.32	Santiago
	11.85	25.32	Rangoon
JVU-2	11.845	25.33	Tokyo
	11.845	25.35	Paris
VLC-7	11.84	25.35	Shepparton
VLG-4	11.84	25.35	Melbourne
OLR4A	11.84	25.35	Prague
CXA-19	11.835	25.36	Montevideo
CR7BF	11.835	25.36	L'enco Marques
VUD-11	11.83	25.36	Delhi
Radio Centre	11.83	25.36	Moscow
VLW-3	11.83	25.36	Perth
WCRC	11.83	25.36	New York
WCRC	11.825	25.37	New York
XEBR	11.822	25.38	Hermosillo
GSN	11.82	25.38	London
JVZ	11.815	25.39	Tokyo
WGEA	11.81	25.40	Schenectady
WLWL	11.81	25.40	Cincinnati
	11.805	25.41	Milan
GWH	11.60	25.42	London.
JZJ	11.80	25.42	Tokyo
VUD-3	11.79	25.45	Delhi
KGEX	11.79	25.45	San Francisco
KNBA	11.79	25.45	San Francisco
WRUS	11.79	25.45	Boston
	11.78	25.47	Moscow
OIX-3	11.78	25.47	Lahti
HP5G	11.78	25.47	Panama
Radio Saigon	11.78	25.47	Saigon
KCBR	11.77	25.49	San Francisco
KCBA	11.77	25.49	San Francisco
VLA-4	11.77	25.49	Shepparton
GVU	11.77	25.49	London
SEAC	11.765	25.50	Colombo
	11.765	25.50	Algiers
ZYB-8	11.765	25.50	Sao Paulo
	11.762	25.51	Berlin
VLG-10	11.76	25.51	Melbourne
VUD-7	11.76	25.51	Delhi
	11.75	25.53	Komsomolsk
GSD	11.75	25.53	London
CE1174	11.74	25.55	Santiago
HVJ	11.74	25.55	Vatican City
COCY	11.74	25.55	Havana
CE1173	11.73	25.58	Santiago
PCJ	11.73	25.58	Hilversum
KGEX	11.73	25.58	San Francisco
	11.73	25.58	Paris
WRUW	11.73	25.58	Boston
WRUL	11.73	25.58	Boston
KGEI	11.73	25.58	Sarn Francisco
CHOL	11.72	25.59	Sackville
PRL-8	11.72	25.59	Rio de Janiero
OTM-4	11.72	25.59	Leopoldville
CKRX	11.72	25.59	Winnipeg

ULTIMATE
Champion Radio

Sole Australian Concessionaires:

GEORGE BROWN & CO. PTY. LTD.

267 Clarence Street, Sydney

Victorian Distributors: J. H. MAGRATH PTY. LTD., 208 Little Lonsdale Street Melbourne

The Ultimate factory has made the changeover from wartime production. Designs for the new mode's are now completed and production is about to commence.

These models should be available soon — they will be worth waiting for. Watch for further announcements.

SERVICE: Servicing of all kinds of radio sets, amplifiers and Rola speakers will continue to be available.

Call Sign	Mega-cycles	Metres	Location
	11.715	25.60	U.S.S.R.
HSP-5	11.71	25.60	Bangkok
	11.715	25.60	Dakar
VUD-3	11.71	25.62	Delhi
HEI-5	11.713	25.61	Bern
WLWS	11.71	25.62	Cincinnati
WLWK	11.71	25.62	Cincinnati
VLG-3	11.71	25.62	Melbourne
CBFY	11.705	25.63	Montreal
CKXA	11.705	25.63	Sackville
	11.705	25.63	Paris
SBP	11.705	25.63	Stockholm
JLG-3	11.705	25.63	Tokyo
GVW	11.70	25.64	London
XORA	11.69	25.65	Shanghai
	11.695	25.65	Singapore
HP5A	11.692	25.66	Panama
HVJ	11.688	25.68	Vatican City
GRG	11.68	25.68	London
	11.675	25.71	Moscow
XGTA	11.65	25.75	Shanghai
XTPA	11.65	25.75	Canton
Radio Centre	11.63	25.80	Moscow
	11.625	25.81	Berlin
	11.623	25.83	Havana
	11.535	26.00	Warsaw
	11.53	26.02	Douala
PZX-4	11.516	26.05	Paramaribo
	11.485	26.13	Tunis
	11.405	26.29	Dakar
HBO	11.402	26.31	Berne
PZR	11.332	26.47	Paramaribo
	11.315	26.51	Moscow
	11.26	26.64	Yaounde
KCBF	11.140	26.92	San Francisca
Emisora Nacional	11.09	27.05	Ponta Delgada
CSW-6	11.035	27.17	Lisbon
	11.00	27.27	Java
PDQ	10.99	27.32	Amsterdam
ZLT-4	10.98	27.32	Wellington
LSD-8	10.875	27.58	Buenos Aires
SDB-2	10.780	27.83	Stockholm
VQ7LO	10.73	27.96	Nairobi
ZIK-2	10.60	28.30	Belize
	10.54	28.45	Johannesburg
	10.445	28.72	Moscow
HED-4	10.405	28.83	Bern
HCHAC	10.312	29.09	Guayaquil
XRRA	10.25	29.25	Peiping
PSH	10.22	29.35	Rio de Janiero
HH3W	10.135	29.62	Port-au-Prince
XBHX	10.12	29.63	Mexico
SUV	10.05	29.84	Cairo
WWV	10.00	30.00	Washington

WALKIE-TALKIE FOR FIRE BRIGADE

A peace-time use has recently been found for the portable or walkie-talkie radio transmitter-receivers recently used by the military authorities. During a big fire at West Ham, firemen carrying the walkie-talkie entered the burning warehouse and sent out orders to the pumps in the street, thus enabling hoses to be directed to the seat of the fire and otherwise assisting in overcoming the blaze quicker than under normal conditions. The fire commander afterwards announced the experiment to be a great success.

—Practical Wireless.

* * *

Do you recall how, in 1936, or thereabouts, the Jap commercial station JNB had a walloping harmonic at the L.F. end of "Ten"? That sig was often R9 for hours. Obviously, in the light of present day conditions engendered by 11 year sun-spot cycle considerations, there would have been easy QSO's with Ham stations in the island locations — if there had been any Hams up there in those times. I suppose one might say the same thing about the Moon — if Hams existed there, now that Radar echoes are being recorded!

NEW STATIONS

(*Continued from page 39*)

c/o Fleet Post Office, San Francisco.

NCLG, Bikini, 9.275 mc, 32.36 m: This is U.S.S. "Appalachian," which is also heard around 8 p.m. and reported by Arthur Cushen.

RADIO BADEN BADEN 6.33 mc, 47.39 m: This German station is reported by Arthur Cushen as coming in fairly well at 2.45 p.m. but mixed with COCW. Announcements are in German and French. Slogan is "Suedwestfunk."

(Baden Baden is listed in my latest advices from Washington as 6.315 mc, and COCW as 6.322 mc., so perhaps Arthur has made a typographical error. By the way, Baden Baden is listed as using 10,000 watts. — L.J.K.)

NCLG, Bikini, 10.64 mc, 28.19 m: Mr. Leo Edel reports hearing this station on the announced frequency of 10.64 mc, at 12.30 a.m. when Correspondents were talking about Atomic tests. Mr. Edel says they announced they were also on 11.24 mc.

RADIO AUSTRALIA

Overseas Shortwave Service of Department of Information

Several alterations took effect in July, so I have compiled a list of latest schedules.

7.15—9.00 am: VLA-6 Shepparton 15.2 mc, 19.74 m: Forces programme to Pacific, Japan and Asia.

9.00—9.30 am: VLA-6 Shepparton 15.2 mc, 19.74 m: To Asia in Japanese.

10.30—11.45 am: VLC-9 Shepparton 17.84 mc 16.82m: To North America (East) and Canada.

Noon—2.00 pm: VLG-6 Lyndhurst 15,23 mc, 19.69 m: Forces programme to Pacific, Japan and Asia.
VLC-4 Shepparton 15.32 mc, 19.59 m:

1.15—5.30 pm: VLA-6 Shepparton 15.2 mc, 19.74 m: Saturdays only.

3.00—3.45 pm: VLG-4 Lyndhurst 11.84 mc, 25.35 m: To North America (West).
VLC-4 Shepparton 15.32 mc, 19.59 m:

4.00—4.45 pm: VLG-3 Lyndhurst 11.71 mc, 25.62 m: To Tahiti in French.
VLC-4 Shepparton 15.32 mc, 19.59:

5.00—6.15 pm: VLC-11 Shepparton 15.21 mc, 19.22 m: To British Isles. Except Sunday.

5.00—6.15 pm: VLA-4 Shepparton 11.77mc, 25.49 m:

5.30—6.10 pm: VLG-10 Lyndhurst 11.76 mc, 25.51 m: To Northern Asia in Japanese.

6.15—6.53 pm: VLG-10 Lyndhurst 11.76 mc, 25.51 m: To New Caledonia in French.

6.29—7.00 pm: VLC-6 Shepparton 9.615 mc, 31.2 m: Saturdays only. To Forces in Pacific, Japan and Asia.

6.34—7.00 pm: VLC-6 Shepparton 9.615 mc, 31.2 m: Sundays.

6.35—10.00 pm: VLA-4 Shepparton 11.77 mc, 25.49 m: Forces programme to Pacific, Japan and Asia.

6.58—8.00 pm: VLC-6 Shepparton 9.615 mc, 31.2 m: To Forces in Pacific, Japan and Asia.
VLG-5 Lyndshurst 11.88 mc, 25.25 m:

8.00—10.00 pm: VLG-5 Lyndhurst 11.88 mc, 25.25 m: To Asia in Chinese, Japanese, English, Dutch and Malay.

8.00—9.50 pm: VLC-6 Shepparton 9.615 mc, 31.2 m: To Asia, in Chinese, Japanese, English, Dutch and Malay

10.00—11.00 pm: VLG-5 Lyndhurst 11.88 mc, 25.25 m: To Asia and Forces.
VLA-4 Shepparton 11.77 mc, 25.49 m:

10.00—11.15 pm: VLC-5 Shepparton 9.54 mc, 31.45 m: To North America (East) and Canada.

11.00—11.35 pm: VLG-5 Lyndhurst 11.88 mc, 25.25 m: To Indo-China in French.
VLA-4 Shepparton 11.77 mc, 25.49 m:

11.35—Midnight: VLG-5 Lyndhurst 11.88 mc, 25.25 m: To Siam in Siamese.
VLA-4 Shepparton 11.77 mc, 25.49 m:
VLC-6 Shepparton 9.615 mc, 31.2m:

Midnight—12.29 am: VLA-4 Shepparton 11.77 mc, 25.49 m: To Pacific and India.

Midnight—12.50 am: VLC-6 Shepparton 9.615 mc, 31.2 m:

12.15—1.00 am: VLG Lyndhurst 9.58 mc, 31.32 m:

1.00—2.00 am: VLA-3 Shepparton 9.69 mc, 30.99 m: To British Isles.

1.00—1.45 am: VLC-6 Shepparton 9.615 mc, 31.2 m:

1.00—1.45 am: VLG Lyndhurst 9.58 mc, 31.32 m:

2.00—3.00 am: VLG Lyndhurst 9.58 mc, 31.32 m: To North America (West).
VLC-6 Shepparton 9.615 mc, 31.2 m:

Lyndhurst Transmitter VLG (10 KW).
Shepparton Transmitter VLC (50 KW).
Shepparton Transmitter VLA (100 KW).

Speedy Query Service

(Conducted under the personal supervision of A. G. Hull)

R.D. (Parkes) enquires about a subscription to "Q.S.T."

A.—Yes, the technical magazine, "Q.S.T." is still in publication by the American Radio Relay League. Quickest way of arranging a subscription is to contact the Technical Book and Magazine Co. of 297 Swanston Street, Melbourne. You can send them £1 in Australian money and they will arrange to have "Q.S.T." posted regularly for 12 issues.

* * *

S.D. (Petersham) wants us to settle an argument.

A.—Whilst there is no actual reason why a high-fidelity modulator could not be used with a ham transmitter, it is generally considered a much better scheme to use one with greatly curtailed high and low note response. This allows a higher percentage of modulation on average speech without over-modulation on certain sounds, and also makes it much easier to avoid troubles with feedback, hum and so on. A comparatively narrow band of frequencies is all that is necessary to give comprehensible speech, and the ordinary voice does not use either extremely low or high notes.

HEADPHONES

Brand New! Just Released!

S.T.C. & STROMBERG CARLSON

Original cost, £2/10/- pr.

130 Ohms, 10/- pair

2,000 Ohms, 25/- pair

(Postage 1/6 pr. extra)

Can supply in quantity.

DEITCH BROS.
210A GEORGE STREET
SYDNEY

R.D. (Perth) is in trouble with a superhet using a 6K8 converter with ordinary oscillator coil kit designed for use with a 6J8.

A.—Normally the 6K8 will work well with ordinary commercial coils, but your only certain check is to whether the 6K8 is operating correctly or not is to measure the actual grid current. This can be done by fitting an 0 to 1 milliammeter in series at the cathode end of the 50,000 ohm oscillator grid leak. Unsolder it for this purpose. With the set operating and the meter in circuit the grid current should be between 100 and 200 microamps. The current will vary according to dial setting, but should not go outside these limits.

* * *

B.D. (Belmore) wants to know what resistance to use as shunt for an 0 to 1 milliammeter, which he is going to build up as a multi-meter.

A.—The shunt to use will depend entirely on the internal resistance of the meter itself, which can be found out by enquiry from the makers. The University meter S4- 46A has its resistance marked at the bottom of the dial, and is 100 ohms.

To find the value of the shunt in ohms, divide the internal resistance of the meter by the full scale reading required, less 1. For example, for a full scale of 10 milliamps with a 100 ohm meter, you divide 100 by 10 less 1, which is 9, and gives you a required resistance of 11.111 ohms. For 50 milliamp scale the shunt will be 2.04 ohms and for 250 milliamps will be .4 of an ohm. If, however, the meter has an internal resistance of 50 ohms, the shunts will work out at 5.555 ohms for 10 ma., 1.02 ohms for 50 ma. and .2 of an ohm for 250 milliamps.

* * *

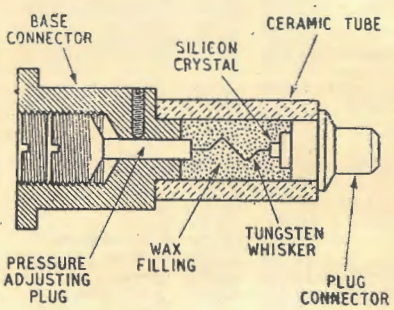
R. T. (Bendigo) asks about the next "ham" exam.

A.—Examinations for the amateur operator's certificate of proficiency are to be held on the second Tuesday in October.

NEW "VALVE" IS CRYSTAL

After a lapse of nearly twenty years the commonplace catswhisker crystal detector once again figures as an important item in an otherwise essentially modern radio receiver. As R.F. amplification is virtually unobtainable on the extremely short wavelength of 3 cm the successful operation of the equipment depends largely on the efficiency and reliability of these new crystal detectors.

Although generally known as a crystal valve, it is basically a silicon-tungsten detector, but externally bears no resemblance whatsoever to

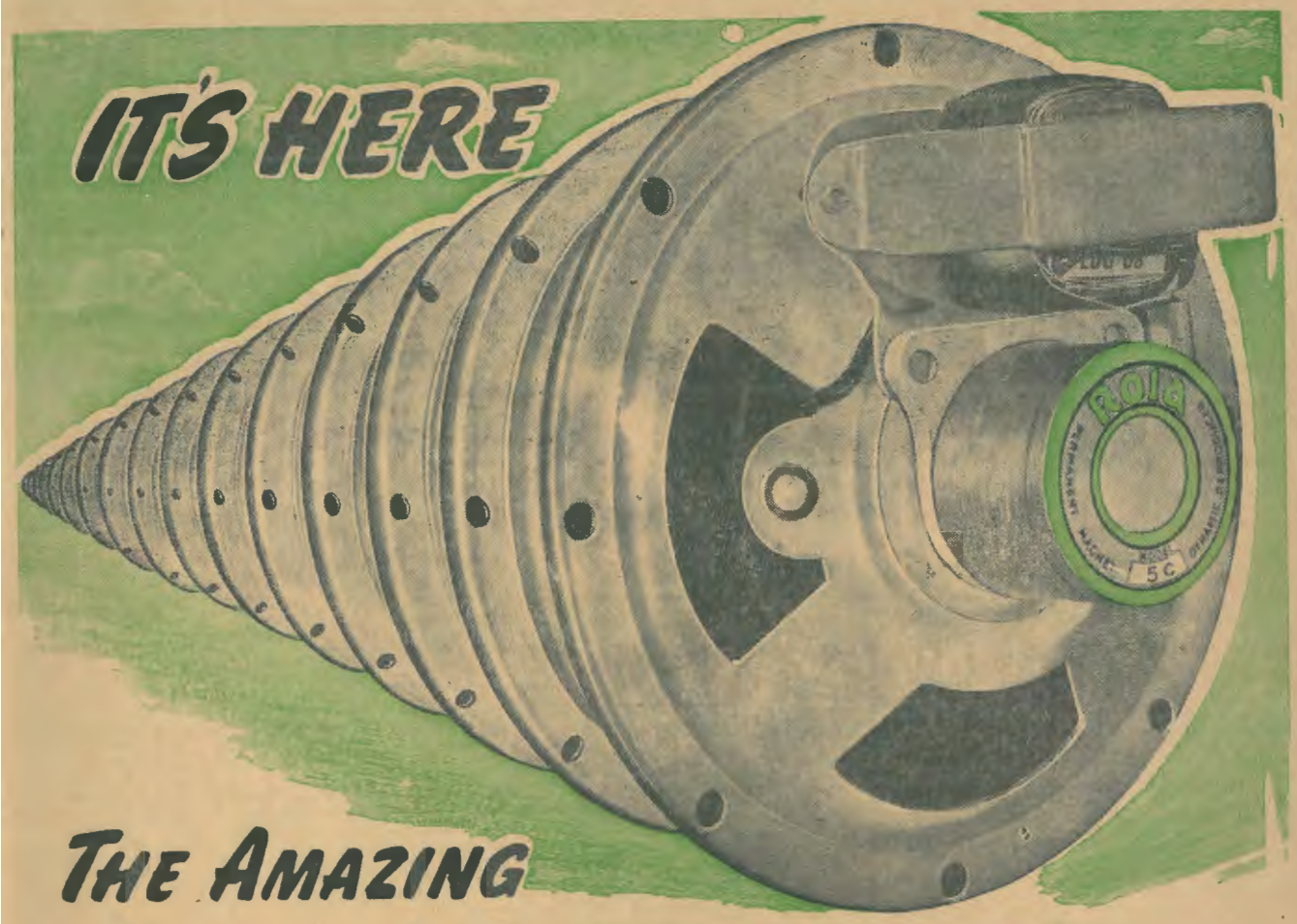


its early prototypes. As the sectional drawing in Fig. 1 shows the crystal and tungsten catswhisker are contained in a small ceramic tube closed at each end by brass plugs and completely filled with wax. This form of construction results in a mechanically robust device in which the contact is quite undisturbed by normal shocks.

When used as a superheterodyne mixer careful control of the local oscillations is needed, and the best guide is a measurement of the rectified current passing through the crystal. This should be between 0.5 and 1 mA for average crystals.

Physically these crystal capsules are quite small, the overall size being just under 1-in. long and ¼-in. in diameter.

—Wireless World (Eng.)



THE AMAZING

ROLA 5C SPEAKER with ANISOTROPIC ALNICO

Using Anisotropic Alnico to achieve the maximum efficiency to weight ratio, Rola 5C is the most modern of all five inch speakers. Ideally suited for use in a.c. and a.c. d.c. receivers, it also finds useful application in vibrator and battery operated receivers.

It occupies the barest minimum of space, weighs only 12 ozs., and is thoroughly robust in construction and reliable in operation. Because of its iminent suitability in midget receivers, Rola 5C is unquestionably the most sought after speaker today.

Retail price with K5 type transformer attached or detached 26/6

(With small isocore transformer detached .. 29/-)

ROLA LOUD SPEAKERS with ANISOTROPIC ALNICO

Nq 621.38405 AUS

AUSTRALIA WILL NEED THOUSANDS MORE COMPETENT RADIO SERVICEMEN!

With a prewar turnover of £8,000,000, the number of male personnel alone engaged in the Radio receiver field runs into thousands and the need for more grows each week.

Train quickly for a profitable career in RADIO . . . or a prosperous business of your own!

One of the most attractive features of Radio in Australia is the scope offered to start your own business. With a total of 1,481,919 licensed radio receivers (remember civilian production ceased during the war), some idea can be gained of the pressing need for more and more trained servicemen . . . Such servicemen make big money, too, in selling valves, components (of which over £1,000,000 annually were sold before the war) as well as associate electrical appliances.

We are entering now a Radio age, an Age which has a place for YOU. Radio, a young industry which has made remarkable progress in the past few years, will want **trained** men urgently to fill vital positions. If you want security, prosperity, and a recognised status in the community, start training NOW.

TRAIN AT HOME, OR AT OUR BENCHES

A.R.C. offers ambitious men a sound proven course in Radio Engineering. Sound because it is the result of many years' successful operation, proven because hundreds of ex-students owe their present success to the College. You can learn with equal facility at home (by means of our correspondence course).

EARN GOOD MONEY WHILST LEARNING

You don't have to wait a year, or even six months, before you are ready to begin "cashing in." We will show you how to earn extra money almost from the word "go." Many students make £4, and up to £8, per week in their spare time whilst studying.

PREVIOUS KNOWLEDGE UNNECESSARY

You don't need a knowledge of Radio or Electricity—we'll give you all you need of both, in a simple, practical manner, that makes learning easy, presented too, in such a way that you remember what you're taught and how to put that knowledge to practical use.

COSTS LITTLE

Think of his—for a few pence per day—actually less than many fellows spend on tobacco—you can prepare yourself for a man-sized job in Radio NOW.

NOW IS THE TIME TO ACT!

Send in today for the free book, "Careers In Radio and Television." It's a book no man can afford to miss. It shows you the steps you can take to get into Radio immediately!

RADIO IS STILL A NEW INDUSTRY GROWING FAST!

£8,000,000 was estimated prewar sales of radio receivers and parts. The next few years should see these figures doubled.

Pre-war Radio Set output reached an estimated 280,000. All records are expected to be broken in near future.

Even a 25 per cent. increase in set sales will mean openings for perhaps 1,000 more Radio dealers—Over 130 Australian Radio Stations employ a vast number of skilled personnel—a team of specialists which would probably be tripled with the advent of F.M. transmission.

GET THIS BIG FREE BOOK NOW!

To Mr. L. B. GRAHAM, Principal,

Australian Radio College, Pty. Ltd.,
Broadway, Sydney. Phone M 6391-2.

Dear Sir—I am interested in Radio. Please send me, without obligation on my part, the free book, "Careers in Radio and Television."

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