RADIO and AUSTRALIAN ELECTRONICS

INCORPORATING AUSTRALASIAN RADIO WORLD

Vol. 16. OCTOBER, 1951. No. 3. 1'6

Registered at G.P.O., Sydney, for transmission by post as a periodical.

AUSTRALIAN

Radio and Electronics

incorporating

(AUSTRALASIAN RADIO WORLD)

A MONTHLY PUBLICATION

Providing National Coverage for the Advancement of Radio and Electronic Knowledge.

Vol. 16. OCTOBER, 1951. **No. 3.**

CONTENTS

SUBSCRIPTION RATES

12 Issues 18/-

POST FREE

★

Published by the Proprietors:

RADIO & ELECTRONICS (AUST.) PTY. LTD.

17 Bond Street, Sydney, N.S.W.

Telephones: BU 3879 - BW 7746.

Telegrams and Cables: "Cranlay," Sydney.

OUR COVER

Apart from the correct alloying of the various metals used in its composition one of the most important phases in the manufacture of Anisotropic Alnico magnet steels is that of heat treatment. Our cover illustration shows one of Rola Company's physicists removing a white hot magnet from the laboratory furance (left) and placing it between the poles of a pewerful electro-magnet in which it will be cooled and made Anisotropic.

When making purchases or enquiries please mention Aust. Radio & Electronics.

IT HELPS US BOTH

Managing Editor:

LAY W. CRANCH, AMIRE (Aust.) M.W.I.A. VK2XC

★

Short-wave Editor:

L. J. KEAST

7 Fitzgerald Rd., Ermington, N.S.W.

Phone: WL 1101.

★

"Ham" Activities:

J. A. HAMPEL

503 Radium Street, Broken Hill, N.S.W.

Sole Wholesale Distributors - - - - - - - - - - - - - GORDON & GOTCH (A'sia) LTD.

Editorial . . .

THE IMPORTANCE OF ELECTRONICS

FOR too many years now has the importanc of electronics been overshadowed in the public mind by the entertainment value of one of its greatest manifestations—radio broadcasting. It is only natural that this, one of the marvels of the century, should capture the public imagination to the extent that it has done, but at the same time there is no reason why kindred, and even more important branches of electronics, should be relatively so little known. The vast part played in the world's economy by radio communication (as distinct from broadcasting) is hardly even guessed at by the layman.

Radio communication itself is now only one item in an evergrowing list of electronic applications, the importance of which, is daily increasing. In the last decade, uses have been developed for electronic techniques which were previously undreamed of. Industrial men, doctors, engineers and workers in all branches of pure and applied science, have been provided with powerful new tools for investigating and solving their problems—problems which, in many cases, have defied solution till electronics supplied the key to them.

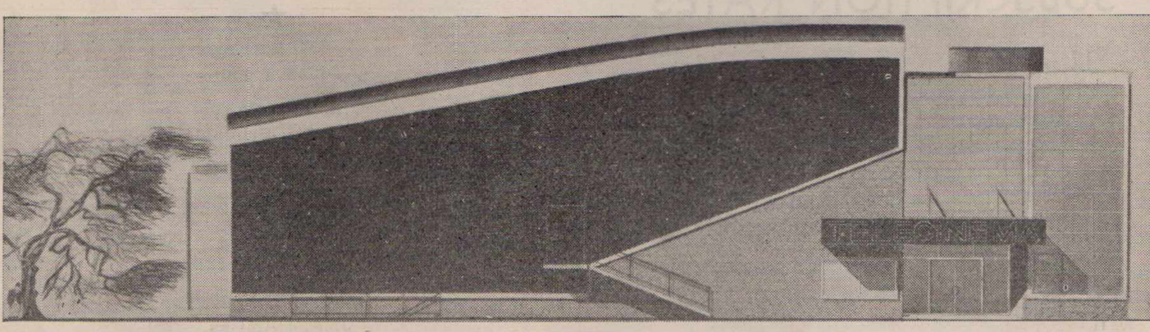
To some, this may seem a sweeping statement, and so it is, but it is none the less true, and in direct proportion to its truth is the importance of electronics to the world at large and to this country in particular. This being the case, the importance of having a sufficiently large body of men trained in electronics engineering can hardly be overestimated. At present a vicious circle exists, whereby the full exploitation of electronic techniques is hindered by the lack of men with good enough qualifications and sufficiently advanced training. The incentive to suitable young men to study advanced electronics is likewise hindered by the lack of positions for them once they are full trained.

However, there is certainly no lack of appreciation in Great Britain or America, either of scientific development generally, or of electronics in particular. It is recognized that in defence alone electronics will, in the future, play a part bigger by far than its share in the last war.

For this reason alone, quite apart from any other, Australia should take care to keep in the forefront of peace-time electronics, just as she did during the war. For, whether peace or war is to be our future lot, we now live an electronic age, when none can say that this branch of applied science will not ultimately exceed all others in its effects upon mankind.

ELECTRONICS IN THE FESTIVAL OF BRITAIN

From Geof. W. Hart, M.A.,A.M.I.E.E., comes some interesting data concerning the South Bank Exhibition in London.



The illustration shows the "telecinema" which was designed to seat 400, and to demonstrate full-size projected T.V. pictures, steroscopic films in colour with four-channel sound on magnetic tape, a high efficiency screen, and special lighting techniques. This complex equipment, it is hoped, will reveal the possibilities of these new techniques of public entertainment.

This is an Image Converter

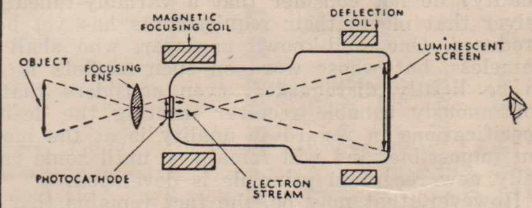
The action of an Image Converter is achieved by first focusing a projected image on to the photocathode; the resultant stream of electrons is then accelerated, and finally focused on to the luminescent screen. The amplification and precise control of radiations, thus made possible by the Image Converter, opens up important new possibilities to designers of electronic equipments. It can, for example, be used for:—

★ Multiple Image Amplification or Reduction.

★ Wavelength Conversion i.e. Infra-red or Ultra-Violet to visible.

★ Studying Ultra-fast Transient Phenomena of the order of 10^{-7} to 10^{-8} seconds—with time base, the gated tube acts as an ultra high-speed camera shutter.

AN IMAGE CONVERTER IS AN ELECTRON-OPTICAL DEVICE WHICH CONVERTS LIGHT OR NEAR LIGHT RADIATIONS FROM A GIVEN SUBJECT INTO A VISIBLE IMAGE ON A LUMINESCENT SCREEN.



PRINCIPLE OF OPERATION

The Image Converters listed below are the first of a comprehensive range at present being developed by Mullard. For full technical information on these tubes, please write to the Communications and Industrial Valve Department.

TYPE:	ME1200AG	ME1201AG	ME1202CA
Description	Visible image converter	Grid-controlled visible image converter	Infra-red image converter
Focusing and Deflection	Magnetic	Magnetic	Magnetic
Photocathode	Caesium-antimony	Caesium-antimony	Caesium-oxidised silver
Sensitivity (At 2,700°K)	20 μA lumen.	20 μA lumen.	15 υA lumen.
Luminescent screen colour	green	green	rapid decay blue
Max. anode-cathode voltage	6 KV.	6 KV.	5 KV.
Max. grid-cathode voltage	—	6 KV.	—
Max. grid-anode voltage	—	6 1 KV.	—
Linear magnification of image	3 times	3 times	1
Screen resolution	200 lines/cm.	200 lines cm.	200 lines cm.
Typical operation: Va-k	6 KV.	6 KV.	3 KV.
Vg-k	—	3 KV.	—
Vg-k for extinction of image	—	—100 V.	—

Variants of these tubes with different photocathodes and luninescent screens are being developed.

Mullard

Radio Receivers • Communication Equipment • Radio Receiving and Transmitting Valves • Television Picture Tubes • Electronic Photo-Flash Tubes • Hearing Aid Valves • X-Ray Tubes and Accessories • Cathode Ray Tubes • Photo-Cells • Image Converters • Industrial Power Valves and Rectifiers • Thyratrons • Stabilising and Voltage References Tubes • Electrometers • Cold Cathode Tubes • Measuring Instruments • Scientific Apparatus • Ultrasonic Generators • Permanent Magnets • etc.

MULLARD-AUSTRALIA PTY. LTD. - - - 35-43 Clarence Street, Sydney
592 Bourke Street, Melbourne

Representatives in Australia for Mullard Electronic Products Ltd., London.

A New High-quality Local-station Tuner

USING PRE-SET SELECTOR

In the August, 1949 issue of "Radio and Electronics" was described a push-button tuner circuit whose purpose was to receive local broadcast transmissions with less distortion, and less side-band cutting than conventional radio sets, thus providing a high-quality output worthy of feeding into a modern amplifier and speaker system. Basically, the scheme used in that tuner was very sound, and gave excellent results. The version described here, however, incorporates several innovations which lead to even better performance.

INTRODUCTION

The problem of high-quality reception of broadcast band transmission is one which, like the poor, is always with us. It is a fascinating topic, containing as it does scope for all the ingenuity the designer can display. It is also a problem that, so far, has not been satisfactorily solved, even by the best technical brains. A number of workable compromises exist, and tuners have been produced that approach perfection fairly closely, but it is a significant that broadcast engineers (who are notoriously hard to please over matters affecting quality) do not consider that a variably-tuned receiver that meets their requirements has yet been produced. One well-known engineer, who shall be nameless, but whose word on such matters is not to be lightly disregarded, even considers that a continuously tunable receiver meeting the desired specifications in regard to quality is at the moment impossible, and will remain so until some radically new reception principle is developed.

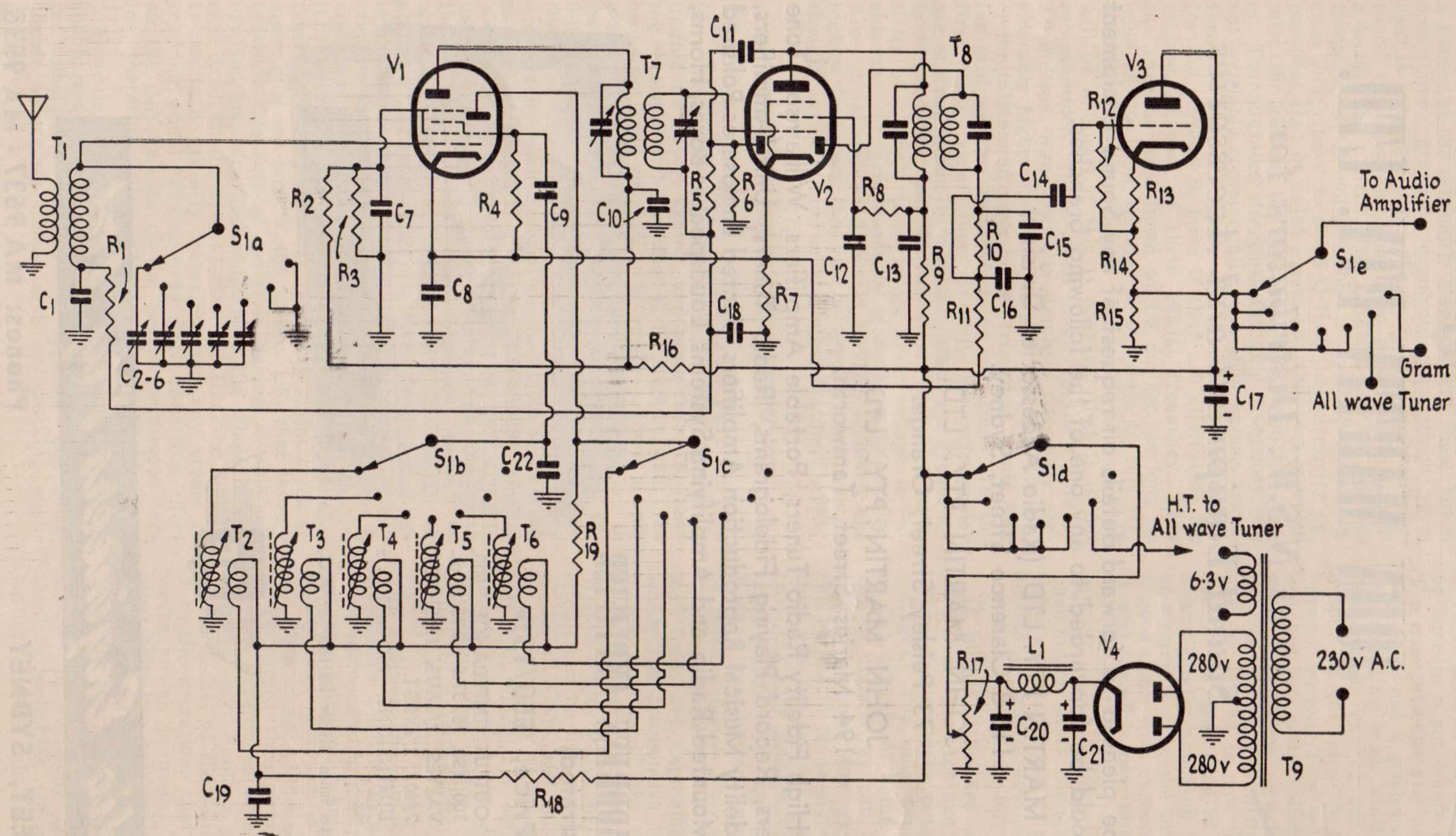
However, that may be, the fact remains that all is not lost. That is to say, workable compromises are by no means outside the bounds of practicability, and more particularly if one is prepared to forego continuous tuning, and put up with pre-tuning, and selection by some form of switch. When this is done, it is possible to meet the most rigid requirements. Not with any show of simplicity, though, so the unfortunate individual quality enthusiast would still seem to be left out in the cold, unless he can build, or have built, a receiver which gains its selectivity and wide pass-band by means of a complex band-pass filter, quite a job in itself, and requiring to be duplicated for each station that is to be received.

THE NEXT BEST THING

The ideal characteristic for our hypothetical receiver is one which gives it infinite attenuation outside the required pass-band, and none at all within it. The selectivity curve then becomes a rectangle with a flat top, and vertical sides. As was implied in the last paragraph, such a response curve can be approached very closely if one is willing to go to the complication and expense of filter circuits instead of conventional tuned circuits. It is also possible to approach it, with only one filter, which need not be very complicated, if one uses the relatively new synchrodyne principle. The latter, however, has certain inherent disadvantages, which are not easy to overcome, so for all except experimental purposes can be ruled out. This leaves us with the seemingly age-old choice between the "straight" or T.R.F. set, and the superheterodyne. The T.R.F. is still found in the literature as the so-called answer to all high-quality difficulties, but in hard fact, it loses by several laps when it comes to making measurements, and evaluating performance properly. Briefly, its main disadvantage is that if it is made selective enough to be useful where there are more than two widely-spaced local stations, its pass-band is not wide enough. Also, it suffers from unpredictable performance on account of regeneration. This does not refer to the sort that is great enough to cause the T.R.F. amplifier to burst into oscillation, but to much smaller degrees of regeneration, which can completely ruin the performance by making the pass-band lopsided, and much narrower than can be expected from an analysis of the circuit.

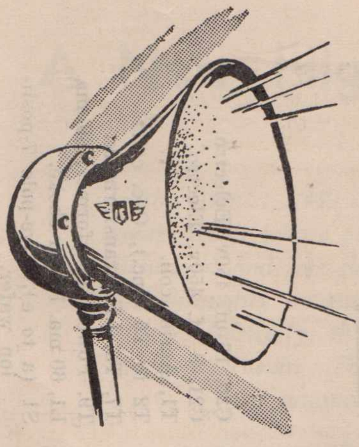
This leaves only the superhet, and the present tuner uses this arrangement, in common with the earlier circuit mentioned at the head of this article. The principle employed is to use a conventional tuner, consisting of an oscillator-mixer and I.F. stage, and diode detector, but to make the intermediate frequency considerably higher than is usual in normal receivers. By this means, it is possible to effect a compromise whereby the pass-band is widened, and yet sufficient selectivity is retained outside it to enable the tuner easily to separate any local station from all the others operating in the same district. Lest some readers should question the word "compromise," and ask whether the performance is not as good as it could be made, perhaps we should state here and now, that the final design represents the best that can be done with the parts available, and that although not perfect, the results can be guaranteed to surpass those from any tuner readers are likely to have heard. We shall have a little more to say about the actual performance later, when we will be able to enlarge on just what is meant by the last sentence.

When 455 kc/sec. is used as the I.F. of a superhet, it is not a very simple matter to obtain a useful amount of increase in the pass-band. Special circuits have to be resorted to, and these are sometimes difficult to adjust, and sometimes do not quite come up to expectations. Several of them have been successfully built in our laboratory, and described in these pages, but for all-round quality of reproduction, combined with ease of construction, it is the writer's firm opinion that the scheme used here is the best of all. The use of a high I.F. enables a



COMPONENT LIST

R1, R8, 100k.
R2, 25k.
R3, 30k.
R4, R10, R18, 50k.
R5, R6, 1 meg.
R7, 150 ohms.
R9, R16, 2k.
R11, R12, 500k.
R13, 1000 ohms.
R14, 10k.
R15, 200 ohms.
R17, 25k. voltage divider.
R19, 5k.
V1, ECH35.
V2, EBF32.
V3, 6J5-GT.
V4, 6X5-GT.
C9, C22, 100 uuf.
C1, C7, C10, C12, C13, C18, 0.05 ufd.
C2 to C6 (inc.), Aerial tuning condensers (see text).
C8, 0.1 uf.
C11, C15, C16, 50uuf.
C14, 0.01 uf.
C17, 16 uf. 450v. Electro.
C19, 0.02 uf.
C20, 16 uf. 450v. Eelectro.
C21, 8 uf. 450v. Electro.
T1, Aerial coil.
T2 to T6 (inc.), Osc. coils
T7, T8, I.F. transformers.
T9, Power transformer, 60 ma.
L1, 60 ma. Power choke.
S1 (a to e), Five-pole 7-position wafer.



AUDIO ENGINEERS PTY. LTD.

Announce the appointment of

JOHN MARTIN PTY. LTD.

as N.S.W. Distributors for

Sound Equipment and Accessories

JOHN MARTIN will be pleased to forward details on request of any Sound Equipment required. Enquiries should be forwarded to any one of the following branches:

JOHN MARTIN PTY. LTD. (Radio Accessories Division)
116-8 Clarence Street, Sydney.

JOHN MARTIN PTY. LTD.
73 Peisley Street, Orange.

JOHN MARTIN PTY. LTD.
194 Marius Street, Tamworth.

Williamson Amplifiers, High Fidelity Radio Tuners, Portable Amplifiers, Williamson Tone Controls, Record Players, Record Playing Fidelograms, Radio Tuners, Unit Amplifiers, Pre-Amplifiers, High Fidelity Musical Reproduction Amplifiers, Vented Enclosures Polished and Unpolished, Rack Mounted Radio and Amplifying Systems, Loudspeaker Boxes, Horns, Amplifiers, etc.

25 WATT PUBLIC ADDRESS AMPLIFIER

(as illustrated)

Model XV25. Price, £50/15/-

Specifications—

POWER OUTPUT—25 watts, noise level—46db.

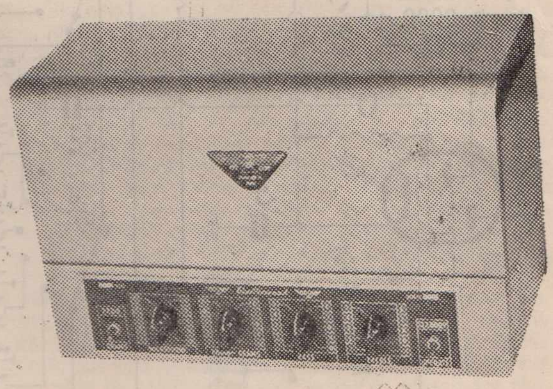
OPERATING VOLTAGE, battery 12 volts or AC 240 volts.

OUTPUT IMPEDANCE, 600, 300, 150, 75, 37.5, 18.75 ohms.

VALVES, 2/6AU6, 1/6SN7GT, 2/807, 2/6X5GT.

DIMENSIONS, 16" x 10" x 8¼".

This amplifier is designed for use from either battery or A.C. mains.



Audio Engineers Pty. Ltd.

422-424 KENT STREET, SYDNEY **Phones: MA 9537 - MA 9538**

Open on Saturday Mornings — 9.30 - 12 Noon

wide pass-band to be obtained without recourse to any of the aforementioned special circuits, as a glance at the schematic diagram will show, but it does have pratical disadvantages which prevent it (a) from being the basis of a continuously-tuned receiver; and (b) from being anything but a local-station tuner. The I.F. is 2 mc/sec. At this frequency it is not possible to produce tuned circuits which have so much Q that the selectivity approaches that of a 455 stage, and this fact is relied upon for getting the extra band-width in this tuner. Transformers designed for this frequency are not available commercially, but 1600 kc/sec. transformers are, and these are perfectly satisfactory for the purpose in hand if they are aligned on 2.0 mc/sec., instead of their official frequency. They can even be used tuned to 1.6 mc/sec. as long as none of the local stations is too close to this frequency. However, slightly less width of pass-band will be obtained if this is done, so that it is not recommended. There is no magic in the figure of 2.0 mc/sec., however, it is simply a frequency considerably higher than 455 kc/sec., and, but for other limitations, an even higher frequency would confer still greater band-width on the tuner. In the first place, transformers of still higher frequency are not commercially available, until the frequency is 10.7 mc/sec., but by this time, the skirt selectivity of a single stage is not great enough to enable the tuner to separate stations satisfactorily. Also, it is considered that 2 mc/sec. is about the highest frequency that can be used, without special circuits, in the simple arrangement featured here.

WHY NOT CONTINUOUS TUNING?

It is only necessary to examine the basic set-up a little more closely to see why the arrangement is limited to pre-set tuning, and some form of selector mechanism. With the I. F. higher than the broadcast band which is to be received, there is only one place for the local oscillator—namely higher in frequency than the I.F. Now the broadcast band extends from 550 kc/sec. to, say, 1500 kc/sec. and the I.F. is 2000 kc/sec. Thus, at the low-frequency end of the broadcast band the oscillator must work at 2550 kc/sec., and at the high-frequency end, at 3500 kc/sec. If, therefore, an attempt were made to use continuous oscillator tuning, ganged with the aerial circuit, the problem would be one of making a circuit with a range of almost 3 to 1 track with one whose frequency range is only 1.37 to 1. In conventional broadcast receivers, the oscillator has a tuning range of 1.94 to 1, and even here, in spite of its commonplace nature, it is quite a problem to get satisfactory oscillator tracking. Indeed it is the relatively slight tracking error in a set with a 455 kc/sec. I.F. that largely prevents this sort of set from having a satisfactory and constant bandwidth over the whole broadcast band. In the present case, the tracking difficulty would be greatly increased, and any errors in tracking would have an even more disastrous effect on the performance of the tuner. Continuous tuning, therefore, turns out to be impracticable.

There is, however, no reason why pre-set tuning should not be used, since then, each station can be individually set up, with the oscillator and aerial circuit accurately tuned, and no tracking error exists.

FOR AND AGAINST PUSH-BUTTONS

There are two ways in which station selection can be done in a set where the stations are pre-tuned. The most obvious and perhaps the most convenient way is to use a push-button unit, with one button for selecting each station. In addition, an extra push–button can be set up so that it selects the output of the pick-up or pre-amplifier, giving a "gram" button. This set-up is very convenient to use, but has certain disadvantages. First and foremost push-button switches are not as reliable as they should be. The writer may have been unlucky, but the one he is now using at home has been in use for no more than 12 months, but is now giving a particularly annoying form of trouble. It will be necessary to take the unit out and at least give it a good clean with carbon tetrachloride, if not scrap it and install a new unit. This sort of thing does not endear the maker of the switch to the user, to say the least; certainly, by their very construction, push-button units cannot be expected to be as reliable as other forms of switch, and it is clearly desirable to guard against unreliability, unless the set is to be nothing but a source of annoyance.

If push-buttons are a source of trouble, then what sort of switch can be substituted in a circuit where the contacts must of necessity carry R.F. voltages? The only type of switch that qualifies as (a) capable of being used in R.F. circuits, and (b) as reliable as can be expected, is the wafer switch, as used for wave-change switches. These can be had in up to eleven positions, which is more than can be said of push-button units, and they have the very great advantage of enabling a much more satisfactory layout of parts to be organized. With a push-button unit it is virtually impossible to make a layout that enables the rules for good R.F. arrangement to be followed. For instance, long R.F. leads are impossible to avoid, and especially where the frequencies to be handled are a little higher than usual, the push-button unit itself can cause difficulty in obtaining stable performance. With a rotary wafer switch, on the other hand, the circuit can be laid out just as well as in the case of the all-wave receiver. For example, it is possible to arrange each wafer to be quite close to the circuit with which it is concerned, because spacers of different lengths can be used between wafers. Moreover each wafer is compact, whereas each switch in a push-button unit takes up the whole length of the unit.

In addition, the contacts of the wafer switch are much more positive in action than those of the push-button, and in general, operate for years without any attention whatever. As against this, the rotary type of switch is not quite so convenient to use, since to get to one station the switch may have to be turned through several positions. However, for the advantages obtained, this is a very small price to pay. Another point on which the wafer scores is that of flexibility. There is almost no limit to the operations that can be performed when a wafer switch is used. The push-button, on the other hand has, as a rule, no more than three levels, or individual switches, operated by each button. Thus, for the purpose in hand, one of these is normally used up in switching the oscillator tuning, another in switching the aerial tuning, and the third in switching the audio output, so that one button can be labelled "Gram." The use of the rotary switch, as in the present tuner, has, in fact, enabled us to incorporate features that would not be possible with an ordinary three-level push-button switch.

DISTINCTIVE FEATURES

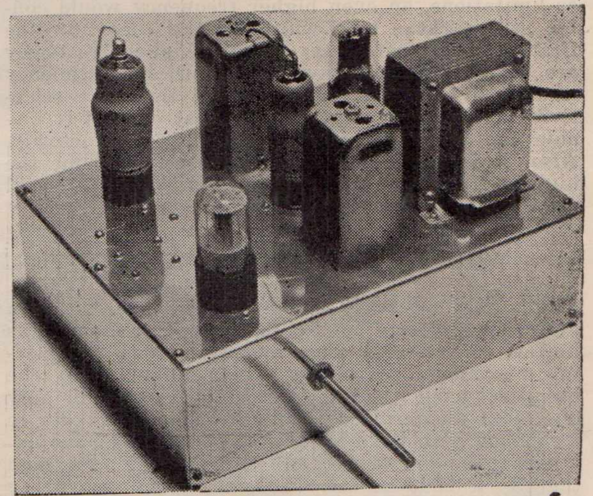
What, then, are the distinctive features that have been incorporated in this tuner? First of all, eight switch positions have been provided. This allows for six stations, and leaves two spare positions. Of these, one is used, as before, for bringing the pick-up into circuit with the amplifier, and the other is used for bringing into use a second, conventional tuner that will provide distant broadcast, and short-wave reception. This does away at one blow, as it were, of the nuisance of having to undo and do up connections in order to bring either the pick-up, or the extra tuner, into operation. Provision is made for applying to the common audio output terminal any desired fraction of the output of the pick-up, high-quality tuner, and conventional tuner, so that the same volume control at the input to the amplifier, can be used at all times, without wide adjustments in setting when the various parts of the system are switched in. The tuner, therefore, becomes in addition, a means of integrating the amplifier, two tuners, and pick-up (and its pre-amplifier, if any) into a complete system instead of having them as a collection of individual gadgets. The switching that can be done with a push–button unit is not comprehensive enough to allow this to be done.

On the R.F. side, the rotary switch has enabled one very important improvement to be made to the original tuner from which this one emanates. It is to use permeability tuning for the oscillator instead of capacity tuning. Previously, a single oscillator coil was provided, and pre-set tuning was done by switching in trimming condensers, in some cases paralleled with fixed condensers. This necessitates the use of compression type trimmers, if the unit is not to be too expensive to build, and previously, dual compression trimmers, as used in I.F. transformers were employed. These did not prove as satisfactory as was hoped, and a certain amount of drift in the oscillator frequency did occur. It would be possible to improve matters by using air–dielectric trimmers, such as Philips trimmers, or even midget variables, but both these solutions would prove fairly costly, without striking at the real root of the matter. It is well known that circuits tuned by fixed silvered-mica or silvered-ceramic condensers, and adjusted by means of movable iron-dust slugs are much more stable as to frequency than are circuits using small variable condensers, so that the proper way to effect a real improvement in oscillator stability is to go over to permeability tuning without further ado. Of course, this, too, is more expensive than using compression trimmers, since one coil must be provided for each station to be tuned in, but it is considered that the improvement in stability is well worth it. Here again, the rotary switch wins out, for with individual coils, it is necessary to switch both grid and plate windings. With the push-buttons, this would take up the third level, leaving no switches available for providing a gram. position.

Condenser tuning has been retained for the aerial circuit, since it is unlikely that drift will be sufficient here to affect the performance, especially if Philips trimmers are used as the variable elements —and this has been done.

OTHER POSSIBILITIES

Since there is almost no limit to the number of wafers that can be used, it is possible to include other features that may be thought desirable without being essential. For example, the necessity for providing a power supply for the high-quality tuner has enabled a reduction in cost to be made, if the whole system with the additional tuner is envisaged. The high-quality tuner has been provided with a built-in power supply using a 60 ma. transformer. This capacity is by no means used up in the tuner itself, whose H.T. drain is only about 30 ma., but, by adding an extra wafer on the selector switch, and providing a socket on the chassis, it has been possible to use the power supply for both tuners, switching off the H.T. from whichever one is not in use. It would be possible at the same time to bring the H.T. supply for a pick–up pre-amplifier into this same wafer, so that its H.T. is off except when it is in use.



Top Chassis View of Tuner

The arrangement just described is to be found on the circuit diagram (except for the provision of H.T. for a pre-amplifier) but there are plenty of other things that could be done, simply by adding wafers to the switch. For example, it would be quite practicable to have a series of dial lamps wired to their own separate wafer so that a different one lights up to indicate the position at the moment. These lights could each be behind a small window on which is inscribed the station callsign, "Tuner," or "Gram", thus doing away with the need for an indicator plate on the rotary switch.

Another possibility is the addition of a further wafer for switching the mains supply to the various units, and also giving an "Off" position for the whole outfit. Readers can no doubt think of other things that could be done by adding more wafers, such as controlling the response characteristics of the pick-up pre-amplifier to suit different types of recording. This, of course, would necessitate the pre-amlifier circuit's incorporation on the same

for Telecommunication, Radio and General Electrical Work ! ...

Superspeed

Activated

ROSIN CORED SOLDER

Equilibrium diagram of the tin-lead alloys

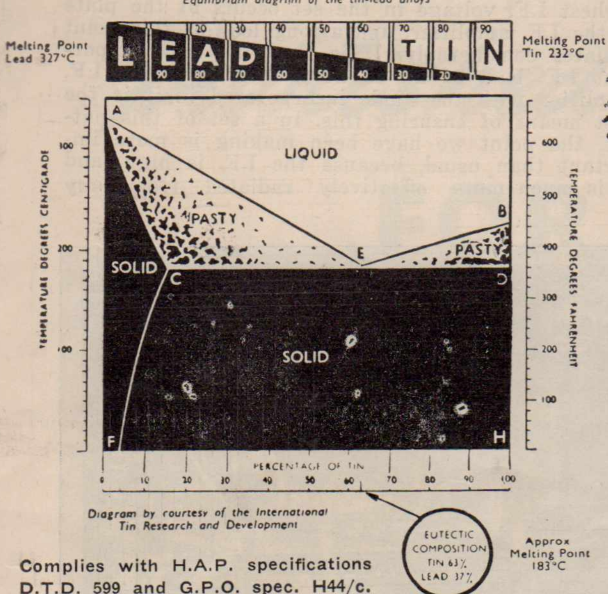
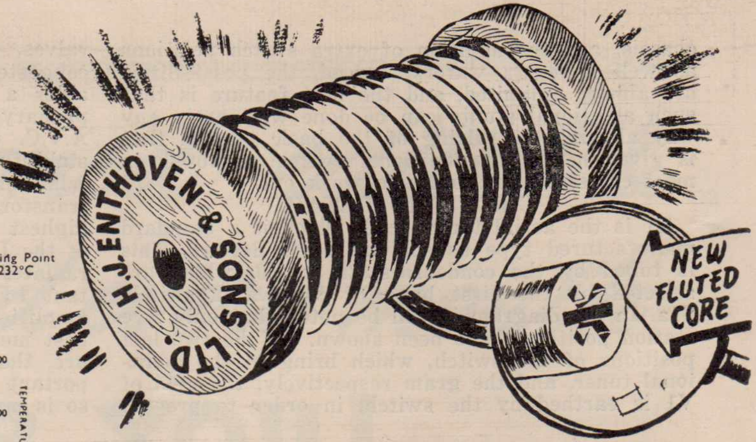


Diagram by courtesy of the International Tin Research and Development

Complies with H.A.P. specifications D.T.D. 599 and G.P.O. spec. H44/c.



CHARACTERISTICS

1. Chemically activated rosin core ensures correct degree of "wetting" and spreading.
2. Increased fluidity accelerates production.
3. Allows more moderate soldering-iron hit temperatures and minimises the risk of physical damage and alteration to the electrical values of small pre-calibrated components.
4. Ensures perfect electrical conductivity.
5. Reduces to a minimum the solder required per joint. No waste.
6. Residue is non-corrosive, solidifies to a semi-transparent film of high electrical insulation value, is non-hygrosopic and unaffetcted under tropical conditions.
7.: The heating of the activated rosin core does not cause any deleterious fume deposits or unpleasant odour.
8. Up-to-date technique assures a completely continuous core.

DISTRIBUTORS IN EVERY STATE.

SOLE AUSTRALIAN AGENTS:

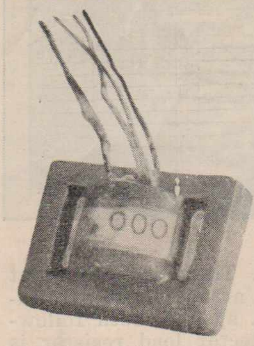
J. H. MAGRATH & CO. PTY. LTD: 208 Lit. Lonsdale St., Melbourne

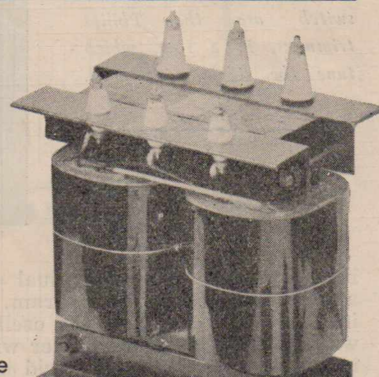
---

ELECTRONIC

A & R

EQUIPMENT





This month we illustrate the outer limits of our transformer range. The item on the right is a 5 KVa High Tension Transformer, and the illustration on the left represents a Microphone Transformer, Impedances 50/25,000. Four of these items fit quite comfortably in a matchbox. The foregoing may seem irrelevant, but it serves as an indication of the large number of applications for which A & R Transformers are produced. When the job is tough and the specifications rigid, an A & R Transformer is a natural choice.

For Value and Reliability insist on A & R

Available from

MELBOURNE: Wm. Willis & Co.
J. H. Magrath & Co. Pty. Ltd.
Homecrafts Pty. Ltd.

ADELAIDE: Gerrard & Goodman Ltd.
W. AUST.: A. J. Wyle Pty. Ltd.
TAS.: A. H. Gibson Electrical Pty. Ltd.

A. & R. Electronic Equipment Co. Pty. Ltd.

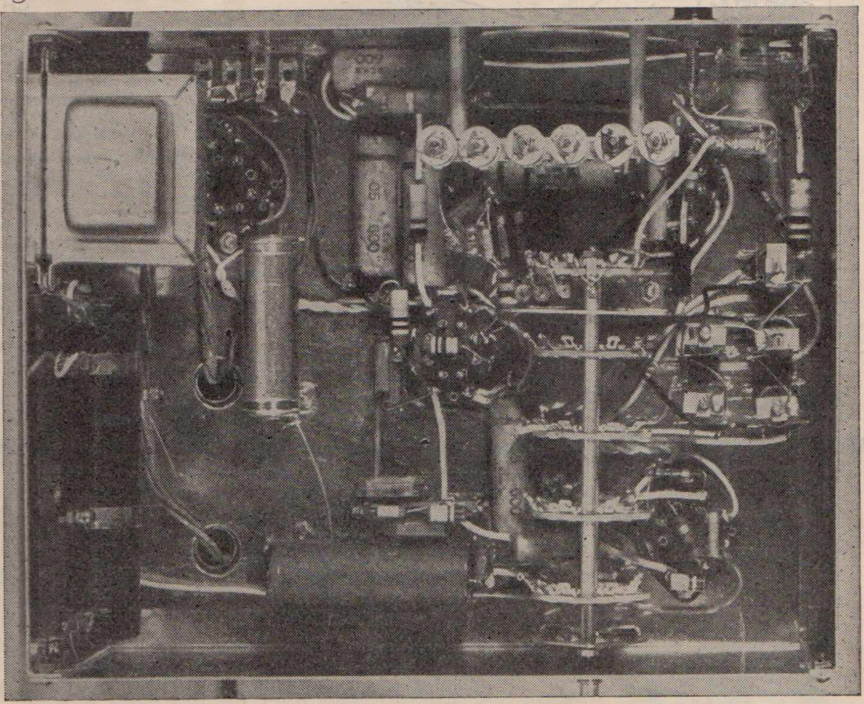
378 ST. KILDA ROAD, MELBOURNE, S.C.1. **Phones: MX1159, MX1150**

chassis, and the addition of extra switch positions as well as extra wafers. Indeed, the possibilities are almost unlimited, and the best feature is that such additional stunts can be done without in any way altering the wiring of the basic portion that is given here. The additional switching would, in most cases, be quite easy to work out.

CIRCUIT IN DETAIL

T1 is the aerial tuning coil, which is a standard manufactured type as sold by parts dealers. This is tuned by the condensers C2 to C6, which are selected by the first bank of the wafer switch, S1a. In the diagram it will be noted that only five station positions have been shown. On the two last positions of the switch, which bring in the additional tuner, and the gram respectively, the grid of V1 is earthed by the switch, in order to prevent break-through. The individual oscillator coils are at the bottom of the diagram, and are T2 to T6 inclusive. S1b switches the oscillator grid winding, while S1c switches the tickler windings, On the two inoperative positions, the grid is disconnected from the tuned circuits, and the plate is disconnected from H.T. It can thus be seen that the tuner is completely disabled on the two last positions, and that there is no chance at all of unwanted signals feeding through to the amplifier in these switch positions.

V1, the oscillator-mixer, is an ECH35 in a perfectly conventional circuit arrangement, and the same can be said for the I.F.-cum-second-detector stage, which uses an EBF32. This tube gives excellent gain as an I.F. amplifier, and has the advantage of having two diodes which can be used for detection and A.V.C. rectification. This kind of tube, similar to the 6AR-GT in the Australian series of valves, gives an excellent layout in the usually congested detector portion of the circuit. It enables a very short lead to be used between the primary of the second I.F. transformer and the A.V.C. diode. This is always a point where instability trouble can arise, especially where a relatively long lead must be run between the transformer and the diode. This is because the highest I.F. voltage in the set occurs at the plate of the I.F. amplifier, and a long lead at this point radiates considerably. It is thus the most important I.F. lead of all to keep short, and the I.F. amplifier with the diode incorporated in it is the best means of ensuring this. In a set of this nature, the point we have been making is more important than usual, because the I.F. is high, and so is much more effectively radiated from any open wiring that may occur. There is nothing at all unusual about the circuit arrangement of either the detector or the A.V.C. system, both following normal practice. The detector load resistor is R11, and this is returned to the cathode of V2 so that the cathode bias voltage of this valve acts as the A.V.C. delay voltage, without affecting the detector. In this connection it will be noted that the A.V.C. diode's load resistor, R6, is returned to earth, giving the diode a negative bias on the plate, equal to the positive cathode voltage of V2. In the detector circuit, R10, C14, and C15 form a filter which removes the I.F. voltage from the audio load, R11. The full audio output of the detector is applied to the grid of V3, which is a cathode follower. This fulfils two most important functions, and is not an extra, but an integral part of the scheme of things. Its first, and most important feature is that its very high input impedance caus-



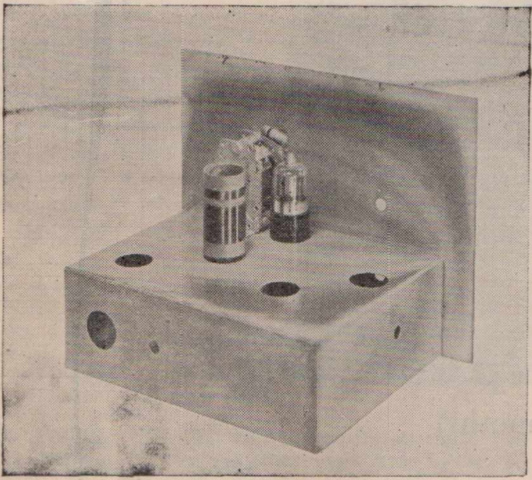
An underneath view of the completed tuner. The back of the chassis is at the top in the picture. At the left are the power supply components, while the wave-change type of selector switch can be clearly seen at the right. To the right of this again are the oscillator coils, mounted in a group, while behind the switch are the Philips trimmers, in a row, which tune the single aerial coil.

NOVICE SET BUILDING

A SECTION FOR THE BEGINNER

The "Progressive" Battery Three

In designing the Progressive Battery Three, we have taken into account several factors of considerable interest to the home constructor. It is intended from the constructional point of view to meet the requirements of those who are new to the building of sets on a metal chassis. Since the details of such a set differ quite markedly from the equivalent bread-board mounted set, and because in a set of this type proper shielding is imperative if the best results are to be obtained, we are describing the set in several instalments. Each instalment gives the constructor a complete receiver which will perform excellently in its class, but successive instalments add new features which improve on the performance of the preceding set. One very good effect of treating the construction in this manner is that each modification may easily be made and the result tested by actual working from the air, as it were. In this way any faults which occur are isolated in the portion which has just been completed, and the constructor is unlikely to end up with a set which does not perform properly, and which has to be taken to a professional radio man to be put into working order.

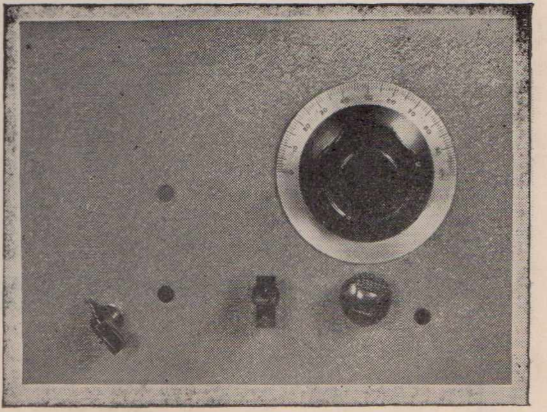


Showing the layout of parts for the first stage of the construction.

THE PLAN OF THE SET.

Briefly, the plan followed, both in this series of articles and in the construction of the set, is as follows. First, the chassis for the complete set is built, including from the start all large valve and coil holes. A working plan of the chassis and front panel is shown on this page. Next, the first part of the set is constructed using only one valve. This is a 1D8-G, and is wired up as a regenerative triode detector resistance coupled to a pentode stage of audio amplification. A glance at the circuit will reveal that it is the same as was used for the all-wave One, which appeared in Aust. Radio and Electronics some months ago. This little set was such a good performer that is was considered quite unnecessary to alter the design to make it suitable for our present purpose. The next stage is to add a 1N5-G as an untuned R.F. amplifier. This gives useful gain without introducing the necessity for top-panel shielding. or for any further controls. It will work quite well from the 45v. used for the first portion of the set, After this, the R.F. stage is tuned, giving greater gain and, this time, an increase in selectivity. It is at this point that the more inexperienced constructor is likely to find difficulty, since now, proper shielding becomes necessary, and careful adjustment of coils is required so that the R.F. and detector tuning controls may track with each other reasonably well. The controls will not be ganged, since this adds further complications and only a small advantage in the elimination of one control. In fact, a separate R.F. tuning control can have the distinct advantage of ensuring that the R.F. stage is always exactly tuned, so that there are no losses from ganging errors.

Up till now, the set is intended for headphone operation only. The final step, therefore, is to replace the triode section of the 1D8-G by a 1H4-G, and to rewire the 1D8-G as two stages of audio amplification. Since the pentode section is intended to be used as a power amplifier. 90 volts of B-battery is now used, and, with the additional gain provided, the set becomes capable of giving good loud-speaker volume on even weak stations. Thus, the final line-up is:—1N5-G tuned R.F. amplifier. 1H4-G regenerative detector, triode section of the 1D8-G as first audio stage, and pentode section as output tube.



The front panel, with the controls mounted for the first stage of construction.

THE CHASSIS

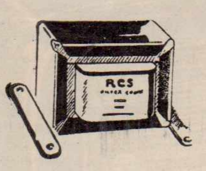
.....This should be made exactly according to the plan given, from 18-guage iron. The purpose of the various mounting holes may be outlined thus:—The hole on the extreme left of the chassis top takes a valve socket for the plug-in R.F. coils. To the right and behind this is the hole for the R.F. tube socket. Almost in the centre at the front of the chassis comes the detector valve and nearly directly behind it is the hole for the detector coil socket. In the top right-hand corner is mounted the output tube. At the back of the chassis, close to the latter, is the hole for the loud-speaker plug, and next to it a ⅜ inch hole through which are led the battery connecting wires. The photographs show the set in its first stage. Next to the tuning condenser is the 1D8-G, and in front of both is

(Continued on page 20)

See that the BIG 3 in your circuit is R.C.S.

Coils
I.F.'s
Filter Chokes

The true basis of performance of any circuit is *stability.* That is why enthusiastic amateurs and radio engineers everywhere prefer to use R.C.S. components, particularly R.C.S. I.F.'s coils and filter chokes, because not only are R.C.S. components built to the very *highest and latest standards,* but the processes of their manufacture are such that *guarantee stability.* R.C.S. components pass through many tests during their assembly, and are thoroughly *impregnated against drift* due to moisture penetration or the extreme and sudden variations of climatic conditions experienced in Australia. If you're contemplating a new rig, piece of new gear, then why not *ensure peak performance right from the start.* Specify R.C.S components throughout.



Filter, Audio & Vibrator Chokes

TC60 100 M/A 30 H. Filter Chokes.
TC65 50 M/A 30 H. Filter Chokes.
TC66 New 14/60 Filter Choke.
TC80 150 M/A 20 H. Filter Choke.
TC81 200 M/A 20 H. Filter Choke.
TA4 100 H. 1000 ohm. D.C. Res. Audio Choke.
TC58 Low Tension 3 Amp. 50 M/H Vib. Choke.
TC70 High Tension 75 M/A 50 H. Vib. Choke.

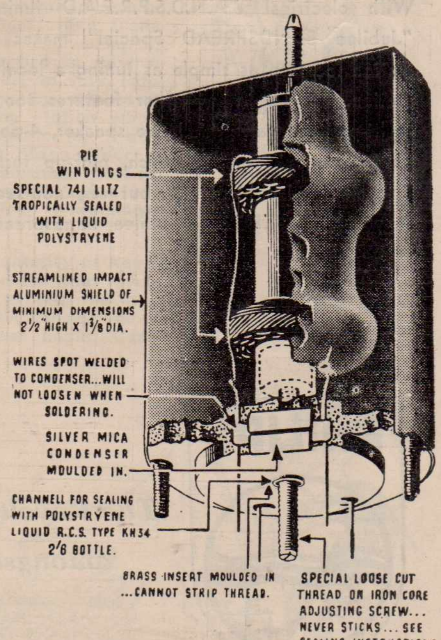
If your local retailer cannot supply, write us and we will arrange for your retailer to receive supplies immediately, or we'll advise you where supplies can be obtained.

Coils

E356 455 K.C. I.C. B'cast Aer.
E357 455 K.C. I.C. B'cast R.F.
E358 455 K.C. I.C. B'cast Osc.
E342 455 K.C. Air Core B'cast Aer.
E343 455 K.C. Air Core B'cast R.F.
E344 455 K.C. Air Core B'cast Osc.
E345 460 K.C. I.C. B'cast Aero.
E346 460 K.C. I.C. B'cast R.F.
E347 460 K.C. I.C. B'cast Osc.
E352 Midget Magnasonic B'cast Aer.
E353 Midget Magnasonic B'cast R.F.
E354 Midget Magnasonic B'cast Osc.
T90 I.C. Reinartz.
T89 T.R.F. Air Core Aer.
T88 T.R.F. Air Core R.F.
T87 T.R.F. Air Core R.F. with Reaction.
H121 Short Wave 13.42 metres I.C. Aer.
H122 Short Wave 13.42 metres I.C. R.F.
H123 Short Wave 13.42 metres I.C. Osc.
H124 10 meter Air Core Aer.
H125 10 metre Air Core R.F.
H126 10 metre Air Core Osc.
H127 20 metre Air Core Aer.
H128 20 metre Air Core R.F.
H129 20 metre Air Core Osc.
H130 40 metre Air Core Aer.
H131 40 metre Air Core R.F.
H132 40 metre Air Core Osc.
H133 80 metre Air Core Aer.
H134 80 metre Air Core R.F.
H135 80 metre Air Core Osc.
H136 B'cast Unshielded Aer.
H137 B'cast Unshielded R.F.
H138 B'cast Unshielded Osc.
F125 Std. 6in. dia. Loop Aer.
F126 Midget 4in. dia. Loop Aer.

Intermediate Transformers

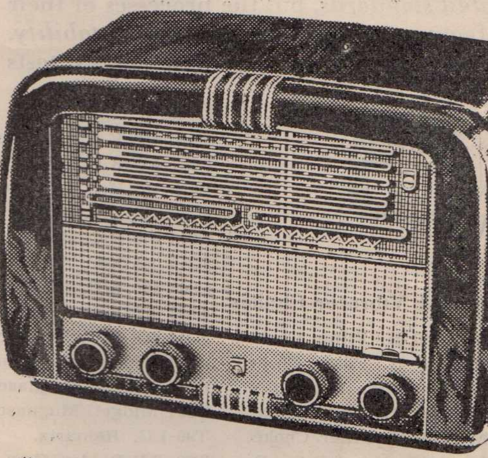
IF170 Std. 455 K.C. 1st stage I.C.
IF171 Std. 455 K.C. 2nd stage I.C.
IF172 Std. 455 K.C. 1st stage I.C.
IF173 Std. 455 K.C. 2nd stage I.C.
IF174 Std. 455 K.C. low gain I.C.
IF162 Std. 460 K.C. square can 1st stage.
IF163 Std. 460 K.C. square can 2nd stage.
IF164 Std. 460 K.C. square can low gain.
IF168 Midget Magnasonic 1st stage I.C.
IF169 Midget Magnasonic 2nd stage I.C.
IE74 Std. 175 K.C. 1st stage I.C.
IE75 Std. 175 K.C. 2nd stage I.C.
IF180 10.7 Meg. I.C.
IF181 Ratio Detector.



R.C.S. RADIO PTY. LTD., 651 Forest Rd., Bexley, Sydney, N.S.W.

Become a Direct Subscriber to this Journal and receive your Copy early

See page 20 for Subscription Form :: Also Advise Your Friends



HERE'S a compact, 5-valve, table-model radio of outstanding POWER. It gives completely effortless reception — even to the most remote short-wave stations. Very few bigger radios (even 6-valve models) can match its amazing distance-getting ability.

With electrical B.A.N.D.S.P.R.E.A.D tuning, Philips "Jubilee BANDSPREAD Special" makes short-wave station location as simple as tuning a local broadcast station. It has many other features too, including multi-purpose valves, full size speaker, 4-position tone control, in-built on/off switch, pick-up terminals, de-luxe moulded cabinet . . . but why not see and hear it yourself — Philips "Jubilee Bandspread" Special"

PHILIPS Jubilee B·A·N·D·S·P·R·E·A·D Special

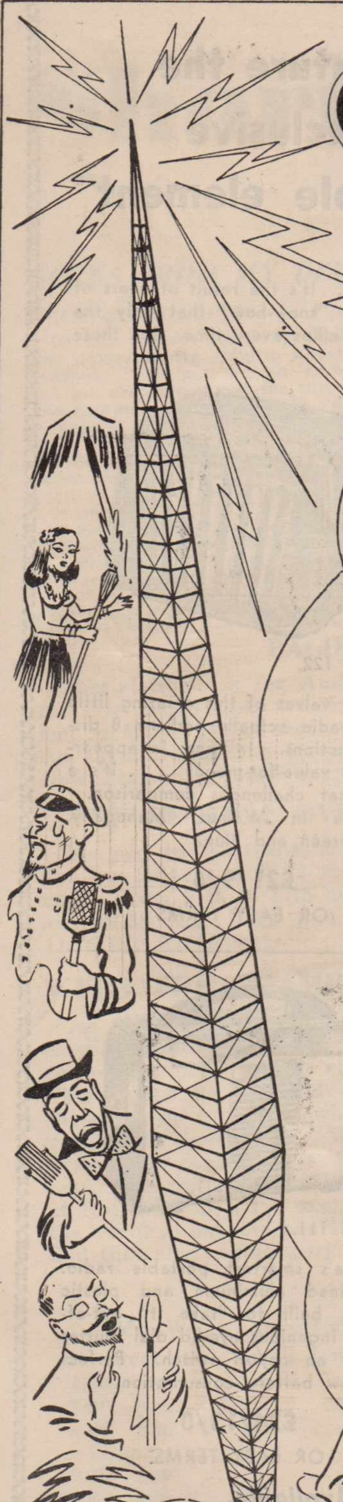
MODEL 124

. . . it's the ONLY 5-valve, dual-wave, table radio in Australia with electrical bandspread tuning and complete short-wave coverage.

PHILIPS

The Royalty amongst Radio

International Broadcasting and SHORT-WAVE REVIEW

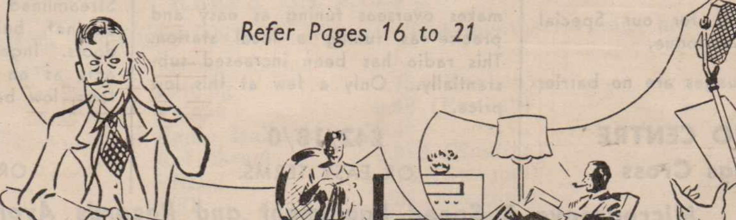


TUNING OVERSEAS STATIONS

We advise you especially to tune very slowly and cull backwards and forwards over each international band. If you do not tune slowly, you may quite easily go right over a station and not hear it. Again we would remind you that there is no magic tuning to short waves; it is simply a matter of patience and trying to get stations only when they are actually on the air. We also warn you again not to be disappointed or blame your receiver if you do not always get your station. Short wave stations, when publishing their operating schedule, often mark es programme "Liable to alteration without notice." Short wave broadcasting conditions can, due to the peculiarities we shall explain, alter so much that a different wavelength or operating time becomes essential. This, however, applies mainly to the less frequently heard stations. Major stations, in most instances will be tuned without any difficulty on one wave band or the other. Many people have the idea that short wave listening is beyond their interest on account of their inability to understand foreign languages. This is hardly correct, as short wave transmission has become so important that there is now hardly a station which does not, during some portion of its programme, either give a talk in English or, at any rate, make several announcements in English. By the same token, there is hardly an English speaking station which is not, during some portion of the programme, broadcasting in from anything from three to a dozen different languages. The British Broadcasting Corporation in London broadcasts in no fewer than 22 foreign languages and our own Australian transmitters employ 7 to 8 languages in ten broadcasts a day.

You will, therefore, readily see the advisability of keeping yourself informed by a radio periodical that gives all this information, thus enabling you to get the best out of your receiver. Most stations, when closing down will tell you when their next transmissions begin. Carefully note this.

Refer Pages 16 to 21



PHILIPS
RADIOS
RADIOGRAMS
PORTABLES

feature the exclusive "invisible element"

The "Invisible Element" is a vital component of every Philips Receiver sold to-day. It's the result of years of intensive research in 16 world-wide Philips Laboratories . . . it's the accumulated "know-how" that only the world's largest radio manufacturers can give you. Listen for it and you'll pick a Philips every time. See these and other famous Philips models now on display at Radio Centre, Kings Cross.

RECORDS

RADIO CENTRE
Kings Cross

Contains the largest selection of foreign language records in Australia. We stock records in all the following languages:

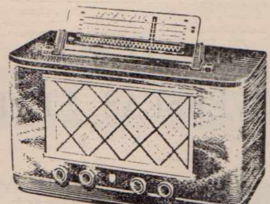
- FRENCH
- SPANISH
- ITALIAN
- RUSSIAN
- POLISH
- LITHUANIAN
- LATVIAN
- ESTONIAN
- HUNGARIAN
- GERMAN
- CZECH
- DUTCH

Mail Orders accepted for any part of Australia (minimum for each parcel, 5 records). Freight within Australia 4/- per parcel. Records sent by our Mail Order Department are guaranteed to arrive safely. When ordering records please state your second choice.

Write or call for our Special Catalogue.

Foreign languages are no barrier at

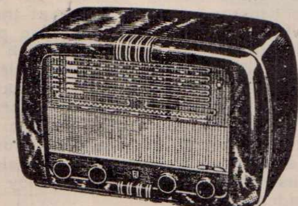
RADIO CENTRE
Kings Cross



PHILIPS 125.

This world-range, de luxe table model is Philips most powerful radio. Superb wooden cabinet. "Invisible Element," gramophone pick up terminals and equipped with every known device for perfect world-wide reception, including 6 special values and B.A.N.D.S.P.R.E.A.D. tuning.

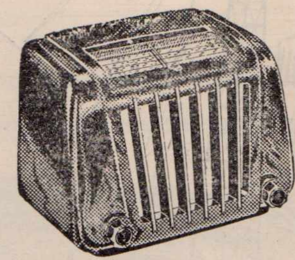
EASY TERMS AVAILABLE



PHILIPS 124.

It's a 5 valve world-range table model . . . the only table radio in Australia in its price class with electrical B.A.N.D.S.P.R.E.A.D, which makes overseas tuning as easy and precise as tuning a local station. This radio has been increased substantially. Only a few at this low price.

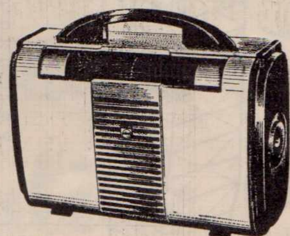
£42/18/0
OR EASY TERMS.



PHILIPS 122.

The four valves of this amazing little mantel radio actually perform 8 distinct functions. In tone, in appearance, in value-for-money . . . it's a radio that challenges comparison. Available in Walnut, Mahogany, Ivory, Green and Blue.

£21/9/6
OR EASY TERMS



PHILIPS 111.

Australia's smartest portable radio. Streamlined aluminium and plastic cabinet, built to "take it" out-of-doors. Ingenious eye-lid dial shutter acts as an on/off switch. Perfect tone, low battery consumption.

£34/13/0
OR EASY TERMS.

Microgroove 3 Speed Equipment and Records Available.

RADIO CENTRE
Kings Cross
FA 2465

EASTERN SUBURBS ELECTRICAL CO. PTY. LTD.

28 DARLINGHURST RD. KINGS CROSS
(ALMOST OPPOSITE MACLEAY STREET)

Short-Wave Review

Conducted by L. J. Keast

NOTES FROM MY DIARY

HELPFUL LOGGINGS.

In this issue I have devoted a good deal of space to the United States Pacific Coast transmissions for several reasons. They put out an excellent signal, the times on the air are convenient for this part of the globe, and the programmes are interesting. Although devoted primarily to special areas—which I have shewn—they spread sufficiently to be heard quite well in Australia. Another thing, it will be a great help to those who are calibrating their receivers, or desirous of becoming acquainted with the position on the dial for various frequencies.

COLOMBO.

U.S.A. is now broadcasting through Colombo from 10.30—11.30 p.m. on 15.12 m.c. 19.83 met. and from 1.30—2 a.m. on 11.975 m.c. 25.06 met. Both broadcasts are directed to India and Pakistan.

CHANGES IN B.B.C. SCHEDULES
PACIFIC

Special Services for Australia and New Zealand are now heard from 6-6.45 p,m. on 7.23 m.c., 41.49 met.; 9.69 m.c., 30.96 met. and 11.82 m.c., 25.38 met. An extra transmitter intended to help reception in New Zealand is 9.825 m.c., 30.53 met.

THE GENERAL OVERSEAS SERVICE

Beamed to Australia is now heard from 4-6.45 p.m. on 9.64 m.c., 31.12 met. and 11.93 m.c., 25.15 met. From 8.45 to 8.15 on 17.715 m.c., 16.93 met. and 21.55 m.c, 13.92 met. and from 6-8 a.m. on 11.75 m.c, 25.53 met.

WITH THE CHAMPIONS

An air-mail letter from Arthur Cushen of Invercargill, N.Z. tells me that with 9 verifications received last month he has now 2200 in his possession. This means he has 133 countries verified, 42 of these are on broadcast whilst he has 121 countries verified on Short-wave. Well that's fine work.

Another champion is Rex Gillett of Prospect, South Australia who by logging the Dutch station at Hollandia on 7.126 m.c., 42.10 met. and receiving the verification now has 115 countries to his credit and that also is fine work.

FOREIGN LANGUAGE BROADCASTS

New readers are advised that listening times and wave bands of the following list of Foreign Language Broadcasts was published in our August issue Vol. 16 No. 1, back copies of which are obtainable from this office at 1/6 per copy plus 2d. postage.

They include:— Dutch, Italian, German, Polish, Rumanian, Yugoslav, Bulgarian, Albanian, Danish, Czechoslavakian, Lithuanian, Spanish, French, Ukranian, Greek, Portuguese, Hungarian, Swedish.

This new feature has been well received by old and New Australians and is continued in this Sept. issue, listing the countries that space would not allow to be covered last month.

We look forward to your co-operation, in keeping this section of our magazine up to date, by asking you to forward your suggestions and any alterations to the schedule shown. PLEASE ADDRESS ALL CORRESPONDENCE TO THE EDITOR C/O THIS JOURNAL, so that we can co-relate the information, and publish same for the benefit of all concerned.

AUTOMATIC FREQUENCY SELECTOR USED AT SEA

Quick and accurate methods of tuning transmitters to the distress frequency are of vital importance in maritime radio-telephone installations. In the past many distress signals from fishing vessels and other small craft have been sent out on the wrong frequencies owing to the difficulty of finding the distress frequency in the dark.

This problem has been overcome in the "Mermaid" Radio-telephone Equipment, manufactured by a British electrical firm, which incorporates an automatic selector to select any one of eight preset wavelengths between 1.6 and 3.8 megacycles.

The mechanism can be worked in the dark by touch and only takes two seconds to operate. As a result tuning adjustments are much more rapid and certain than with manual tuning.

Besides finding important use for automatic frequency selection in radio transmitters, auto-selectors have a great value in industrial and marine functions where extremely accurate operations have to be repeated many times.

KEEPS ON KEEPING ON.

Mr. W. R. Anderson, Paddington, N.S.W. Writes:—This months loggings have not been the best, However here are a few:—

4.00 p.m.	Leipzig	9.73 (English)
5.00 p.m.	VLA-9	9.58 (English)
5.00 p.m.	Radio Italiana	13.40
7.15 a.m.	Kol Israel	9.010 (English)
6.20 a.m.	SBD-2	10.78 (Swedish)
6.45 a.m.	GSB	9.51 (English)
7.15 a.m.	WRCA-3	11.89 (English)
9.15 p.m.	Malaya	7.20 (English)
10.30 p.m.	YDA-3	4.945 (English)

The only varie this month, came from VLC-17, making my total 32.

(Continued on page 18)

Short-Wave Review — Continued from page 17

VOICE OF DENMARK

The Danish Short-Wave Transmissions are now as follows:—

To Australia & New Zealand

Tuesdays, Thursdays and Saturdays, 7-8 p.m., followed by a 20minute programme to Danish ships; 15.18 mc, 19.76 met.

To India & Malaya

Tuesdays and Saturdays, 11 a.m.—Noon. Followed by a 20 minute programme to Danish ships 9.52 mc, 31.51 met.

To North America.

Daily 9.30—10.30 p.m.; 11 p.m.—M/N

Results of reception on these changes will be welcomed

BROADCASTS IN FRENCH

The following information is supplied by Consulat General De France, Sydney.

		m.c.	met.	To
6.00—6.45 a.m.	Radio Paris	11,70	25.64	Fr. West Africa and Fr. Equatorial Africa
6.00—6.45 a.m.	Radio Paris	15.24	19.69	Fr. West Africa and Fr. Equatorial Africa
6.00—6.45 a.m.	Radio Paris	9.55	31.41	Central Europe
3.30—4.30 p.m.	Radio Paris	9.55	31.41	Tahiti, Marquesas
6.00—6.45 p.m.	Radio Paris	15.24	19.69	New Caledonia
6.00—6.45 p.m.	Radio Paris	17.80	16.85	New Caledonia
5.30 and 6.30 a.m.	Radio Brazzaville	11.90	25.21	Near and Far East
3.00, 4.00 and 5.00 p.m.	Radio Brazzaville	11.90	25.21	Near and Far East
10.00 a.m.—12 noon	Radio Noumea	6.035	49.72	
5.00—8.30 p.m.	Radio Noumea	6.035	49.72	

(Continued on page 21)

Attention!

NEW AUSTRALIANS

AND OTHER D.X.'s INTERESTED IN A RADIO SET TO GIVE FIRST-CLASS SHORT WAVE RECEPTION . . .

HERE IT IS

IMMEDIATE DELIVERY

★

UWAGA!

(IN POLISH)

Nowoprzybyli, zaintere — sowani w kopnie pierwszorzednego aparatu radjowego dla odbioru krotkofalowego. Natychmiastowa dostawa w niniejszym sklepie.

★

ACHTUNG

(IN GERMAN)

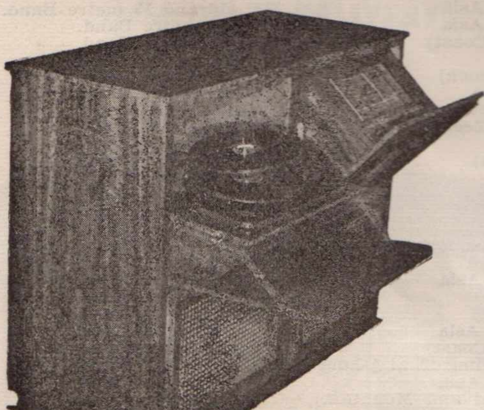
Neue Australier und andere neuankommlinge die interessiert sind in einen radio-apparat der erstklassigen kurzwellenempfang gibt.
Here ist er fur sofortige auslieferung.

★

FIGYELEM

(IN HUNGARIAN)

Uj Ausztralok es mas D.P.-K akik erdekelve vannak radio irant amelyen eisoranguan lehet rovid hullamot fogni.
Kaphato azonnali szalitassal.



MODEL "M"
RADIOGRAM

Table Model — No. 734B

FEATURES

- SEVEN power packed valves for spanning the world.
- Frequency coverage, triple wave, 500 KC - 1500 KC broadcast band; 13-42 metres and 40-120 metres on the TWO short wave bands.
- Tuned R.F. stage and push pull output.
- Large, legible console type dial.
- 8 inch heavy duty speaker.
- Large, modernistic, totally enclosed polished wooden cabinet, with protective back panel and attractive aluminium speaker grille.
- Extension speaker and pick-up terminals, also "Radio-Gramo" switch.
- Dimensions: 22in. across x 15in. high x 11½in. deep.

All Electrosound chassis (240v. A.C. or any specified D C. home lighting plant voltage) are interchangeable, and any of these can be fitted to any of our various cabinets. Enquire from your local dealer or from Electrosound direct.

IN POLISH . . .

Wszystkie Electrosound radja (240v. pradu zmienneco albo wyszczegolnionego pradu stalego) da ja sie nawzajem zamienic iwszystkie, mozna zlatwoscia wmontowac w ktorykolwiek z naszych kabinetow radjowych. Informacje i dalsze szczegoly od naszych zastepcow lub wprost z Electrosound fab ryki.

IN GERMAN . . .

Alle Elektrosound Radio-Apparate (240v. Wechselstrom oder jede spezifierte Gleichstrom Haus Beleuchtungs Anlagen Spannung) sind auswechselbar und konnen in unsere verschiedenen Radiogehause eingebaut werden. Weitere Auskunfte von Ihrem Radiohandler oder direct von der Firma Electrosound

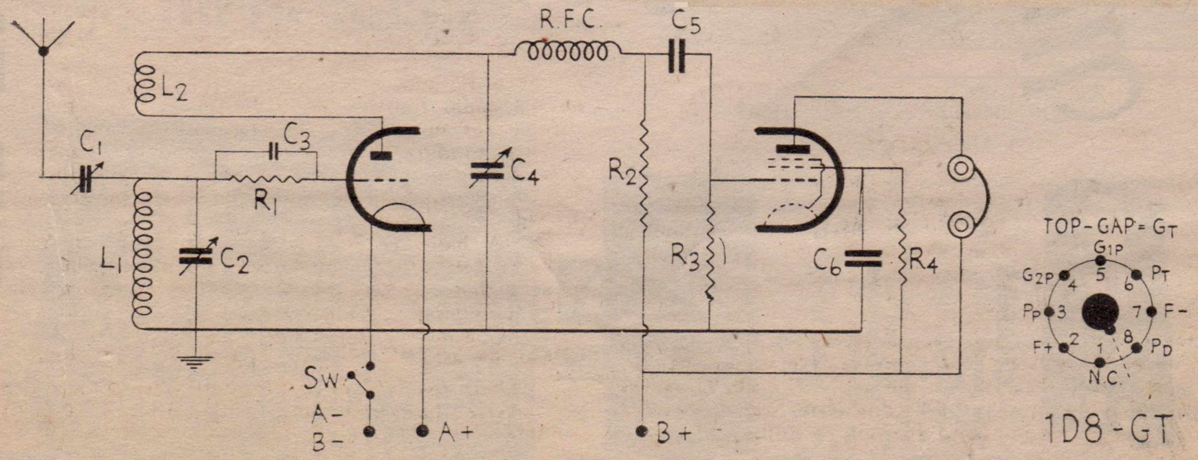
Electrosound

ELECTROSOUND PTY. LTD.
RADIO CRAFTSMEN

110 Salisbury Road, Camperdown, N.S.W.
Phones: LA4898 - LA4959.

CRAFTSMAN-BUILT RADIOGRAMS AND SPECIALITY SETS.

THE "PROGRESSIVE" BATTERY THREE (FROM PAGE 12)



C1, 30 μμf. max. trimmer.
C2, 0.00035 μf. max. variable.
C3, 0.0001 μf. fixed.
C4, 0.0003 μf. max. variable.

C5, C6, 0.1 μf.

R1, 2 Megs.
R2, 50,000 ohms.
R3, 5 Megs.
R4, 20,000 ohms.

(Continued on page 26.)

SHORT WAVE REVIEW (from page 18)

(from page 18)

United States International Broadcasting Stations and Overseas Relay Stations.

PACIFIC COAST STATIONS INCLUDING HONOLULU and MANILA.

		m.c.	met.	To
7.15—7.45 a.m.	Manila 3	6.12	49.02	East Asia
7.15—7.45 a.m.	Manila 1	11.895	25.23	Far East
7.15—7.45 a.m.	Manila 2	15.25	19.68	Far East
7.15—7.45 a.m.	KCBR-1	15.34	19.55	East Asia
7.15—7.45 a.m.	KCBR-3	17.77	16.88	Phil./E. Indies
7.15—7.45 a.m.	KCBR-2	21.74	13.81	East Asia
8.00 a.m.—12.15 p.m.	Manila 3	6.12	49.02	East Asia
8.00 a.m.—1.00 p.m.	Manila 1	11.896	25.23	East Indies
8.00 a.m.—6.45 p.m.	Manila 2	15.25	19.68	Far East
8.00 a.m.—10,00 a.m.	KCBR-1	15.34	19.55	East Asia
8.00 a.m.—10,00 a.m.	KCBR-3	17.77	16.88	Phil./E. Indies
8.00 a.m.—10,00 a.m.	KCBR-2	21.74	13.81	East Asia
10.00 a.m.—1.00 p.m.	KRCA-2	15.13	19.82	South America
10.00 a.m.—1.00 p.m.	KWID-1	17.76	16.89	South America
10.00 a.m.—1.00 p.m.	KRCA-1	21.46	13.98	South America
11.00 a.m.—6.45 p.m.	KWID-2	9.57	31.35	Alaska/Aleutions
11.15 a.m.—5.00 p.m.	KCBR-2	15.31	19.60	Alaska/Aleutions
11.15 a.m.—5.00 p.m.	KCBR-3	17.77	16.88	East Asia
12 noon—12.15 p.m.	KGEI-2	15.105	19.86	Phil./E. Indies
12 noon—12.15 p.m.	KGEI-1	21.74	13.81	Mid-Pacific
1.00 p.m.—1.15 p.m.	KRCA-3	17.80	16.85	East Asia
1.00 p.m.—6.30 p.m.	Manila 3	15.33	19.56	East Asia
1.15 p.m.—6.45 p.m.	Manila 1	17.78	16.87	East Asia
2.45 p.m.—3.30 p.m.	KGEI-2	15.105	19.86	Phil./E. Indies
2.45 p.m.—3.30 p.m.	KRCA-2	15.13	19.82	East Asia
2.45 p.m.—3.30 p.m.	KRCA-3	17.80	16.85	Phil./E. Indies
2.45 p.m.—3.30 p.m.	KRCA-1	21.46	13.98	East Asia
3.30—9.30 p.m.	KWID-1	11.90	25.21	South Pacific
4.00—5.00 p.m.	KRCA-1	11.79	25.44	Australia.
4.00—5.00 p.m.	KRCA-3	9.65	31.09	Phil./E. Indies
4.00—6.45 p.m.	KGEI-1	9.67	31.02	Mid-Pacific
4.00—6.45 p.m.	KGEI-2	11.73	25.58	Mid-Pacific
5.15—6.45 p.m.	KRCA-1	9.60	31.25	East Asia
5.15—6.45 p.m.	Honolulu-1	11.89	25.23	Phil./S.E. Asia
5.15—6.45 p.m.	KRCA-2	6.06	49.5	Hawaii/Australia
5.30 p.m.—12.15 a.m.	KCBR-3	9.70	30.93	East Asia
5.30 p.m.—12.15 a.m.	KCBR-2	6.04	49.67	East Asia
7.00 p.m.—1.45 a.m.	KRCA-2	6.06	49.5	Hawaii/Australia
7.00 p.m.—2.00 a.m.	KGEI-2	6.075	49.38	Phil./E. Indies
7.00 p.m.—1.45 a.m.	Manila-3	6.12	49.02	East Asia
7.00 p.m.—1.45 a.m.	KRCA-1	6.185	48.51	East Asia
7.00 p.m.—2.00 a.m.	KRCA-3	9.515	31.55	East Asia
7.00 p.m.—1.45 a.m.	KCBR-1	9.60	31.25	Phil./E. Indies
7.00 p.m.—2.00 a.m.	Honolulu-2	9.65	31.09	East Asia
7.00 p.m.—12.15 a.m.	KGEI-1	9.67	31.02	Marianas/Phil.
7.00 p.m.—12.15 a.m.	Honolulu-1	11.79	25.44	Phil./S.E. Asia
7.00 p.m.—12.15 a.m.	KWID-2	11.86	25.29	East Asia
7.00 p.m.—1.45 a.m.	Manila-1	11.89	25.23	East Asia
7.00 p.m.—2.00 a.m.	Manila-2	15.25	19.68	Far East
10.00 p.m.—1.45 a.m.	KWID-1	9.57	31.35	East Asia
10.30 p.m.—11.30 p.m.	Colombo	15.12	19.83	India/Pakistan
1.00—1.45 a.m.	Honalulu-1	6.195	48.47	Phil./S.E. Asia
1.30—2.00 a.m.	Colombo	11.975	25.07	India/Pakistan
2.15—7.00 a.m.	Manila-3	6.12	49.02	East Asia

RADIO NEW ZEALAND.—NOTE NEW SCHEDULES.

To Pacific Islands & Australia.—

4-6.45 a.m., 5-8.45 p.m. (Sundays till 8 a.m. Saturdays till 9.20 p.m.); ZL-3, 11.78 mc, 25.47 met. ZL-2, 9.54 mc, 31.45 met. 7 a.m.—5.15 p.m.

4-6.45 a.m.; 5-8.45 p.m. (Sunday till 8 a.m. Saturdays till 9.20 p.m.); ZL-4, 15.28 mc, 19.63 met. ZL-10, 15.22 mc, 19.71 met. 7 a.m.—5.15 p.m.

AMATEUR RADIO

SECTION

The "A. R. & E." 1951 V.H.F. Programme

This short resume indicates the scope of a programme of articles, to be started shortly, on amateur equipment for the V.H.F. bands. There has been of late a quickening interest in this type of work on the part of amateur transmitters, and it is hoped that this series of articles will be of assistance to those who are wondering how to start on this fascinating subject.

INTRODUCTION

Snags or problems confronting the amateur who has not previously tackled V.H.F. operation are not by any means insoluble, and, especially to the technically inclined, are very interesting. To those not so much interested in technique, but rather in communication from place to place, the V.H.F. bands offer a very pleasant change from the overcrowded conditions of the M.F. bands, and there is no reason why these people should not avail themselves of this golden opportunity to get away from Q.R.M.

WHAT ARE THE REQUIREMENTS?

We all know, in some sort of way, that receivers and transmitters for the V.H.F. bands are different from their M.F. counterparts, and, in our opinion, it is the realization of this difference, without a great deal of knowledge what the differences are, that manages to scare off quite a number of would-be V.H.F. fans. They think that because Tom, down the road, has had lots of no success in getting started on 6 metres, or, more likely, on 2, they would find themselves in the same unenviable boat were they to try their hand themselves, and as a result, decide to give it a miss. It is to help people like this, as well as those who are already confirmed V.H.F. addicts, that the present series of articles has been prepared. Up till now, we have presented a number of practical articles describing equipment for all the bands mentioned earlier, but they have not been co-ordinated, and it is felt that a definite programme would be of more assistance and interest than more articles chosen more or less at random.

GENERAL SCHEME OF THINGS

To all appearances, then, we have bitten off a fairly large mouthful. The subject automatically divides itself into two compartments, transmitters and receivers, but in reality there are six parts, because we have both sections applied to each of the three bands. But things are seldom as bad as they seem, and it will not be too difficult to arrange things so that some of the gear for the lower bands is usable for working all three. In this way, not only is expense saved, but also the V.H.F. learner, as we may perhaps call him, can progress from building and operating technique that is not so very dierent from standard H.F. practice to things that are decidely new to him. Let us see, then, what we are up against if we decide to embark on the great migration.

RECEIVERS

At the outset, it is best to forget all about ordinary H.F. practice, and start from scratch, without any preconceived ideas. The best way to do this is to set up a list of requirements for a V.H.F. receiver, see in principle how they may be fulfilled, and then look at what we have to see how different it is from our existing receivers. We will not then be tempted to incorporate features from our H.F. jobs that serve no useful purpose, or are actually disadvantageous in a V.H.F. receiver.

(a) **Type of set.**
Here, it has to be decided whether we are to go for a superhet. (straight, or double conversion), a T.R.F. (with or without regeneration), or a super-regenerative detector.

(b) **Selectivity required.**

(c) **Sensitivity needed.**

(d) **Signal-to-noise ratio.**

(e) **Image rejection (if a superhet.).**

(f) **Bandwidth.** (This is not really covered under (b).)

(g) **Additional features** (Xtal filters, B.F.O., A.V.C., etc.).

(h) **Complexity and cost.**

The first of these cannot properly be answered until (b), (c), and (d) have been examined, but our general knowledge of the characteristics of the types of set mentioned should enable at least a partial decision to be made. The superhet. can be designed to have any desired degree of sensitivity, selectivity, image rejection, and signal-to-noise ration, and at first sight would seem to be the answer, but the claims of its rivals should be examined before they are discarded, if they are.

The T.R.F., with or without regeneration, becomes increasingly difficult to handle as frequency gets higher, and may also be criticized on the score of stability, unless it is designed for great bandswidths, as in television receivers. Signal-to-noise ratio is good, however, but the difficulty of getting high enough sensitivity and selectivity to be useful, combined with the instability problem, puts it out of court.

On the other hand, the super-regenerative set has undeniable points in its favour. It is the ultimate in sensitivity for the smallest number of valves, which alone gives it a considerable advantage over other arrangements. Also, like the T.R.F.,

it has no image response. On the other hand, it tends to be critical in adjustment, and its characteristics, even today, are not as easy to reproduce as to make it a suitable receiver for serious work. Of course, there are applications in which the super-regenerative is supreme, assuming that the frequency is high enough, but for the application we have in mind, its advantages are outweighed by its disadvantages. For fixed-station use, its sensitivity, high though it is, is not adequate; except for the reception of modulated-oscillator transmitters, its selectivity is not good enough, and its signal-to-noise ratio is very poor for signals lower in level than is required to stop the super-regenerative hiss. Unless preceded by an R.F. stage, or a superheterodyne mixer, it radiates a broad signal that is a source of interference in other receivers. It has the curious feature, according to one authority, that the addition of an R.F. stage does not sensibly decrease the strength of signal that is required to overcome the hiss. so that perhaps the greatest advantage of the R.F. stage is lost if it precedes a super-regenerative set.

From the above, it is clear enough that the logical choice for (a) is the superheterodyne. But there is a wide variety of superhets., and we are still left with many decisions to make. ,

REMAINING FEATURES

For a fixed station, then, we have clearly settled on a superhet of some kind for the receiver. It is not proposed to go further into the question of what sort of superhet at this stage, for that will be more appropriately dealt with when we come to describe the actual receiver or receivers. The exact details of the design will depend on the answers to the implied questions contained in the list above, but it would perhaps not be inappropriate here to indicate what we have in mind for covering the three bands, at least on the reception side.

If the requirements of each band were taken on its merits, it might turn out that the best possible answer would be an entirely separate receiver for each band, but this would obviously be a solution to be avoided if at all possible, because of the expense. At lower frequencies we would hardly think of building completely separate receivers for each band, and here band-switching turns out to be the almost universal solution to the difficulty, but on the face of things, it does not seem very likely that band-switching would be practicable for three such widely spaced bands as 144, 288 and 576 mc/sec. If separate receivers are "out" on grounds of expense, and band-switching is, too, because of impracticability, what are the remaining alternatives?

First of all there is our old friend, plug-in coils. It might be possible to arrange this, with conventional LC circuits used for six metres, and different types of tuned line for 144, 288, 576 mc/sec., but the difficulty of making suitable tuned circuits for the latter frequency—circuits that could be variably tuned by the same condensers that will be used for six metres—rather puts one off the idea.

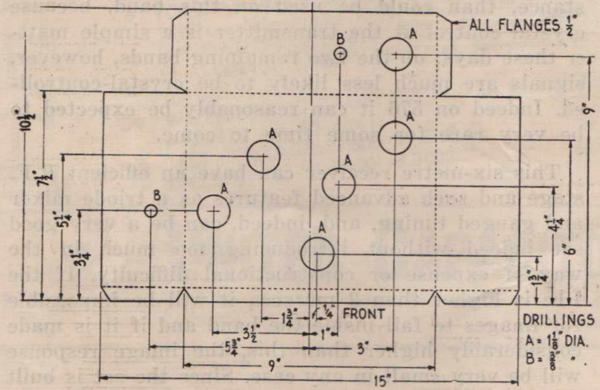
Perhaps the most attractive idea that presents itself is the following. Suppose we construct a superhet specially for six metres—with one or two reservations.. It will have less selectivity, for instance, than **could** be used on this band, because crystal control at the transmitter is a simple matter these days; on the two remaining bands, however, signals are much less likely to be crystal-controlled. Indeed on 576 it can reasonably be expected to be very rare for some time to come.

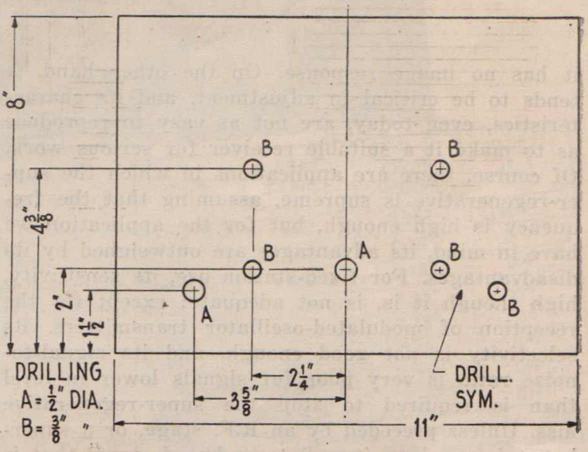
This six-metre receiver can have an efficient R.F. stage and such advanced features as a triode mixer and ganged tuning, and, indeed, can be a very good set indeed without introducing too much in the way of expense or constructional difficulty. If the I.F. is higher than 2 mc/sec., it will be impossible for images to fall inside the band and if it is made considerably higher than this, the image response will be very small in any case. Since the set is built as a single-band one, the best possible L/C ratio can be used in the tuned circuits, and the mechanical layout will not have to be sacrificed on account of other really extraneous considerations, as is often found in multi-band receivers. This set then forms the basic unit for all our V.H.F. reception. For 144, 288 and 576 mc/sec., then the idea is to build special converters. This enables each band to be received almost, if not quite as well as if entirely separate sets had been designed, for the "front end" in each case is made solely for its own band, and likewise contains no compromises which will reduce its performance. There are still two possibilities which must be explored before the final system is decided upon. The first is to make the converters fixed-tuned, converting their respective bands to six metres, where the six-metres set is used as a tunable first I.F. in what amounts to a double superhet. The second is to provide the converters with their own tuning arrangements, and to set the dial of the six-metre set to a pre-determined point which is to act as a fixed first I.F. in the double-conversion arrangement.

For the two-metre band, either of these arrangements would be quite practicable, because this band is four megacycles wide, and so is the six-metre band, so that a fixed-tuned converter would be able to change 144-148 mc/sec. to 50-54 mc/sec.

PROGRESSIVE THREE (from page 20)

the detector coil. It will be noted that, with this layout, all small components and connecting wires are under the chassis with the exception of the grid leak and grid condenser. The wire from the tuning condenser to the "hot" end of the grid coil is taken through the chassis from underneath the tuning condenser. The type of condenser shown is strongly recomended for this set since these condensers are very well matched and will minimise any tracking difficulties which may arise. The stator has a connecting lug at each end so that the above-mentioned lead is connected to the bottom one, and the grid-leak condenser combination to that at the top.. Underneath the chassis all wires carrying R.F. should be run with solid tinned copper wire of fairly heavy guage. Anything up to 18 guage is suitable. The leads referred to are those to the reaction condenser, the lead from the tuning condenser to the grid coil, and from the tuning condenser to the grid coil, and from aerial and earth leads. A 3/8 inch hole has been provided in the left-hand side of the chassis through which aerial and earth leads should be taken. The photograph of the front panel layout shows controls as follows:—At the left is the On/Off switch for the batteries. In the centre is the 'phone jack





and next to it is the reaction condenser control. The large dial of course is the detector tuning control. The remaining three holes are to be used in the completed set. The one at the left near the centre is for the R.F. stage tuning control, while the one underneath this is for the R.F. gain control. The unoccupied hole on the right is for an audio gain control.

COIL DATA.

If the constructor has previously built the All Wave, the coils used for this set can be retained at least for the first portion illustrated here. Unless there is room for a primary winding on the formers, fresh coils will have to be wound when it comes to adding the R.F. stage. For convenience, the table of coil data for the All-wave One is reproduced here. The tuning condenser in this case is 0.0003 f, so that some alteration of the broadcast coil may be necessary in order to cover the band properly.

Continued on Page 30

AMATEUR RADIO SECTION (Continued)

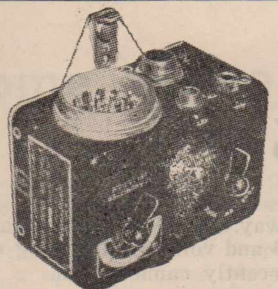
TRANSMITTING ARRANGEMENTS

Unfortunately, it is not quite so easy to settle on a cut-and-dried scheme for transmitting circuits for the three V.H.F. bands. This is partly because such a wide variety of arrangements can be used that it is almost impossible to know where to start! As was mentioned above, there is no reason why crystal control should not be used on six metres as long as crystals on suitable frequencies are available. At one time, when the amateur V.H.F. bands were in harmonic relationship to the H.F. bands, crystal control did not present such a problem, since some crystal could be chosen to be useful on almost all bands from 80 to 5 metres. However, unless war surplus crystals, at low prices, can be obtained on suitable frequencies, many amateurs will not feel much like spending money on crystals that can only be used on one V.H.F. band each! Another difficulty about crystal control is that for the very high bands in particular 576 it is difficult to retain a clean note, simply because of the high degree of frequency multiplication needed before the final frequency is reached.

It is proposed, however, to describe a number of alternative arrangements. In general, a chain of mutipliers can be used both on six and two metres without any coil changes, because, although these bands are not in exact harmonic reationship, they are nearly so, and by carefully choosing the band coverage of each stage, it can be used for either band simply by providing the right input frequency and re-tuning.

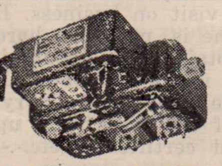
There are numerous possibilities, and in our opinion the best arrangement for the man who wishes to work all these bands, is to design a V.F.O. on a fairly high frequency, that can be multiplied into each band. This should not be too difficult, and, although the stability may not be quite up to the best that crystal control can do, it should be more than adequate for satisfactory working, and far, far better than the old self-excited oscillator, directly modulated. As readers will be aware, there is almost unlimited scope for ingenuity in design and construction, allied to not very high first cost, since low powers are quite satisfactory for almost all V.H.F. purposes. About the most difficult item is to find 288-576 M.C., Tx. tubes, so essential to spend a little money on a tube or tubes that will handle this band well, but as against that, there will be almost nothing to spend on parts of the gear that eat up quite a lot of cash at lower frequencies—high-voltage tank condensers, etc. Altogether, we expect to have quite a lot of fun with the AR&E-V.H.F. programme, and it is our earnest hope that those of our readers who follow the series of articles will do so too.

(Continued on page 28)



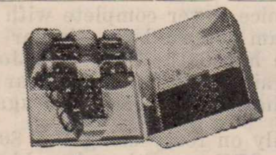
RADIO CONTROL BOX BC 451A

Ex U.S. Army. Parts are:—
1 SP Push Button.
2 SP Toggle Switches.
1 4-position Semi Rotary Switch.
1 3-position Semi Rotary Switch.
2 Phone Jacks.
All fitted into neat black-crackle finished box. Easily worth 25/-. Our price, 7/6 each.



CONTROL UNIT

CZR-23ABG, combined with Selector Unit CZB-23ABH. Ex U.S. Navy equipment. Parts used are a 6 position wafer switch, 2 SP Butler Hammer Switches, a Phone Jack and 5 pin Plug and Socket, and a 7 pin Plug and Socket. Housed in two neat black crackled boxes, mounted on unit plate. Value at least 15/-. Our price, 5/-.



INTERPHONE AMPLIFIER

Ex U.S. Army B.C. 21 2D. Has two audio coupling transformers, 4 resistors, 1 condenser, 2 valve sockets. Uses two 6C5 valves. In neat aluminium box, with open connector plug and socket. Price, without valves, 8/6 each.

SWITCHES

SPECIAL LINE OF SEMI ROTARY

Switches suitable for voltages up to 240 volts; ideal for switching any type of radio, etc.; has ¼in. shaft to suit Standard size radio knobs. Single hole mounting. Easily worth 4/6. Our price, 1/9 each.

SINGLE POLE TOGGLE SWITCH

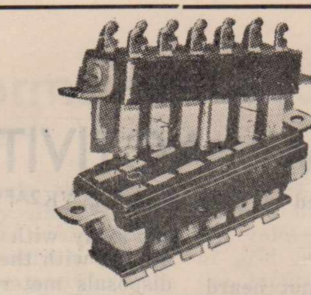
In solid bakelite, with nickel-plated toggle for low voltage work (up to 32 volts). Very robustly constructed. Easily worth 3/6. Our price, 1/9 each.

DUAL IGNITION SWITCHES

As used in aircraft. A good pair of switches for heavy duty low voltage work (up to 32 volts). Worth 7/6. Our price, 3/6 each.

PLEASE NOTE

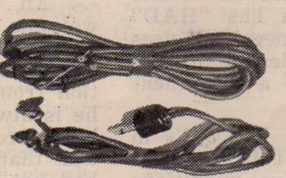
All parcels sent registered post unless otherwise stated. Postage or freight must be included with order.



JONES PLUGS AND SOCKETS

As illustrated. Available in following sizes, all brand new and perfect.

6 pin	5/6
8 pin	5/6
12 pin	8/6



PHONE CORDS

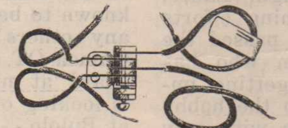
Rubber Insulated Phone Cords, with plug. A few only. Usual price 4/6. Our price, 2/3.

TWIN FLEX

Rubber covered in 10ft. lengths, suitable for extension speaker cords, light power flex, etc.: Only 1/- each. 100 feet lengths of Insulated and Waterproofed Aerial Wire for outdoor use. Our price, 5/- each.

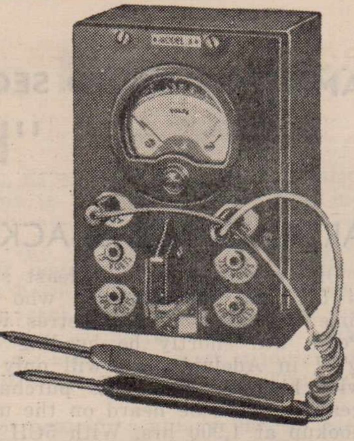
INSULATORS

Well-known Egg type Porcelain Insulators available again after many years. Just the thing for outdoor aeriels. Our price, 10d. each.



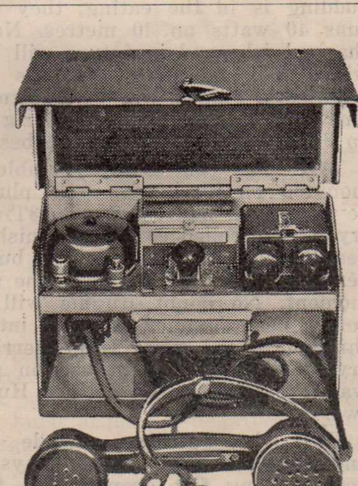
METAL RECTIFIERS

U.S. Army full wave I.M.A. Rectifiers. Will work successfully on 5 M.A. Extremely small physical size. Brand new. Easily worth 35/-. Our price, only 17/6 each.



CHIEFTAIN MULTIMETER

The ideal pocket size meter for measuring voltages of electrical circuits and checking continuity of circuits, etc. Volts scales: 0-15, 0-150, 0-300, 0-600, D.C. OHMS Scale: 0-50000. The cheapest and smallest on the market. Complete with prods and battery. Can be carried in your coat pocket with ease. Price, £3/9/6.



TELEPHONES

These Don 5 Telephones are suitable for the office, farm or factory. Each phone is equipped with new batteries, hand set and buzzer. All are in good working order. Easily installed, simple to operate. Price, £5/5/-.

MOTOR SPARES LTD.

547 ELIZABETH STREET, MELBOURNE, VIC.

"HAM" ACTIVITIES

(Conducted by J. A. Hampel, VK2AFW)

AROUND THE SHACKS

One person who is at least seen but not heard is 5KB at Mt. Gambier who occasionally finds time to appear on 40 metres with his 80 Watts. Peter will shortly be heading back to his home QTH in Adelaide and will only take this big rig with him. Col, 5CJ has purchased Peter's 144mc gear and will be heard on the usual Monday night hookup at 1,900 hrs. With 5CH and 5MS, Col will keep the Mt. Gambier 2 metre net active. 5TW has at last got the AC and is being heard on 40 and 20 with a much better signal. Tam has "HAD" D.C. Bill 4KH is very keen on 144 megs and uses an SCR 522. On the lower frequencies he uses a four stage rig running 90 watts to a 3 element beam.

7RM has finished a new rig using P-P 807's in the final but according to the circuit from which it was built possesses none of the usual conditions which cause those parasitics in 807's to make their presence felt. Well, Rupe, the proof of the pudding is in the eating, they say. The new rig runs 40 watts on 40 metres. Newcomer 5DP has changed jobs and in future will be playing around with tape and wire recorders so no doubt the knowledge gained will be put to use in recording amateur transmissions. Ted's rig runs 60 watts to an 807 final with the same tubes in the final mod.

3ABK has gone really portable with a small rig mounted on his motor-cycle plus another one to be used on 2 metres. Byron, 3TA, has his 2 metre crystal controlled converter finished but so far has heard little. 5BC has plans to build a similiar converter soon but says time is the main factor at the moment. No doubt Hughie will have it together before next summer as he is interested in getting through to the cities from Berri on this band. A crystal converter is in use on six metres and it was it's stability that decided Hugh on another for two.

2WH is batching awhile with the XYL and daughter away on holidays; don't ruin your key-punching fist opening the tins Hugh. Lance, 5XL, at Clare has had his Morse teaching efforts rewarded recently when both his pupils passed the exam. One is already on the air—Tim who has been allocated 5TJ and John Cluer is getting impatient waiting for his call. Welcome to the hobby chaps. Tim is already doing a good job with only 14 watts seeing he is confined to the use of batteries and two genemotors.

VS6BE is in Sydney on five months leave from Singapore and going through a pilot's course while here. Lyall is VK2ACL while in Australia. 4ME operates on 20 metres with a 809 in the final but is busy building a new one to use Push-Pull 807's. What have the triodes-versus-tetrodes debaters to say to this one? Perhaps it was the replacement cost of a new 809 that decided Mac to try the tetrodes. 5MS has shifted the gear inside the house beside the hearth—did a DX station give you the cold shoulder Stuart? Half your luck if you can get away with it anyway. 2AVG has been playing around with the AMPS and volts recalibrating some disposals meters he recently came across.

After five months absence from the bands, 3AMH has returned to the air with a completely new rig which consists of a 100TH in the final running 100 watts, Class B 100TH's in the mod. and the station is topped off by the National NS100X receiver. Bill has built the transmitter band-switched for 40, 20 and 10 and intends to make full use of it's capabilities in the future. -.-. An OT, the Broken Hill boys were glad to welcome for a month's stay in the Silver City was 2AGU who made the visit on business. Harry, being the modest chap he is, proved a hard proposition from whom to obtain much about himself but he is always ready to relate any news about other hams around him. The only thing Harry admitted was that his count of DX was "way up" but he had not worried about certificates etc.-.-.

3ACK is having a building changed in the shack so cannot use the usual antenna but still manages to put out a good sig with the parallel 807's into the "piece of wire"; P-P 807s in the modulator, a Command VFO and 640 receiver complete the line-up John uses at Mooroopna.-.-. 5WM isn't as active on the lower frequencies these day since he bebecame interested in the VHF bands.-.-. Adelaide's recent storms took toll of several sticks and in the case of 5MX, a very nice tower complete with three element 20 metre beam topped by a similar array on 288mc. It is to be hoped the boys help John to get things righted again so that his familiar voice may soon be heard chasing the DX on 20 again.-.-.

4 PD is heard mainly on forty using P-P 807's in the final but was on QRP recently when his final power tranny burnt out necessitating using only seven watts. With the rotary beam he has on this band though no one could detect any change in Tom's signal. This envy of most Forty metre users is atop a thirty foot tower and has been built with the ends of the elements bending it down to fit it all on the small boom. 9XR is the only other station known to be using a rotary array on 40 so are there any others? .-.-. While on the subject of New Guinea OT of the bands Gill, ex-9VG, is now being heard at nights signing JA5A1 from Japan and is looking out for his old VK friends he made while at Bulolo.-.-.

2AGU has been complaining about rising early and finding the bed rather late at other times due to his doing shift duty at the National station. Shame on you Harry; if you were getting up to chase the DX it would be a different story.-.-. 3TI reports the recent hobbies exhibition held in Mildura a great success from the local Ham's point of view. The local press quoted "interesting contacts were made from many parts of Australia including Albany, W.A. (Good old Len) much interest was shown by visitors in the gear displayed.

Continued on Page 32

Some Wave Forms and How to Make Them

PART III

In the last instalment of this article, the action was described of a circuit which by simply overdriving an amplifier valve, fed with a sine–wave from the secondary of a coupling transformer, produces a square-cornered wave, whose positive and negative portions are of almost equal duration. This time, we describe a circuit which illustrates another slightly different method of overdriving the amplifier valve, but which produces a square-wave whose positive portion lasts much longer than the negative part. The actual wave-forms are shown in Fig. 7, reproduced here, in which the middle pair of waves shows the output, with a timing wave immediately below it, to show which part of the square wave corresponds with what portion of the original sine-wave.

This again is a very simple circuit, and at first it is not at all obvious why it should produce such a different answer from the one of Fig. 2, whose action and output wave-form was illustrated in Figs. 5 and 6. Briefly, the answer is that the different conditions that obtain in the grid circuit can and do account entirely for the difference in behaviour.

ACTION ON FIG. 3

First of all it is necessary to know something about the size of the grid circuit parts, and their relation to the frequency of the sine-wave input voltage, Rg and Rs are grid leak and grid stopper respectively, and in this circuit both have a high value. For example, both can be of the order of 500k., but frequently it is found that Rs is somewhat smaller than Rg. However, this has no effect on the action of the circuit. The next point is the size of the input condenser, Cg in relation to Rg and the working frequency. Briefly, its value is large. That is to say, its reactance is small compared with the value of Rg, at the frequency of operation. For instance, if low-frequency square-waves are to be generated, it will have to be of the order of 0.1UF. It can thus be seen that as in audio amplifier coupling circuits, the time constant of the coupling condenser/grid leak combination is long compared with the duration of one cycle of the input frequency. This is important, because it enables the action of the grid circuit, which determines the performance in this case, to be quite readily understood.

First of all we will not attempt a point-by-point description of the generation of the wave-form, because once the biasing conditions are discovered and understood, there will be no necessity for one. The first fact to be noted about this circuit is that while the valve is unbiased to all appearances, and certainly is so when there is no signal voltage applied to the input condenser, the valve is actually biased very strongly negatively, when a large input voltage is applied. This bias is a kind of automatic bias that is never met with in ordinary amplifier circuits, and which some people find difficult to understand, so that we will have to explain it quite carefully, and probably in two or three different ways. The bias obtained by this method is automatic, as we have said, but it is also directly in proportion to the size of the signal input voltage. And it comes about because the flow of grid current through the grid resistors charges the input condenser negatively. Let us imagine that the action has been going on for some time, so that things have reached a steady state. If we imagine a milliammeter connected in series with the cold end of Rg, we would find that it indicated a steady grid current of a certain number of microamperes.

This current is not actually a steady one, as can be readily imagined, because it takes place only during the positive half-cycles of the input voltage, but the meter reads its average value, and it can be regarded for our present purpose as a steady grid current. We can see from the circuit that this current flows through Rg. It must, therefore, produce a voltage drop across this resistor. Morever, if the direction of the flow of electrons is considered for a moment, it will be seen that the grid end of Rg must acquire a negative potential. An **average** negative potential, that is, which is as steady, for all practical purposes as if it were produced by a battery. This potential is applied to the grid of the valve through the grid stopper Rs, so that when the signal voltage is great enough to produce grid current, there is a perfectly real negative grid bias on the valve. This bias due to the grid current, is the grid voltage about which the grid signal swings, and thus represents the datum line for the input voltage. It must thus be only the positive peaks of the input wave that cause grid current to flow. The grid condenser is charged up to a negative potential equal to the grid bias, but, as in all charged condensers, this charge would leak away through the grid leak resistor were it not for the fact that for a small portion of each cycle there flows enough grid current to make up for the charge lost during the time that grid current is not flowing. There is, in fact, an equilibrium set up, in which the grid voltage is such that just enough

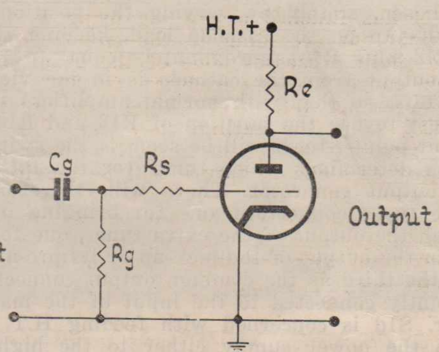


Fig. 3

(Continued on page 3?)

High Quality Tuner (from page 10)

es practically no shunting at all on the diode load resistor, and reduces distortion in the detector circuit to negligible proportions even at very high percentages of modulation. In a tuner that pretends to any degree of fidelity, this is essential, since a poorly designed detector circuit, diode or no, can introduce as much as 40 per cent. distortion at high percentages of modulation, thus completely ruining the performance, when it is desired to feed the output to an amplifier whose distortion is probably less than 0.5 per cent. The other important feature is, of course, the low output impedence. The load resistor of the cathode follower has been shown as split into two unequal parts. R14 is 10,000 ohms, and in our case, R15 is only 200 ohms. It is arranged that the actual output is taken from the junction of these two resistors, through S1e. Thus, only about one-fiftieth of the output available at the cathode is actually used. This was because in our case the amplifier had to feed a commercial amplifier which required only 50 milli–volts input to fully load it. However, any output, up to the full output of the cathode follower may be chosen, simply by varying the position of the output tap on the cathode load, keeping the total of R14 plus R15 approximately equal to 10k. The full output from the cathode is in the vicinity of 2.5 volts, so that with normal amplifiers it would be best to use the junction of R13 and R14 as the output point S1e, it will be seen, is the switch bank which determines which tuner (or the P.U.) feeds the output connector. There will, therefore, need to be three connectors, one for bringing in to the switch the output of the extra tuner, one for bringing in the output of the pick-up or its pre-amplifier, and the third as the common output connector, permanently connected to the input of the main amplifier. S1d is concerned with feeding H.T. voltage from the power supply either to the high-quality tuner, or to the additional all-wave tuner. It could also be used to feed H.T. to the pick-up pre-amplifier, if one is used, and this would be an excellent thing to do, because it is much better to have separate H.T. supply for this unit, rather than try to provide its H.T. from the main amplifier chassis. This gives some idea of the monetary savings that can be effected by treating the combined tuners and the gramophone as a complete system, rather than as separate bits, because the one light-duty power supply contained in the present circuit diagram can serve all three of the auxiliary pieces of equipment, where if these are not integrated in this way each might have to have its own power supply, which would be very wasteful.

The power supply is quite usual, employing a 6X5 rectifier with a single stage condenser-input filter, which is perfectly adequate, and gives a nicely hum-free output. The output voltage would be nearer 300 volts than 250 if no bleed were used, so that a 25,000 ohm voltage divider, R17, is used to ensure that the tuner gets no more than 250 volts. This should on no account be omitted, as with A.V.C. acting strongly on local stations, the valves would operate with 300 volts on them most of the time if it were not incorporated. The 6.3-volt heater winding can be used as well for the additional tuner without straining the resources of the transformer at all.

SOME OF THE COMPONENTS

The first point here which might need a little elucidation concerns the aerial tuning condensers C2 to C6. These have been shown as variable, but for the lower frequency stations at least, they will actually consist of fixed mica or silvered mica condensers, making up the bulk of the capacity, and paralleled with Philips trimmers to give the slight range of adjustment that is necessary for accurate tuning.

It should be mentioned here that the type of aerial coil used was one designed for a gang condenser with a maximum capacity of 385 uuf. This has the advantage that the fixed condensers required are rather smaller than if the other type, intended for a 420 uuf. gang had been used.

The oscillator coils are also commercial units.

Apart from this, and the fact that the 1.6 mc/sec. transformers are tuned up to 2.0 mc/sec., there is nothing about the tuner that need cause the slightest difficulty, and builders will find the time and monetary outlay very well spent.

The Progressive Three (from page 26)

The best plan, if the set is being constructed for the first time, is to wind the grid coil with about 10 more turns than specified. This should bring 2 F.C. too far out on the condenser, and will cause the high frequency end of the broadcast band to be off the dial. Turns can now be taken off, say, two at a time, until 2 F.C. is received with the condenser almost fully meshed. If this is done, the broadcast band up to 1600 kc/s. should be located on the dial. The shortwave coils specified have plenty of overlap, so that the high frequency coil should not require alteration. It may be found, however, that the 80-metre amateur band is off the dial at the low frequenc end if the intermediate coil is used as specified. This band is easily located by listening, so that the proper procedure for accurately constructing the intermediate coil is the same as that outlined for the broadcast coil. three or four turns too many should be used for a start, and turns removed one at a time until the 80-metre band is found near the fully closed position of the tuning condenser.

Constructing the set on a metal chassis may necessitate some slight alteration in the number of tickler turns required, but as long as the number of turns specified enables the set to be brought into oscillation at all points of the dial, no change will be needed.

COIL DATA.

Broadcast.
L1 105 turns 36 guage enamelled wire, close wound.
Shortwave A (approx. 30m.-90m.)
L2 30 turns of same wire, close-wound.
L1 16 turns 24 guage enamelled wire, double spaced.
L2 10 turns of same wire, close wound.
Shortwave B (approx. 19m.-60m.)
L1 6 turns 24 gauge enamelled wire, double spaced.
L2 10 turns of same wire, close-wound.
Note.—All tickler coils spaced ⅛in. from top of grid coil.

COIL FORMER: 1¼" dia.

In our next issue, we will describe the coil changes and the additional construction required to put the untuned R.F. stage into operation. This type of stage is comparatively unknown to radio enthusiasts, but has two very important advantages when attached to a simple regenerative detector. Its gain, though not as high as a tuned stage, is appreciable, and it effectively isolates the detector from the aerial. This means that there will be no tendency for the detector to be pulled out of oscillation by the latter, and that much more effective coupling can be used. Altogether, the untuned R.F. stage renders the set easier to handle, and at the same time gives a considerable increase in the strength of weak signals.

(To Be Continued)

WAVE FORMS, from page 29

grid current flows during every cycle to counterbalance the loss by leakage from the grid condenser. If for any reason the grid voltage should be less than the equilibrium value, as happens immediately after switching on, then on the next positive half-cycle, more than the final value of grid current flows in exactly the same way as a diode, such as is used as a peak voltmeter, so that the negative bias developed is almost, but not quite, as great as the peak voltage of the input wave. The difference is due to the fact that some charge, however small, must be lost by the grid condenser during every cycle, and so this must be made up by grid current at the extreme positive tip of the input waveform. The higher the value of Rg, the more closely does the built-up bias approach the peak input voltage.

We have gone to some lengths to explain this mechanism, because the action is a very important one, which is used to a considerable extent in oscilloscope and television circuits.. The grid circuit action is identical with that of the so-called D.C. restorer circuit, which uses a diode, with the precise object of automatically inserting a D.C. component into an alternating wave-form. The D.C. component in this case is the D.C. voltage built up across the grid resistor, and is used as a means of biasing the valve. In measuring-diode circuits, it is used as a measure of the amplitude of the A.C. input wave, while in D.C. restoring circuits it is used to prevent the output from having positive values at any time, or to ensure that the signal always has negative values, from earth as a reference point.

This somewhat lengthy description of the grid action has perhaps rather obscured what we are trying to do with the circuit, but it is easy to see what will happen to the shape of the output wave. It will still have sharp corners, and flat portions top and bottom, but now the positive flat will last for considerably longer than the negative portion. **This comes about solely because of the** bias on the valve. The amplitude of the input is still high, of course, but because only the tips of the positive half-cycles cause grid current to flow, only these same tips will cause the valve to draw plate current too. In fact, by arranging to vary to bias on the squaring valve, we can get a square wave output in which the ratio between the durations of the positive and negative portions is anything we please. This ratio is usually called the mark/space ratio, and is the ratio between the times during which the valve is conducting and non-conducting. The action of the circuit is illustrated in Fig. 7. The two lower pairs of wave-forms illustrate it very well, and bring out the points we have been discussing. At the bottom we have the original sine-wave, and above it, the wave-form at the grid of the valve, after amplification in a normal class. A resistance-coupled stage not shown. Here it can be seen that only the very tips of the positive half-cycles have driven the valve into grid current, and have thus been cut off by the same clipping action of the grid stopper as we saw occurring in the first circuit. The middle pair of wave-forms illustrates the output wave. Unfortunately, this picture was taken with

Continued on Page 32

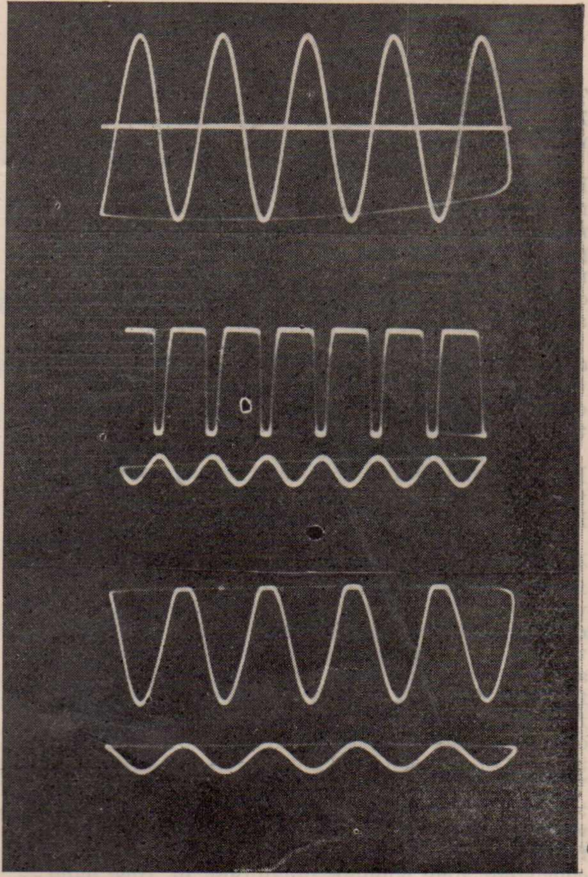


Fig. 7.—Showing some of the wave-forms to be found in the circuit of Fig. 3. Above is the sine-wave input voltage, at the bottom is the voltage at the grid, showing that the grid current just clips the positive peaks. In the centre is the output square-wave.

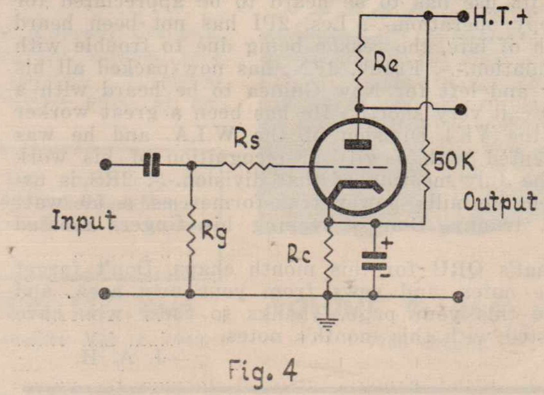


FIG. 4

This is another circuit which gives the same effect as that of Fig. 3, but which does not rely solely on grid current for the high negative bias.

AMATEUR RADIO SECTION

(Continued from page 28)

The display was staged by the Far North Western Zone of the W.I.A. to interest scouts and others in radio as a hobby." The bold is 3TI's comment!

Two of the local DCA boys in the persons of Ian, 3AMJ, and his friend Robbie organized a mobile station wagon of gear which attracted much interest. All the Mildura hams played their part in manning the station and a special mention must go to Noel, 3AUG, and Gordon 3SN, who carried out a marathon shift on the friday afternoon and night of the Exhibition..

As3TI says "Special thanks to the many hams we contacted and who said the right thing at the right time and did all they could to make our show successful. They will be glad to know that it was just that."

A large-scale field day is the next item on the F.N.W. Zone programme for this year and full details of rules, times and dates etc. wil be published as soon as they are finalized.-.-.

2BF hardly has time to get on his favourite 40 metres these days, his time being taken up with running ACCP classes, but knows the effort will be worthwhile in forming embryo future hams.-.-. One of the prominent lunch-time networks certainly blotted their copy-books just recently in trying to get a station who had been operating on the frequency, for the past hour to move off, because it was their frequency. Gentlemen, since when did anybody own any frequency in the Ham Bands? Since all the stations should know better and all have VFO's the answer should have been obvious to them.-.-. Hams everywhere will miss the cheery voice of Mal, 5NM, from the twenty metre band following his untimely death in July. Mal was a consistent and popular inhabitant of this band.-.-. 3ZU has been having a spell of ill health and consequently his activities have had to be curtailed accordingly. Frank hopes to be back on shortly .-.-.3DP is getting interested in Single Side-Band and is putting the finishing touches to a fine new receiver.-.-. 3ABP is another to break out with voice controlled carrier. 5JL and 5KN are often heard with this type of transmitter control and its use has to be heard to be appreciated for snappy operation.-.-. Les, 2PI has not been heard much of late, the reason being due to trouble with modulation.-.-. Frank, 4FN, has now packed all his gear and left for New Guinea to be heard with a VK9 call very shortly. He has been a great worker for the VK4 Division of the W.I.A. and he was presented with a gift in recognition of his work at the July meeting of that division.-.-. 2RS is using a 40 mills power transformer as a 50 watt mod. tranny. Don is keeping his fingers crossed .-.-.

That's QRU for this month chaps. Don't forget those notes, and news from your own area, and make this your page. Thanks to those who have assisted with this month's notes.

—J. A. H.

WAVE FORM, from page 31

a different time scale, but the frequencies are the same, and it can quite clearly be seen that the negative half-cycles, corresponding with the positive half-cycles of the input, are of much shorter duration than the positive ones, which represent the duration of the period during which the valve is cut off. By varying the input voltage, the mark/spaceratio can be altered, because the bias is proportional to the input voltage, so that the two are interdependant in this circuit. Another way of varying the mark/space ratio is to make the grid resistor variable, because this will also vary the developed bias, and therefore the period during which grid current flows.

What we would like to emphasise before leaving this circuit is that the essential feature of the arrangement which causes the mark/space ratio to change is the provision of bias for the valve. The rather complex manner in which the deceptively simple circuit provides this bias is really only a secondary consideration, since we will see later that pulses can be produced by biasing the valve in any other of the more straight-forward ways, such as by simply using a battery.

(To be continued.)

PRICE CORRECTION.

THE RADIO CENTRE, 28 Darlinghurst Road, Kings Cross, advise that the price shown in our last issue for the H.M.V. Electric Record Player, Model G23, is incorrect, and should read £16/6/0.

Just Out!

VOLUME 9 (1950 CIRCUITS)

Australian Official

RADIO SERVICE MANUAL

Thirty-nine Australian Brand Line Radio Manufacturers have contributed their range of 250 receivers to provide you with a quick reference to Australia's 1950 Receiver Circuits and data.

This volume completes the Radio Service Manual coverage of Radio Receivers from 1937 to 1950.

This is Australia's only circuit book of Brand Line Receivers, and nearly 60,000 copies have been sold to date.

No other means is available to the serviceman to obtain complete circuit information. "The Australian Official Radio Service Manual" is the sole and only record.

HALF PRICE BARGAIN OFFER

9 VOLUMES (1937 - 1950 Circuits) £4/10/-

VOLUMES 1-5: 6/- each

Volume 1, 1937 circuits; Vol. 2, 1938; Vol. 3, 1939; Vol. 4, 1940-41; Vol. 5, 1946.

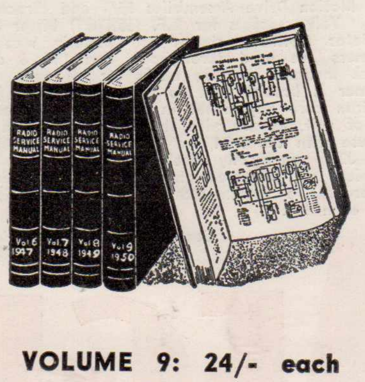
Paper and storage costs and scarcity compel the publishers to cancel their policy of keeping all volumes of the "Australian Official Radio Service Manual" in print.

In order to effect a speedy clearance, prices of all previous volumes have been drastically reduced. 9 volumes for £4/10/-. Previous price, £1 per volume.

> This is your last opportunity to complete your Radio Service Manual Library — there will be no further reprint issues.

VOLUMES 6-8: 12/- each

Vol. 6, 1947 circuits; Vol. 7, 1948; Vol. 8, 1949.



VOLUME 9: 24/- each

1950 circuits.

Postage 1/- per volume extra.

ORDER NOW FROM:

AUSTRALIAN RADIO & ELECTRONICS

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

Printed by ACACIA PRESS, 171 Parramatta Road, Annandale.