THE AUSTRALASIAN

Radio World

PRICE, 1/-

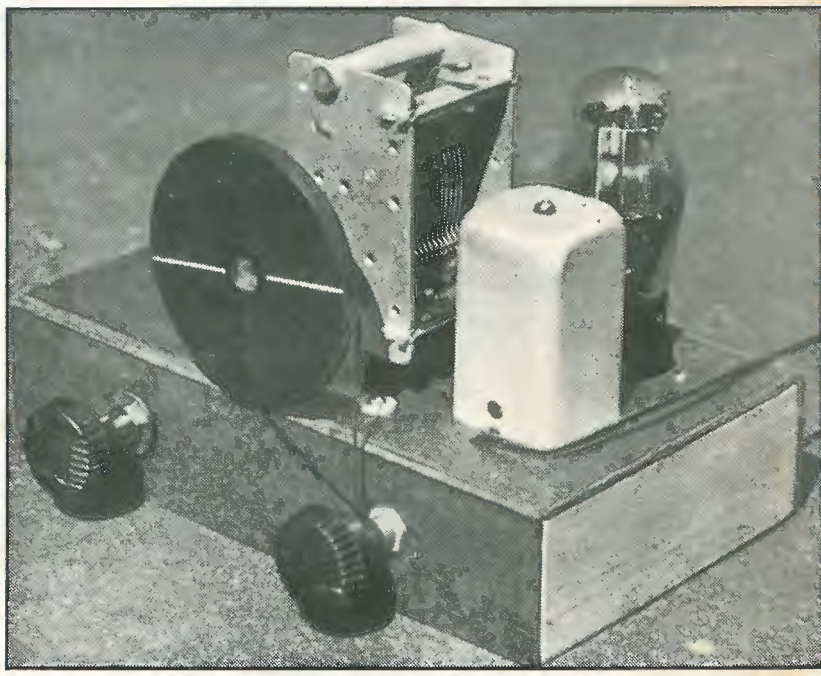
VOL. 6 ..... NO. 9 FEBRUARY 16 1942

ONE-VALVE BATTERY SET

BAFFLING THE LOUD-SPEAKER

TWO MORE ESSAY CONTEST CIRCUITS

AMPLIFIERS AND DETECTOR UNITS



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To Radio Dealers & Service Men . .

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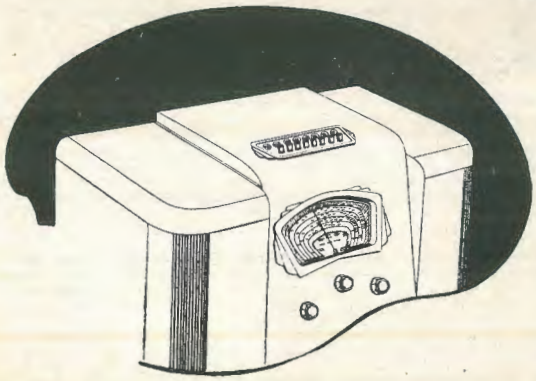

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Full stocks of "CROWN" components are obtainable from our AUTHORISED DISTRIBUTORS, who will be pleased to place at your disposal their specialised knowledge of Crown Radio Products, the "reliable" line.

USE CROWN COMPONENTS IN THE ONE-VALVE SET DESCRIBED IN THIS ISSUE.

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Vol. 6 FEBRUARY, 1942 No. 9

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EDITORIAL

Owing to difficult trading conditions — most radio lines being easier to sell than to buy — there is a falling off in advertising, thus allowing more space to be devoted to reading matter. Scarcity of paper, however, tends to offset this gain, and so we find ourselves this month with an issue which contains only a small number of pages, a few scattered advertisements, but a full complement of technical matter which will give some idea of the way in which "Australasian Radio World" will face up to changed conditions.

Space being so much at a premium, we are unable to go over the fundamentals thoroughly in each issue, but we do keep a stock of back numbers so that these may be referred to for such matters. We find that these back numbers are in keen demand, and the success of our recent special offer of a set of a dozen for 5/- prompts us to make another special offer.

This time we are prepared to supply, post free, a complete set of the 1941 issues to every reader taking out a subscription for 1942. Only a limited number of sets are available and so an early application is essential.

Specify R.C.S TROLITUL COILS

for MAXIMUM SENSITIVITY OPTIMUM SELECTIVITY

For the One-Valve Battery Broadcast Receiver featured in this issue you can't do better than specify the Reinartz type coil as used by the Editor in the construction of the original laboratory set. Reinartz coil, Type T72, incorporates Trolitul throughout and is manufactured to the highest possible standards of efficiency. Use R.C.S. and be satisfied! R.C.S. Reinartz Coil, Type T72 ..... 6/6

Code DA-9

The new D.W. Kit Dial, Code DA-9, has all parts supplied ready to assemble. This is an excellent replacement dial and is suited for crystal and small T.R.F. sets. The special walnut escutcheon is easy to tit and requires an aperture 3 in. x 3 in. Available for use with "H" type Gang Condenser on 1600 and 550 k.c. and 13.7 to 40 metres. S.W. bands.

Code DA-9 .... Price 9/-

DA-1	Standard D.W. Dial	22/6
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DA-5	13.7 to 40 metres D.W. Dial, "H" Condenser	22/6
DA-6	Mantel Set Dial, D.W. "H" gang	18/9
DA-7	Portable Kit Dial, D.W. "H" gang	9/-
DA-8	Same as DA-7, but ready assembled	13/6

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Type DW-36, as illustrated, consists of Aerial and Oscillator Coils, Wave Change Switch, the necessary B.C. and S.W. Trimmers and Padder mounted together, wired up ready to assemble into a set utilising 465 k.c., the bands being S.W. 13.7 to 40 metres, and B.C. 1600 to 550 k.c.

Code DW-36 — Price £1/7/6

Code DW36

R.C.S. D.W. Unit, with R.F. Stage — DW-35 for "H" gang, B.C. and 13.7 to 40 metres £3/7/6

R.C.S. PERM. TUNED I.F.'s

The new R.C.S. permeability-tuned I.F.'s are wound on special Trolitul formers into which are inserted the adjustable iron cores. These R.C.S. permeability-tuned I.F.'s are the most dependable and efficient I.F.'s it is possible to produce. They should be used whenever the optimum in results is required.

465 K.C. I.F.'s
When two I.F.'s are used:
IF162 1st .. 13/9
IF163 2nd .. 13/9
When three I.F.'s are used:
IF164 1st .. 13/9
IF164 2nd .. 13/9
IF163 3rd .. 13/9
465 K.C. I.F.'s
IF166 1st 7/6
IF167 2nd .. 7/6
Air Core 175 K.C.
1E68 1st 7/6
1E69 2nd 7/6

IF162

R.C.S. TROLITUL BROADCAST COILS

These coils are available in both Air Core and Permeability tuned types. The latter are adjusted to ensure maximum efficiency in our laboratories.

AIR CORE "H" GANG

E342 Aerial 6/6
E343 R.F. 6/6
E344 Osc. 6/6

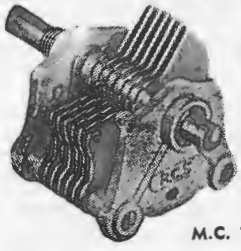
PERM. TUNED "H" GANG

E345 Aerial 8/6
E346 R.F. 8/6
E347 Osc. 8/6

T.R.F. TYPE-AIR CORE

T88 Aerial 6/6
T89 R.F. 6/6
T87 R.F. with reaction 6/6
T81 Reinartz 6/6

R.C.S. TROLITUL MIDGET CONDENSERS



R.C.S. Midget Condensers are made in two types, using Trolitul supports, thus guaranteeing practically no loss.

M.C. Type

The 14-plate equals old style 23-plate capacity. The M.C. type may be ganged.

R.C.S. for all Coils, Kits, Pots. and Condensers.

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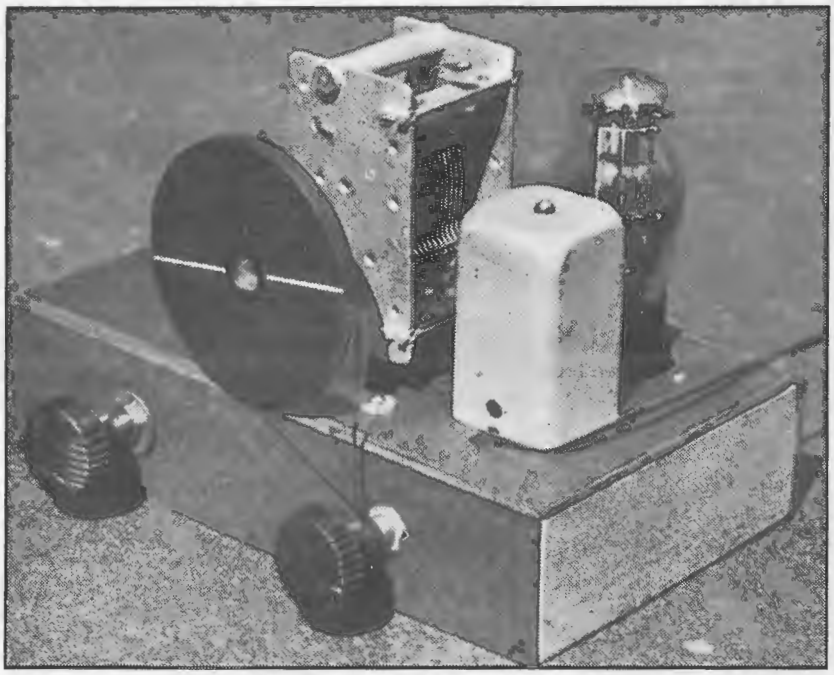
R.C.S. RADIO Pty. Ltd.

SYDNEY, N.S.W.

TRIED AND TESTED ONE VALVER

RIGHT throughout the whole development of radio there has always been a place for the little one-valve headphone receiver. Using practically no battery current, its running cost is only a matter of a few shillings per year, which is out of all proportion to the service it can give. There is one minor drawback, for it is nearly always necessary to use headphones. This difficulty, however, is not always of great importance. Many a lonely camp gets all the latest news, race results and general entertainment by way of one of these modest little sets.



A general view of the new one-valve set. Note the base, which is made of "Masonite."

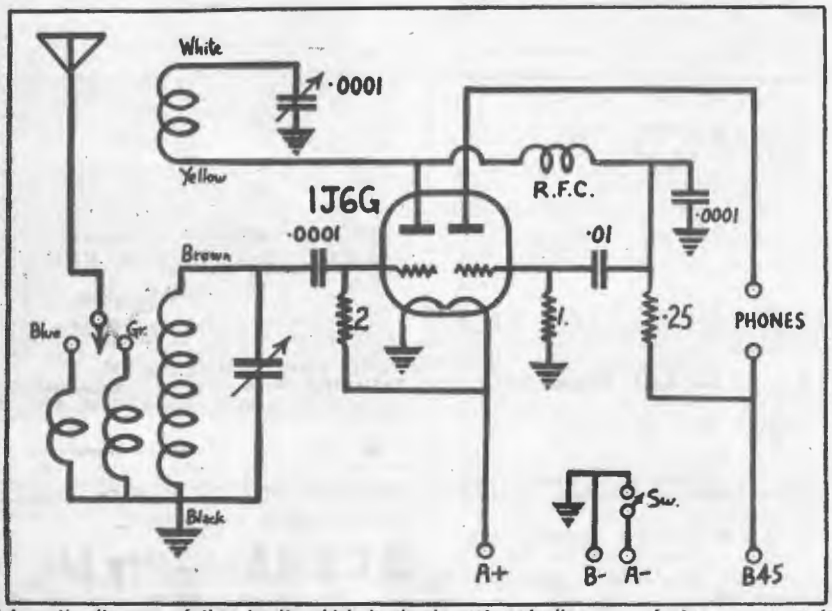
Not So Easy

Strangely enough, the little one-valve sets are not nearly as easy to get into perfect operating condition as you might expect. At one time or another an idea got around that one-valve sets were just eight times as simple to build as an eight-valve set. Actually it doesn't work out like that, for the one-valver needs to be in perfect operating condition in order to give satisfaction, whereas the big job might operate at only 50 per cent. of its maximum efficiency and yet still give fairly good results.

Reaction

The performance of the one-valver is also largely tied up in the effectiveness of the regeneration or reaction, as it is sometimes called. When operating with full regeneration and on the very threshold of breaking into oscillation, a one-valve set can achieve the most amazing sensitivity and selectivity, too. But on the other hand, if the set is normally unstable and bursts into squeals and howls before the regeneration gets a chance to build up, well, then, the whole set falls down in its performance.

To ensure success, therefore, we strongly advise the use of a circuit which has been thoroughly tried and tested, and the use of a coil which is of modern type and produced under precision methods in a modern coil factory. The day of home-wound coils seems to be drawing to a close. Built exactly as described, this set should give perfect results without the slightest chance of failure.



Schematic diagram of the circuit, which is simple, yet embodies every feature necessary to ensure reliable performonce.

A Tested Circuit

For the most efficient circuit we cannot imagine anything better than one which was submitted in our recent battery circuit contest by Mr. Bob Eady, of "Keelogues," Unanderra. This little circuit does not contain any revolutionary characteristics, but embodies all the best practice. It has been thoroughly tested under practical conditions and has been experimented with to make sure that everything is just right.

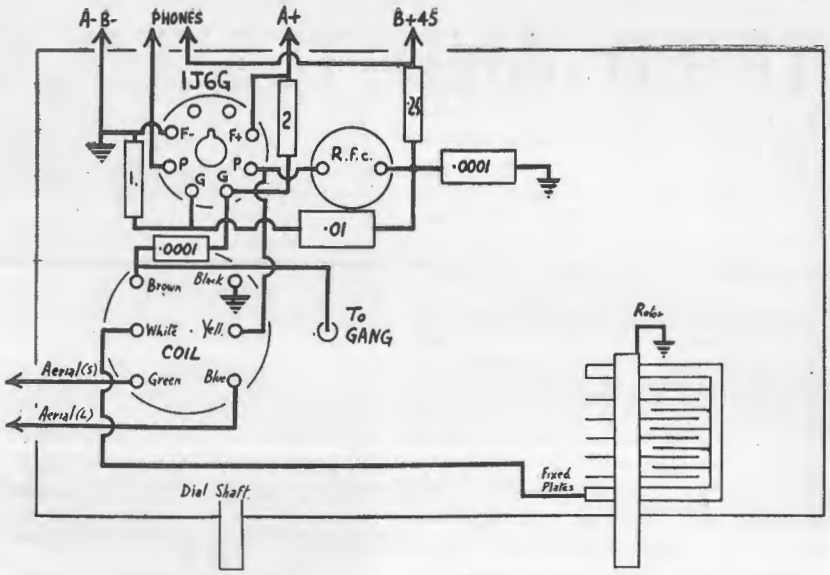
(Continued on next page)

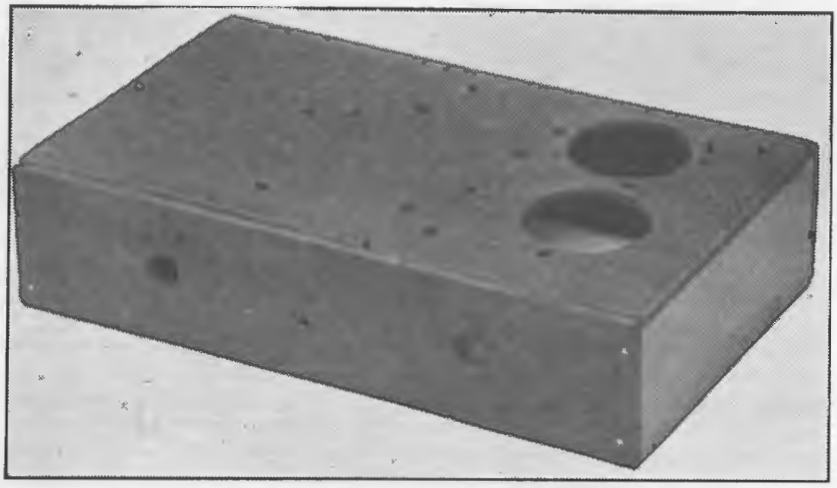
ONE-VALVER (Continued)

We can recommend the circuit, with a stern warning to use the exact components specified without the slightest alteration.

Our Laboratory Test

Using this circuit we recently ran together a one-valve set in our laboratory, mainly to investigate the possibilities of "Masonite" as a material for chassis construction. Immediately on completion, this receiver gave excellent results and not the slightest modification or adjustment was required. Originally we built the set with the "Crown" coil which Mr. Eady found so successful, but we also changed over to both "R.C.S." and "Radiokes" brands of similar coils and found that they were also completely successful. It is because of this testing and experimenting that we are able to put such a strong recommendation behind this little set.





ABOVE: Picture diagram of the wiring.
LEFT: A photo of the "Masonite" base before final assembly.

The Original Essay

Here is what Mr. Eady said about his little set when he submitted his essay in our contest:—"I have built up this set and found it to perform beautifully. The coil I used was a 'Crown' type C/S Reinartz job. The following is a list of stations brought in on an aerial about 80 feet long and 15 feet high: 2WL, 2CH, 2UE, 2CK, 2TM, 2BL, 2KO, 2SM, 2UW, 2CA,

2KY, 2FC, 2NC, 2LT, 3AK, 3KZ, 3LO, 3UZ, 3SR, 3DB, 3HA, 3BA, 4BH, 4BK, 5DN, 5PI and also a station from Christchurch, New Zealand.

"On 2WL, which is only a few miles away from our house, I can operate an old-style Sonochord 14-inch cone speaker with excellent volume and quite good tone."

Construction

Owing to the difficulty in obtaining a suitable metal base for this little set, we built one up from a piece of "Masonite" short. This composition material is an excellent insulator and is very nice stuff to work with. It cuts easily with an ordinary woodsaw, finishes off smoothly with a rub of sandpaper, and looks fine, as will be seen from our photographs of the original set.

We used a couple of blocks of wood for the endpieces and then cut a panel for the top and two strips for the front and back, putting the whole together with short nails, wood screws also being unavailable. The result was entirely satisfactory, and the cost most reasonable. A piece of "Masonite" costing 9d. provided enough materials to make several bases of this size.

In the near future we have in mind to build up a full-size superhet on a base of this material. Cutting the socket holes was a simple process, using a fret saw blade. We also tried to cut one with a sharp knife, and found that this method was also quite a possibility. It is a mighty different job cutting and drilling the "Masonite," compared to working on a steel base.

Needless to add, the masonite being an insulator, it is not possible to use the base as an earth return, so that a piece of bare wire is needed to run around to join up all earth terminals and to effectively earth the framework of the tuning condenser.

This cannot be considered as a drawback, however, as even with a steel base the earth wire is nearly always necessary or desirable.

Cutting the base to size and getting an idea of the layout can be managed by studying the picture diagram of the wiring, as this is drawn to scale.

Once the components are assembled, the wiring job is simple, again the picture diagram being followed, and then a check made against the schematic circuit.

Batteries

For the high tension, a 45-volt "B" battery is required and this can be of any type.

The high tension current drain is so small that a PR45 type portable battery is quite O.K. On the other hand, if a battery of heavier capacity can be afforded, it will be found to be a better proposition in the long run, as it will last much longer than a lighter battery, to a much better proportion than to the extra cost.

For the filament supply a current of nearly a quarter of an ampere is required at a pressure of 2 volts. This voltage is quite critical, so that for preference a small two-volt accumulator should be used.

It is possible, however, to get this filament supply from a pair of "A" cells, but the voltage must be broken down by a resistor or rheostat. If a resistor is used it will need to have a resistance of 4.16 ohms, or, to be on the safe side, 4¼ ohms.

WHERE THERE IS A WILL . . .

In America recently a radio enthusiast passed the examinations for his amateur operator's certificate notwithstanding the disability of being deaf, dumb and blind. Seems impossible — but it is true!

VICTORIAN CHAMPION

Melbourne held an Amplifier Championship recently. The winning amplifier design was quite simple.

IN last month's issue we carried an advertisement for Rola speakers, in which mention was made of an amplifier championship held recently in Melbourne. Since so many of our readers are keenly interested in amplifier and audio design, it is only natural that we have been inundated with requests for further details about this contest.

The contest was conducted by the Melbourne radio programme paper, "Listener-In," in conjunction with their Australian DX Radio Club.

Two judges made a run through the 42 amplifiers entered, allowing each to play three recordings, and made a preliminary elimination of all but ten of these. The ten selected amplifiers then got together on a Saturday night in December, with an audience of over a hundred keen enthusiasts.

Prizes were awarded for first, second and third in three sections, as well as a Champion of Champions trophy of the value of five guineas, donated by the "Listener-In." Other prizes, mainly being donated by firms in the radio trade, were an attractive lot, ranging in value from 7/6 to £10.

The Champion

The title of Champion of Champions was a hard-fought contest between two push-pull amplifiers using 2A3 type triodes in the output, with the verdict going to a job having the first stage a phase-changer valve, with a second stage of push-pull obtained by using a twin-triode type of valve. The basic circuit of this amplifier is shown in our diagram. The power supply was of normal design.

The runner-up used a pentode first audio, with a 6V6G phase-changer and fixed bias for the output valves. We should imagine that the circuit used would be somewhat similar to the one which appears elsewhere in this issue in connection with the article by Mr. Hughes.

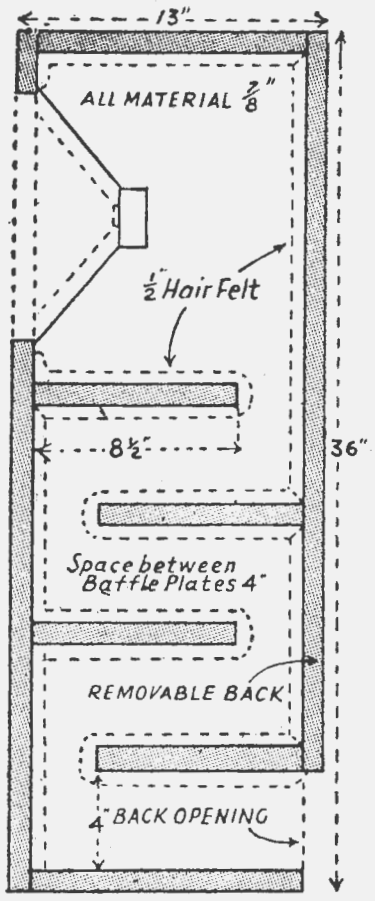
Probably the success of the winning amplifier was due in no small measure to the use of a suitable baffle to load the speaker correctly. A diagram of this type of infinite baffle used is also reproduced for the benefit of those interested. The full constructional details of the winning amplifier and the baffle, together with the list of components used was published in the "Listener-In" issue dated December 27.

The Speakers

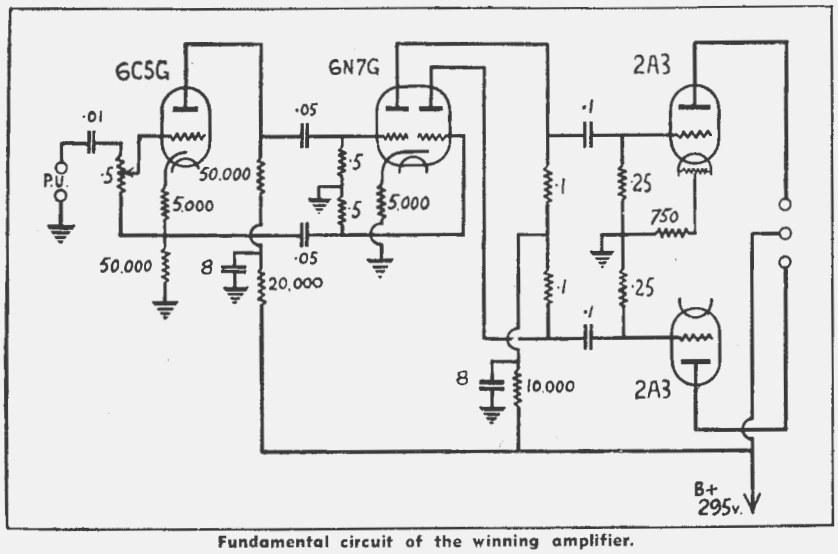
Rola speakers were particularly successful in the contest, being used by both finalists in the Champion of Champions contest, the winner using a G12 type and the runner-up a 12/42 type permagnetic.

Other Amplifiers

The ten finalists brought a representative collection of amplifiers before the judges, including single-ended amplifiers with 2A3 type triodes, and with beam power valves and inverse feedback. There was one amplifier with 6L6 type valves in push-pull and also another consisting of 2A3 type triodes in a twin-channel direct-coupled arrangement.



Details of the box baffle used by the winner of the Victorian Championship.



Fundamental circuit of the winning amplifier.

Pick-ups

An interesting point gleaned from the "Listener-In" reports on the contest is that every finalist used pick-ups of the crystal type.

Australian Champion?

In offering our congratulations to the "Listener-In" on their initiative in staging the contest, we would like to express the hope that as soon as conditions return to normal it will be a grand scheme to arrange a duel between the champion Victorian amplifier and one from New South Wales or, even better still, a contest between representatives from all States for the title of Australian champion.

TWO EFFECTIVE BATTERY CIRCUITS

For country radios there are many types to choose from and in each type there are innumerable variations in each.

The field that is open to an experimenter is very wide and it is difficult to make a choice. However, a radio which will cover most requirements and conditions is the common-sense choice.

Myself, I think a radio using 2-volt valves of the modern high efficiency type is the most reliable and satisfactory choice for most country homes.

Varieties and Types

There are two obvious varieties of this type, the straight battery radio and the vibrator-driven model.

I enclose a circuit of a highly-efficient radio which can be adapted for use as a vibrator set as well as a straight battery set.

As drawn, the circuit is suitable for battery operation.

Some of the points which are especially suitable to country conditions are these:—

Back bias which is automatic. With this method, almost any high-tension voltage from about 45 volts to 150 volts may be used without any alteration to the value of bias resistors, whereas if a "C" battery had been used to bias the tubes continual alteration of the tappings would be necessary to obtain good results. With the back bias method batteries may be used as it were to the last kick, with fairly consistent operation, this being specially valuable to a non-technical-minded country owner.

Another point more suitable to country conditions is the use of permatune iron-cored coils.

These provide the high-gain necessary for country conditions where the utmost selectivity is not required.

The radio-frequency stage peps up again and helps eliminate the characteristic hiss of the mixer when tuned to a weak carrier.

A point worth noting also is the automatic volume control system. The circuit is one which I have used with success as it provides good control with the utmost gain and selectivity on weak signals. By studying a standard circuit you will notice that the earth return to delay the a.v.c. system is electrically paralleled by the filter network to the controlled valves. This halves the effective resistance which is connected to form a load on the primary of the second intermediate transformer, thus causing a serious loss of selectivity and gain. This is perhaps more clearly represented by a suitable sketch.

Selectivity Improved

In the method used in my circuit the two resistors are in series and, although the second is by-passed by a .25 mfd. condenser, the selectivity and gain of the stage is considerably improved as the load is approximately half that of the standard circuit.

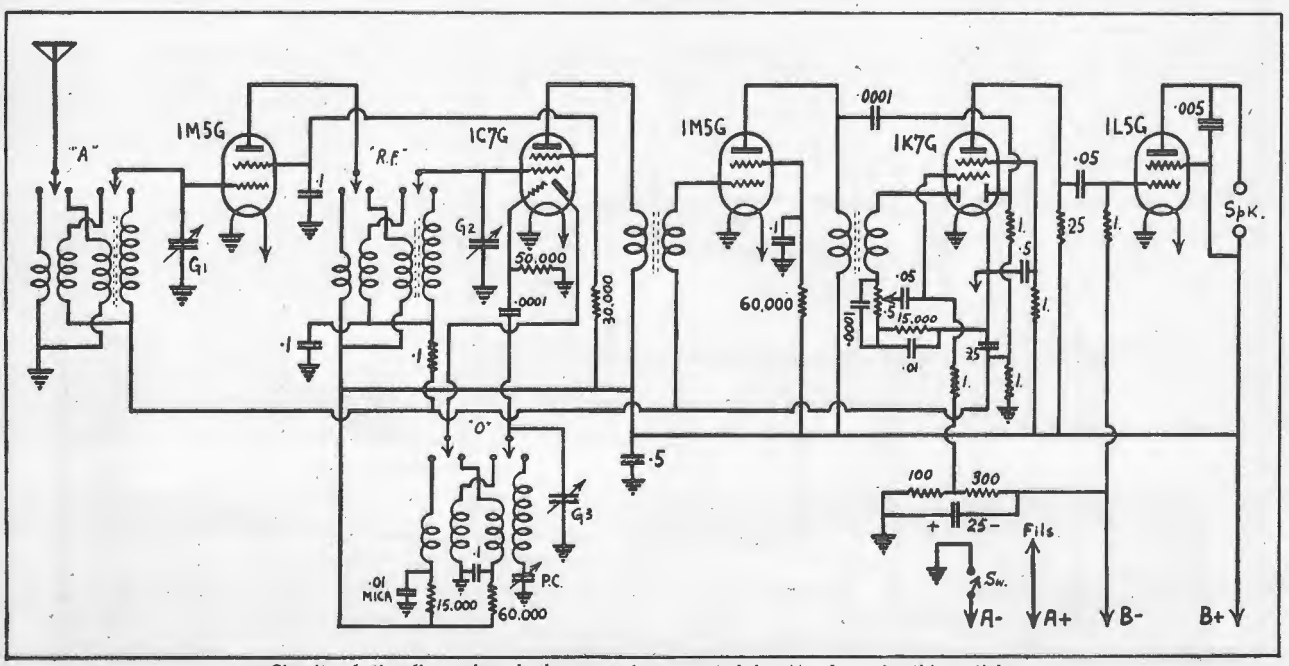
The next point is in connection with the dual-wave operation of the set. I have found that on the short waves

(Continued on next page)

THE WINNER

Mr. R. BROWN,

of 82 Victoria Street, Taree, who was winner of the £5 first prize in our battery circuit contest, as announced in last month's issue.



Circuit of the five-valve dual-wave set suggested by Mr. Lyon in this article.

BATTERY CIRCUIT
(Continued)

a higher plate oscillator supply voltage is necessary.

I find that on the broadcast band a dropping resistance of .06 megohms by-passed by a paper condenser of the tubular type (.1 mfd.) does a splendid job. However, it is a failure on short waves below 50 metres. For good results from 16 to 45 metres, the best combination is a .015 megohm dropping resistor by-passed by a .01 mica condenser. This is easily incorporated in practice by following the circuit in the diagram.

Sliding Screen Voltage

Incidentally, it is becoming standard practice to use the sliding screen grid voltage method in all modern sets. This system has the advantage that as the "B" maximum voltage drops, the screen grid current drops and the voltage on the screen rises, thus compensating for the falling "B" voltage by increasing the gain of the valves.

The sliding screen grid circuit is much to be preferred to the older method of tapping off the required voltage from the "B" batteries. The resistor and condenser in series with the volume control provide low-level tone compensation.

Having covered the circuit from the angle of purely battery operation, I should like to demonstrate how easily such a set can be converted to vibrator operation.

The filaments should be arranged as shown in the drawing below, with the addition of the .1 and .5 tubular condensers.

When using the set as a vibrator model, a three-point three-way switch should be used and wired up as follows:—

Use separate leads for both the vibrator unit and the valve filaments and use separate sections of the switch to break the positive lead of each pair of wires. When this is done a filament choke should not be necessary. The third section of the switch may be used to switch the dial lights, the positions being these: (1) Off; (2) set on, dial lights off; (3) set on, dial lights on. To do this, the wiring should be done as shown in the sketch.

The leads X and Y may be joined at clip on battery but nowhere else.

Here is another prize-winning essay from our battery circuit contest, contributed by —

Mr. R. M. LYON
of 120 French Street, Hamilton, Victoria.

The only other alteration necessary is to remove the 100 and 650-ohm back bias resistor and the 25 mfd. by-pass and return the gridleaks of the 1L5G and 1K7G to earth.

Any standard vibrator high-tension unit may be used or a unit may be built to suit. In either case, good results should be secured.

In my opinion, this set will appeal to most constructors because the parts and valves are all Australian made and easily obtained.

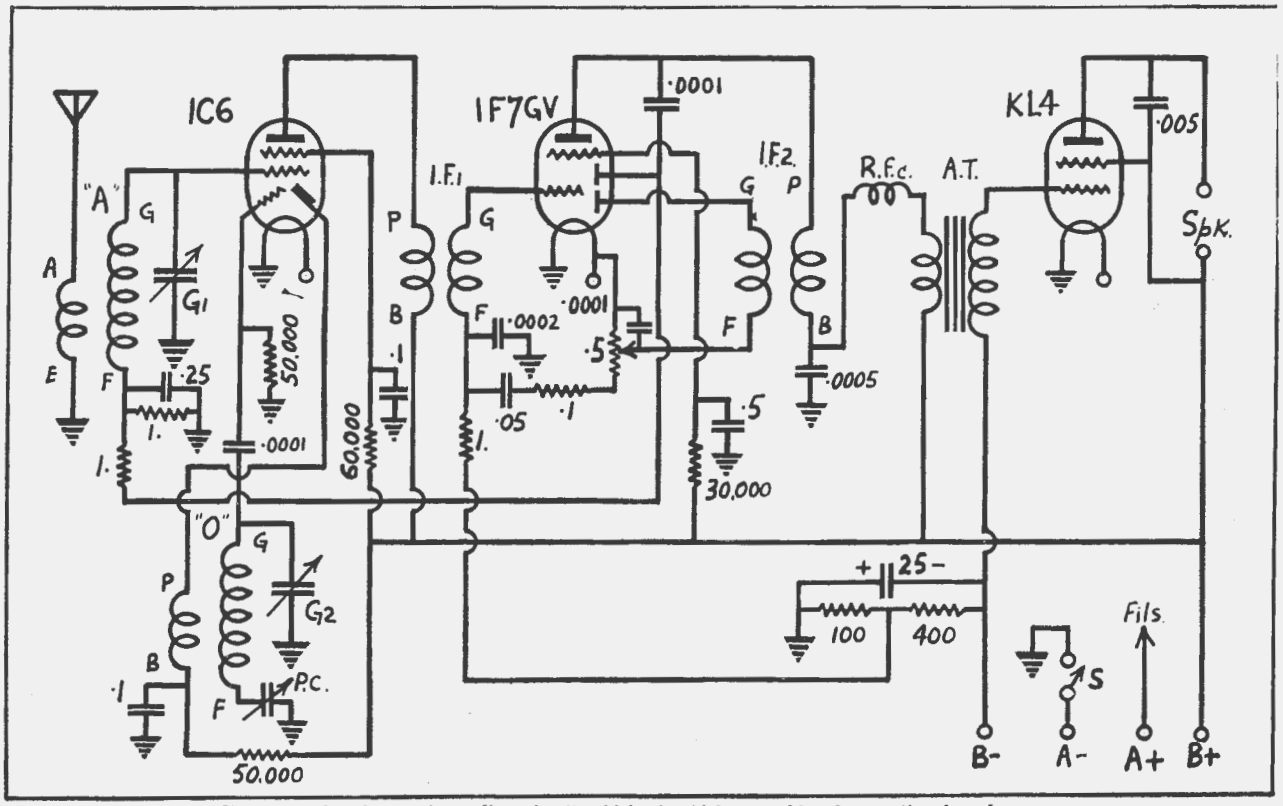
Having covered the ground for a good quality set of ample sensitivity for all requirements, I think it is only fair to provide a model for the listener who wants a reliable radio to provide programmes from local stations by day and interstate by night and yet be economical to build and operate.

I have decided that the best circuit in this line is one of the excellent three-valve circuits employing a reflexed detector.

This type is ideal for the above conditions and is entirely reliable in operation.

The circuit also incorporates those features I have pointed out, where they are adaptable to the needs of the circuit.

This circuit is very economical, the

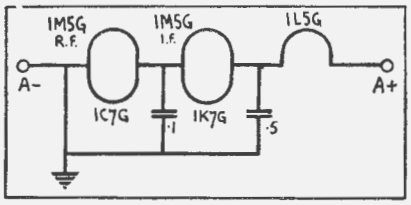


Circuit of the three-valve reflex circuit which should be capable of exceptional performance.

"B" battery drain being only approximately 10 milliamps, under which load the triple capacity type batteries should give about 18 months' or more service.

While as the circuit is the filament drain is only .32 of an amp., which means that the average 100 ampere hour, 2-volt accumulator will give about 300 hours' running time.

This is definitely economical and, into the bargain, the set gives a really marvellous performance, one which I built easily managing Tasmanian



Circuit to show filament arrangements when vibrator is used.

and South Australian stations in the daylight, in addition to all the usual Victorians.

You may say that a further saving in battery consumption may be effected by substituting a 1A6 for the 1C6. This is so and is quite allowable; the reason I have not specified

NEXT MONTH —

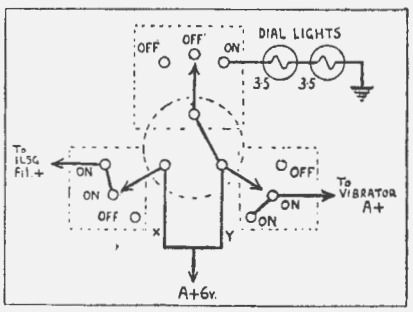
A New Four-valve MANTEL MODEL for A.C. operation

this tube is that I have not used it, while I know that the 1C6 is very reliable.

A point about this set to watch is the coupling transformer. This is a specially-matched transformer and is necessary if good quality is to be preserved.

It is possible to use resistance coupling instead, but I find that this greatly reduces the sensitivity.

I notice that two points were missed in my previous commentary on the



Suggested switching circuit for the vibrator version of the five-valve set.

circuit. They are, firstly, the time constant of the automatic volume control system. This must not be faster than .25 of a second or all the bass will be removed by the smoothing action of this circuit. The time constant is found by multiplying the filter capacity and resistance in this circuit and the result is in the fraction of a second. It will easily be seen that if either the resistance or capacity or both are too small, the bass notes will be removed.

Good Base Reproduction

The second point is in connection with the audio coupling circuit. In order to procure good bass reproduction, the audio coupling condensers and resistors should have as high a value as is consistent with the rule that the capacity by the resistance shall not exceed .05 if audio troubles such as blocking of the valves is to be avoided, the resistance referred to being that of the grid leak.

Tone Compensation

You will notice that I have included a .01 condenser and a .015 megohm resistor in series with the "off" end of the volume control. This is an idea for providing low volume tone compensation. I have not tried this in practice and the values given in the circuit diagram may have to be experimented with to obtain best results. I have suggested this idea as an alternative to a tapped volume control which is rather expensive compared with the ordinary type.

— R. M. LYON.
120 French Street,
Hamilton, Vic.

BAFFLING THE LOUD SPEAKER

Reprinted from that fine American technical journal, "Radio," this article on speaker baffling answers all the questions which amplifier enthusiasts usually ask.

MANY an experimented who owns a high-quality amplifier is constantly troubled with the thought that the baffling of the speaker is not as efficient as it should be, and would like to build a really effective box baffle or acoustic labyrinth, but is at a loss when it comes to choosing and calculating dimensions for a suitable enclosure. For those faced with such a problem this article is written. First there will be a brief discussion of the theory involved, then construction details for some cabinets that will improve the frequency response of an ordinary speaker; yet cost so little as to fit into anybody's budget.

Theory

At low frequencies, where baffling is most important, the cone of a dynamic loudspeaker can be considered as a piston, because the entire cone moves as a unit. As shown in Fig. 1, on the forward stroke the cone (or piston) compresses the air before it and rarefies the air behind, and reverses the procedure on the backward stroke.

The illustration shows the action of the cone as it moves from its rest position forward, back to rest, and backward. At the start the air pressure is the same on both sides. When the cone moves forward the air in front is compressed and a slight "vacuum" is produced behind. This compression moves out from the cone, leaving the air immediately in front of the cone at normal pressure again. Then as the cone returns to its rest position again, the air in front is rarefied and the air in the rear is compressed, as will be seen in the third part of Fig. 1. Part four shows the conditions existing when the cone moves back from its rest position. The rarefication and compression are both increased, and the preceding pressure changes continue to move out from the cone.

In accordance with well-known laws of physics, the air that has been compressed will tend to flow around the edge of the speaker into the vacuum on the other side, thus greatly reducing the pressure changes caused by the movement of the cone.

To prevent this effect, or to shift it to a much lower frequency, is the purpose of a baffle, which in its most elementary form is simply a flat partition of acoustically insulating material that serves to isolate the pressure or vacuum area at the front of the cone from the vacuum or pressure area at the rear.

Sound Radiation

When the sound radiation from the rear of the cone reaches the front of the cone exactly 180° out of phase with the front radiation, cancellation takes place, and causes a dip in the speaker's response curve. This occurs at a frequency where the length of the path from the rear centre of the cone is exactly one wavelength. Since the wavelength varies inversely with frequency according to the relation $l = 1089/f$, where f is the frequency in cycles per second and l is the wavelength in feet, it is clear that the lower the frequency at which the baffle is to be effective the larger will be the baffle required.

The dip in the response curve will be very pronounced when a regular baffle, such as a square or a circular one with the speaker mounted concentrically, is used. The reason for this is that all paths from rear to front are of essentially the same length, so that cancellation occurs at one frequency. A great improvement can be effected by the simple trick of using an irregular baffle (even a rectangular one is better than a square one) with the speaker mounted asymmetrically, rather than in the centre, in order that no two rear-to-front paths are of the same length. The result is a smoothing out of the response curve, because the cancellation frequencies are spread over a considerable portion of the spectrum.

At low frequencies the radiation angle of a speaker mounted in a flat baffle is a solid angle of 180° (in other words, a hemisphere), if the speaker is well clear of the walls, ceiling and floor of the room. By mounting the speaker near one edge of an irregular baffle, as explained above, and then locating the baffle at right angles to the floor with this edge on the floor, the radiation angle can be reduced almost to a quarter-sphere. This will result in loading the cone much better and the cone will therefore radiate much more efficiently. Care must be exercised to prevent reflections from the floor surface. A rug on the floor in front of the speaker will be of help in this respect.

An improvement in efficiency can also be effected in the case where two speakers are used on the same baffle by locating them as close together as possible. The phase of both cones is the same (if properly connected), so that the pressure area of each cone helps to load the other, thereby increasing the efficiency and improving the bass response.

Figure 4 — Measurements to be taken in using the formula for the surface area of the speaker cone. They should be taken in inches.

Designing the Cabinet

To be considered really high fidelity, especially from the standpoint of frequency modulation, a speaker or speaker system should reproduce all frequencies from 30 to 16,000 cycles per second with a response that is flat within about 5 db. So for the purposes of illustration a lower limit of 30 cycles has been chosen in the following designs.

For adequate baffling down to 30 cycles a baffle 36.3 feet square (or an irregular baffle with the longest dimension 36.3 feet and the shortest at least 15 feet) is necessary. Obviously, for home use such a large baffle is out of the question, and that required for a still lower cut-off frequency would be even worse. To obtain the beneficial effects of such a baffle and still stay within reasonable limits as to size, some form of cabinet enclosure seems to be the best answer at present.

Before going ahead with the cabinet design it might be in order to mention that the effect of an infinitely large

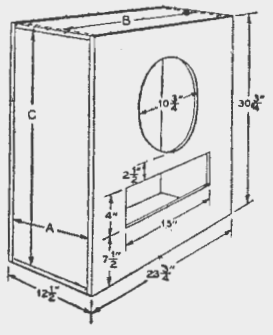


Figure 3 — Dimensions for a vented enclosure intended for a twelve-inch speaker. The letters designate the dimensions given in the table in the text.

baffle can be obtained by mounting the speaker unit in a hole in the ceiling of the room, or in one of the walls, thus preventing the rear radiation of the speaker from combining in any way with the front radiation at any frequency.

Infinite Baffle

One of the simplest enclosures that can be built to provide the necessary baffling action is an "infinite baffle," so called because it approaches the action of an infinitely large flat baffle when properly designed and built. It consists of a box with a single hole for the speaker, strongly constructed and with the walls braced to prevent vibration. The shape is unimportant as long as the box is large enough for its resonant frequency to fall at or outside the lower limit of the speaker's response range, and has sufficient lining of high absorption material. A half-inch layer of rock wool, felt, or rug cushioning will usually be enough.

A twelve-inch speaker requires a box of about eight cubic feet volume, and an eighteen-inch speaker should have about 50 per cent. more volume. Using these figures as a basis, the following table gives the approximate box sizes for various speakers:

Speaker Size	Volume of Box
18"	12 cu. ft.
15"	10 cu. ft.
12"	8 cu. ft.
10"	6.7 cu. ft.
8"	5.3 cu. ft.
6"	4 cu. ft.

Acoustical Labyrinth

An acoustical labyrinth speaker is one having a long tube with absorbent walls closely coupled to the rear of the cone. The tube should be one-half wavelength long at a frequency near the lower end of the response range, and is normally folded into a console cabinet with the open end at the bottom or in the front of the cabinet.

The absorption of the tube lining increases with frequency, thereby greatly attenuating all except the lower frequencies. Making the tube a half-wavelength long, as mentioned above, causes a reinforcement of the front radiation of the cone by the radiation from the tube, since these are in phase at this point.

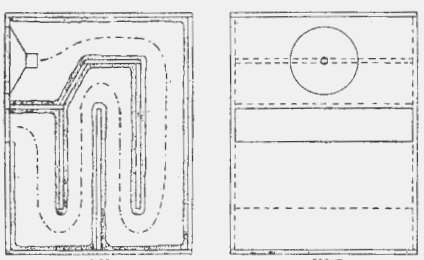


Figure 2 — Acoustical labyrinth speaker design. The tube coupled to the rear of the cone is folded into a cabinet to conserve space. This is only one of many possible arrangements, but serves to illustrate the general principle.

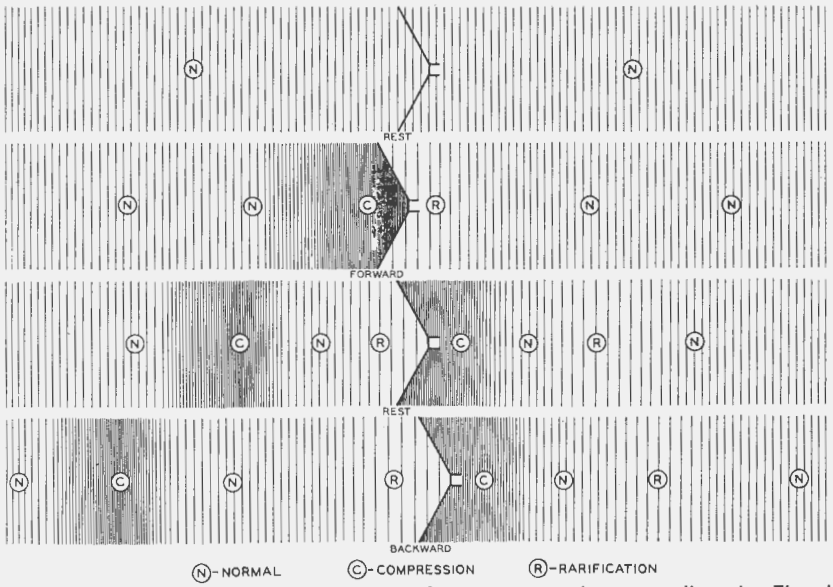


Figure 1 — Effect of the movement of a speaker cone upon the surrounding air. The air is compressed in the direction in which the co enmoves and rareified on the other side, the resulting waves moving out from the cone similarly to the movement of waves in a pool when a stone is dropped into the water.

Not all of the improvement of the response range credited to the labyrith is due to reinforcement of the low frequencies, however; a great deal of improvement is the result of the baffling action of the long tube.

An example of this type of speaker system is given in Fig. 2. No dimensions are included, as these will depend upon the speaker to be used and the type of cabinet into which the labyrith is to go. Possibly better arrangements of the interior will suggest themselves to the constructor. The cross-section area of the tube should be approximately equal to the area of the speaker cone (as calculated by the formula given in the next section), and the centre-line length, as indicated by the dot-dash line, should be a half wavelength at some frequency near the low end of the response range.

Vented Enclosure

A vented enclosure for a speaker is another type of cabinet baffle which improves the speaker's low frequency response by the in-phase addition of the back radiation to the front radiation of the cone at these low frequencies.

It consists of a box having two holes in the front, one for mounting the speaker and the other by which the air in the box is acoustically coupled to the outside air. The box is partially lined with an absorbent material such as hair felt or acoustic insulating board to absorb the higher frequencies and to prevent excessive cabinet resonance. The cabinet should not be completely damped, as is required for the "infinite baffle" type cabinet.

For the same reason mentioned in the last paragraph of the theory section of this article it is best to locate the speaker hole and vent fairly close together.

Cabinet Dimensions

Fig. 3 shows the necessary details and dimensions of a cabinet of this type intended to house a twelve-inch speaker. No claim is made that these dimensions are the only correct ones; merely that they worked well with a particular speaker. Ambitious constructors may be able to improve upon the performance of such a unit by experimenting a little with the various dimensions.

Acoustic Treatment

If the box is made of ¾" five-ply wood and fastened together with wood screws it can easily be disassembled for shipping or storage. The inside of the box is acoustically treated as follows: a piece of ½" Celotex or other similar acoustic insulating board about 10" x 24" is placed vertically in the centre of the back, and another piece about 8" x 24" is placed on each side. Some cut-and-try will probably be necessary to obtain optimum results. During this process the back can be held on with only two or four screws if the volume is reduced to less than maximum, thereby reducing the labour involved in closing and opening the cabinet several times.

In the following table the dimen-

(Continued on page 28)

CRYSTALS FOR FREQUENCY CONTROL

How they are ground in the factory of Amalgamated Wireless

One hundred and thirty broadcasting stations flooding the air with music and talk by day and night —

Navy and merchant ships in unknown numbers using their wireless —

Coastal stations transmitting and receiving —

Long-distance short-wavers telling the world what Australia is doing and thinking —

Great flocks of military and civil aircraft burning up the ether —

Ground stations in two-way communication with aircraft in flight, ships afloat, police cars, ambulance waggons, electrical service vehicles, wireless telephones, Beam telegraphs, and all the rest —

One may well ask how all these manage to survive and work together without the chaos which would result from overlapping.

The Answer

The answer is found in the tiny piezo-electric quartz crystals that are produced in the laboratories of Amalgamated Wireless, and are incorporated in the heart of virtually every Australian radio transmitter.

The demands of war and extensive use of mobile vehicles have given a great impetus to the production and use of crystals for controlling the frequency of the emitted waves of radio stations.

Wireless transmitters in operation in Australia for varying purposes can now be counted in thousands. Every increase in number involves greater care in keeping each one upon its allotted frequency or wavelength.

In order to obviate interference, practically every Australian transmitter is now fitted with a crystal which holds its rigidity to its frequency. Production of these crystals has become an important branch of the wireless industry.

Vibration Frequency

Until comparatively recent years, radio stations of every kind were fairly widely separated in respect of frequencies. Special but relatively ineffective and expensive methods were adopted to prevent interference, but the crystal has now changed the technique. Every crystal has a mechanical vibration frequency dependent upon its physical proportions. When it is connected in an electrical circuit, the mechanical vibrations set up equivalent electrical vibrations, which in turn control the generating circuit of the initial oscillating valve of the transmitter. The crystal must, therefore, be cut, ground and polished until its frequency is as desired. Its dimensions then are usually quite small, perhaps about an inch square by one-sixteenth of an inch thick.

Care Needed

The making of crystals calls for great care and precision; for example, the faces should be flat and parallel to within one hundred-thousandth of an inch. This was undertaken on a commercial scale in Australia first by A.W.A., in 1931, and the first Australian broadcaster fitted with crystal control was that company's new 3BO, Bendigo, which was opened on June 4 of that year. A tiny seven-metres transmitter for special short-distance work was also fitted with a crystal at the same time. These innovations proved so successful that A.W.A. prepared crystals both for several short-wave broadcast stations and for many succeeding medium-wave broadcasters. Most notable of these were the "YA" stations of New Zealand, which were much more powerful than the national stations of Australia. The crystals were all temperature-controlled, and they held the New Zealand stations to within plus or minus 10 cycles of their allotted fre-

(Continued on page 30)

AUSSIE — NOT AMERICAN

In our January issue in the article dealing with direct-coupled phase-changers we published o circuit and mentioned that it was of American origin. It has been drown to our notice that this circuit was featured by Parry in an article on the subject which appeared in the Proceedings of the Institution of Radio Engineers (Australian) for April, 1939, and was reprinted from there by the Radio Digest (American) for November, 1939, which explains how we got the impression that it was American. We are pleased to make this correction and to place the credit where it rightly belongs to our local radio engineer.

DETECTOR UNIT FOR AMPLIFIER

Amplifier enthusiasts can easily add this coil and switch to allow radio reception.

With regard to a recent enquiry for a suitable circuit to convert the first valve of an amplifier into detector, Mr. W. W. Terry, of Brisbane, sends a circuit used in conjunction with his own P.A. system. As you will see, it is simple and effective. Valve used in original is type 57. Values are marked, and the only adjustment required to obtain first-class results by the builder will be adjustment to the regeneration coil to obtain smooth reaction.

The main feature is the switching arrangement.

In normal position the microphone is available if the radio is needed; one turn of switch and the valve is converted from a screen grid amplifier to regenerative detector.

Short Aerial Sufficient

Only about 10 feet of aerial is required in most areas close to the main stations, and this can often be built into the amplifier cabinet.

Coil details are not necessary, as any Reinartz type coil with reaction winding is obtainable at most radio stores.

Anyone using a crystal microphone can easily add the above unit. If no room is available on the present chassis, a small box can be built up from suitable plywood or other wood and placed as close to the pre-amp. valve as possible.

Mr. Terry says he has found this little job to be a very great asset indeed, and a real boon at times when a good radio programme is on the air, and you wish to leave your amplifier for 15 minutes or so and not be worried about having to change a record every three minutes.

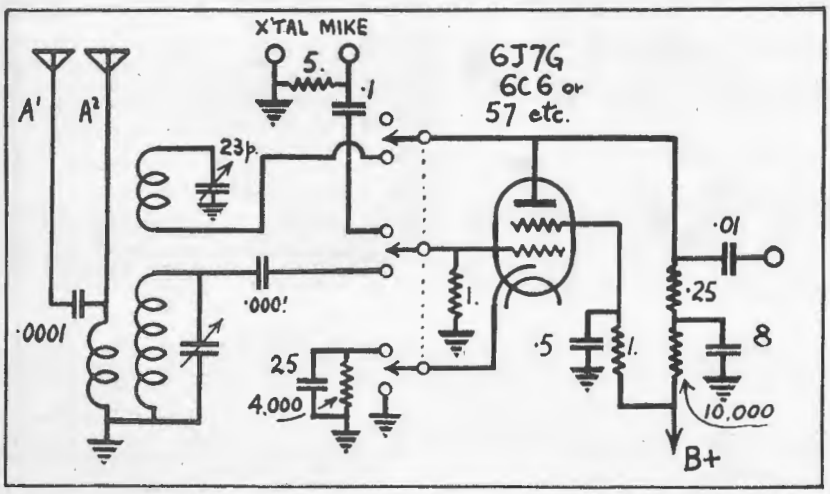
Circuit for Crystal Mike

You will notice the circuit used for the crystal "mike" is a bit different to the usual hook-up, but you can rest assured it will take a lot of beating. In wiring up the switch, builders should be careful and make sure that the correct connections go to the rotor arm in each set of contacts, likewise that other leads connect to corresponding contacts so that no trouble will be experienced with a mixed-up circuit when the rotor arm is turned to radio or vice versa.

Rotor connections of the circuit are shown as centre contacts in the circuit diagram for simplification of circuit drawing. The switch can be the usual rotary 3 x 3 or 4 x 3 contacts in a single deck.

Further Details Available

Mr. Terry mentions that he will be pleased to give further details of this device to any reader who cares to write to him, enclosing a stamped envelope. His address is: W. W. Terry, 11 Manning Street, Melton, W2, Brisbane, Q.



Schematic diagram of the unit, showing how the switching is arranged.

WANTED--
USED TRANSMITTING VALVES

Used transmitting valves in reasonable mechanical condition are required urgently by Amalgamated Wireless Valve Co. Pty. Ltd. to assist in maintaining the production of transmitting valves for Defence purposes. Owing to the difficulties being experienced in obtaining certain parts of these valves and materials from overseas, it has become necessary to make a special effort to obtain used valves containing electrodes and other parts which may be used in the manufacture of new valves.

Prices Paid

In order to act as an inducement to the return of certain types of transmitting valves, the company has determined a list of prices which it is prepared to pay for transmitting valves returned in good mechanical condition. In order to avoid damage in transit it is emphasised that care should be taken with the packing and the original packages should be used wherever possible.

Schedule of Prices: Type 802, 1/- each; 807, 1/-; 809, 1/-; 866, 1/-; 866A, 1/-; 804, 5/-; 805, 5/-; 810, 5/-; 211, 5/-; 813, 12/6 each; 833, £2; 833A, £2; 872, 2/6; 872A, 2/6.

Other Types Wanted

Any stocks of used transmitting valves outside those listed above may also be useful, no matter what make or type, and holders of such stocks are invited to send in lists on which a quotation may be given.

In all cases the prices paid on postage or carriage will be refunded by Amalgamated Wireless Valve Co. Pty. Ltd., if the amount is stated in the covering letter.

All correspondence should be addressed to the Sales Manager, Amalgamated Wireless Valve Co. Pty. Ltd., 47 York Street, Sydney, New South Wales, and the valves should be addressed to No. 4 Store, Valve Works, 552 Parramatta Road, Ashfield, endorsed "Used Valves" on the outside of the package.

RE-BUILDING RADIO BATTERIES

OWING to the scarcity of batteries we have had numerous appeals from our readers. Many feel that they should be able to do something to salvage the old batteries.

Inspection of a run-down "B" battery will show that there is still a lot of the zinc of the cells left intact, although this is destroyed by internal chemical action if the run-down battery is left standing for any great length of time. The carbon rods do not appear to deteriorate at all, so that it seems fairly logical to consider some scheme for replacing the chemicals in the cells to renew their life.

Practical experiments conducted by us recently seem to indicate that there is quite a sound proposition behind the thought, but some minor difficulties have yet to be overcome. Even the actual construction of new batteries would not be beyond the scope of the average handyman, if it were not for some obscure knacks of battery manufacture on which it is extremely difficult to obtain reliable information. The actual theory of the so-called "dry" battery is simple enough.

A photograph of a "B" battery, showing the internal construction.

The Primary Cell

The dry cell, which is the unit used in the manufacture of torch and radio batteries, is based fundamentally on the primary cell. A primary cell consists of two elements, one of copper and the other of zinc, both in a solution of dilute sulphuric acid, or other suitable electrolyte. This very elementary cell will give a small current at a pressure of a volt, but only for a short time, as it soon becomes "polarised." To understand polarisation we must consider the chemical action which goes on in the cell when the circuit is completed to draw current from it.. Bubbles of hydrogen are released at the zinc plate and travel through the electrolyte and attach themselves to the copper plate, which is the positive element. As soon as the bubbles completely isolate the copper from the electrolyte the cell cannot function.

The Leclanche Cell

To overcome the difficulty of polarisation the Leclanche cell was introduced, which provided a depolariser to deal with the troublesome hydrogen bubbles. The cell, as shown in our diagram, consists of two elements, this time zinc and carbon, with an electrolyte of sal ammoniac solution. However, the carbon element is surrounded by a mixture of crushed carbon and manganese dioxide. The manganese dioxide is rich in oxygen, which readily combines with the

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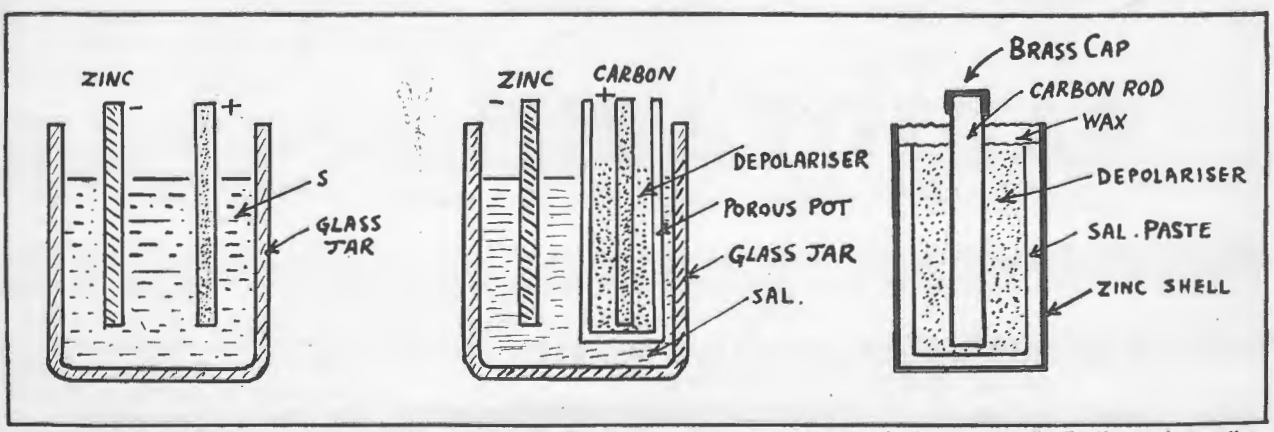


Diagrams to illustrate the evolution of the "dry" cell. First is the primary cell, then the Leclanche, and finally the modern cell.

BATTERIES (Continued)

hydrogen, thereby avoiding the polarising effect.

Leclanche cells are not so popular these days, but some years ago they were used quite extensively, especially for intermittent work, such as ringing bells. They have quite considerable recuperative properties, quickly running down when on load but regaining their characteristics if left standing for a short time. The main thing about the Leclanche cell which interests us is its fundamental theory, as the modern dry cell can be considered as nothing more or less than a convenient modification of the original Leclanche.

The Dry Cell

Looking at the third of our diagrams you will get an idea of the internal construction of a dry cell. The can is made of zinc and forms the negative element. The positive element is the carbon rod which runs down the middle of the cell. It is closely packed around by a depolariser compound of manganese dioxide, crushed carbon and other chemicals. The electrolyte consists of a sal ammoniac solution, but usually made up in the form of a paste or sticky jelly.

Although called "dry," the dry cell must remain moist inside, as otherwise the electrolyte will dry up and become useless. Which explains the presence of a seal of wax across the top of each cell.

The "B" Battery

Radio batteries are made up from a collection of cells, each cell having a normal potential of a volt and a half. If torch batteries were any easier to obtain than radio batteries, it would be a simple process to wire up ten torch batteries of the "1000" type and thereby make up a battery equivalent to the PR45 portable "B" battery.

The "1000" type torch battery consists of three cells of similar size to the thirty cells which are wired in series to make up the PR45. Similarly with other cells of heavier capacity it is possible to wire up thirty cells to give 45 volts of high tension.

Reviving Batteries

When batteries run down it is sometimes possible to revive them for a time by introducing sal ammoniac solution to replace the electrolyte which has dried up. This can be done by knocking holes in the zinc can of each cell and then standing the cell in a sal ammoniac solution for a while. However, to keep the cell in service again for any length of time it becomes desirable to re-seal the holes by filling them with sealing wax. Sal ammoniac is readily available at any chemist shop, but we have also seen it claimed that even salt water, made up from common salt, will revive a battery when injected in this way.

Our Experiments

Practical work in our laboratory was most interesting. First we took a rundown battery of the PR45 type and pulled it to pieces, washing out the zinc cans carefully and cleaning the carbon rods. Wax from the seals was put away carefully and used again for re-sealing.

Instructions

For instructions we followed an old English book on the subject of battery making at home. According to these instructions we made up two separate sal ammoniac solutions, one for use as the electrolyte, lining the zinc cans with three thicknesses of blotting paper and then soaking the paper with this No. 1 solution as we called it.

No. 2 solution was slightly different and was used to make a sticky paste out of the carbon and manganese dioxide depolariser.

Our results were fairly satisfactory, but not quite up to standard. As regards a test made with a commercial cell, we found that our initial voltage was only 1.4 volts per cell, as against 1.5. Furthermore, we found that the maximum capacity of our cells was about a hundred milliamps on partial short circuit, as against about 250 for the commercial job, tested under identical conditions.

Obtaining Chemicals

Apparently there is no difficulty about obtaining the required chemicals. We walked into a chemist's shop at Bondi Junction and found that all the materials were readily available from stock and at quite low prices. The powdered carbon, manganese dioxide and sal ammoniac are quite cheap, apparently about a penny an ounce or so. The chloride of zinc was a rather different story, costing 4/- for an ounce in a glass bottle with a

(Continued on page 29)

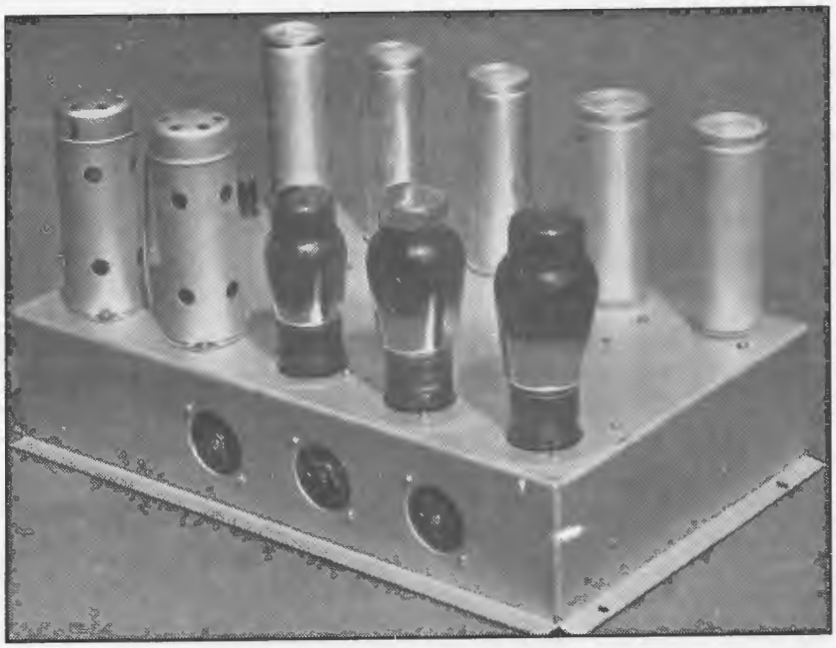
ALTERNATIVE BIAS FOR AMPLIFIER

AMPLIFIER enthusiasts are always interested in ways and means of getting greater power output and better tonal quality. It is therefore to be expected that most of them are deeply interested in the subject of fixed-bias for the output valves. The valve manufacturers data sheets indicate, for example, that the 2A3 type valves in push-pull will normally deliver about 77 watts of undistorted output, yet with fixed bias are rated as high as 15 watts.

The matter is a fertile one for arguments, however, for many an enthusiast has changed over his amplifier design to incorporate fixed bias and has then been forced to admit that he couldn't tell the difference.

To make doubly certain on the point and to prove once and for all the advantage of fixed bias, one of our readers, the same Albyn Hughes who contributed an article on amplifier experiments in our November issue, set to work and built an amplifier with a socket arrangement so that on plugging in a 45-volt "B" battery, the amplifier was immediately changed over from self-bias to fixed bias.

We show the circuit of the arrangement, which can be readily followed. On plugging in a four-pin plug with the "B" battery connected across the pins, the self-biassing resistor is shorted out, also portion of the resistance in the grid circuit, as this is desirable when fixed bias is used.



A general view of the amplifier.

In practice, Mr. Hughes reports that the results are vastly improved by the use of fixed bias and that the difference can be readily detected.

The arrangement is handy in practice, too. When the amplifier is used for the quality reproduction of records at home the battery is used, but when taken out for "dance band' work, the battery and plug are left at home. The amplifier is still capable of excellent results with the normal self-bias arrangement.

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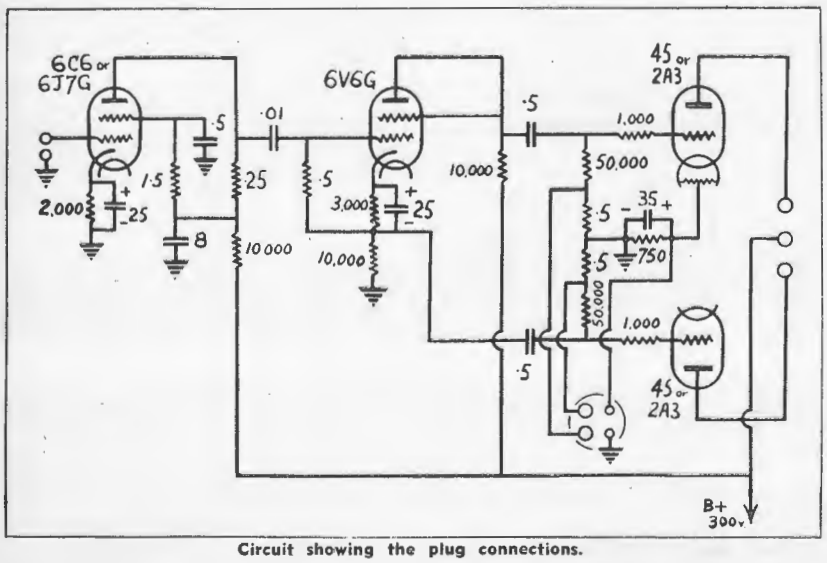
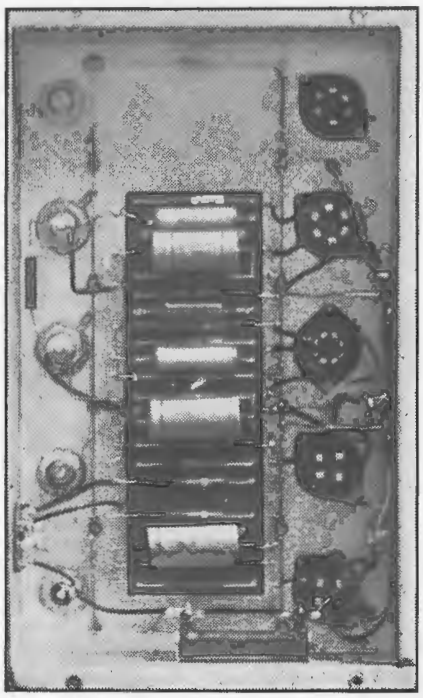


Circuit showing the plug connections.



A photo of the terminal strip and wiring.

REDUCTION OF HARMONIC DISTORTION

By —

JOHN W. STRAEDE

B.Sc., A.M.I.R.E.

7 Adeline Street, Preston, Victoria

WHAT is harmonic distortion? Any amplifier, R.F., I.F., or A.F., may distort the waveform of a signal applied to it. The amount of distortion usually increases with the amplitude of the signal and so this type of distortion is often termed "amplitude distortion." Mathematically, the distorted output signal is equivalent to an undistorted signal together with a number of small signals, each having a frequency an exact number of times the frequency of the applied signal. These new frequencies are termed "harmonics" and may be useful or otherwise (very high frequencies may be generated by the deliberate "distorting" of a lower frequency).

In audio-frequency amplifier design, distortion results in a more-or-less distasteful sound in the speaker. The amount of distortion that can be noticed or tolerated depends on the type of distortion (what multiple the harmonic produced is of the original signal), the frequency of the signal and the volume level.

The frequencies of very high notes have harmonics that are practically inaudible. Similarly, very low notes, themselves almost inaudible, may have harmonics that are not very noticeable.

Second harmonic and third harmonic distortion is not so distasteful as that due to higher harmonics. Triode enthusiasts (remembering that triode output valves have high second harmonic at full output?) claim that second harmonic distortion is not so distasteful as third harmonic (that produced by pentodes). The same people, however, find beam outputs distasteful (and beam tubes have more second than third harmonic!). It's a matter of taste, as the bird said to the farmer when it swallowed the worm.

Reduction of Harmonic Distortion

However, all harmonics added to the original signal are distasteful, so let's see how they can be reduced. There are three main ways:—

1. Push-pull operation.
2. Inverse (or negative) feedback.
3. A frequency characteristic dropping from low to high frequencies, so that harmonics are reproduced to an extent less than the original frequency.

Push-pull operation, applied usually to the output stage, because that is where most distortion is produced, produces a symmetrical distortion.

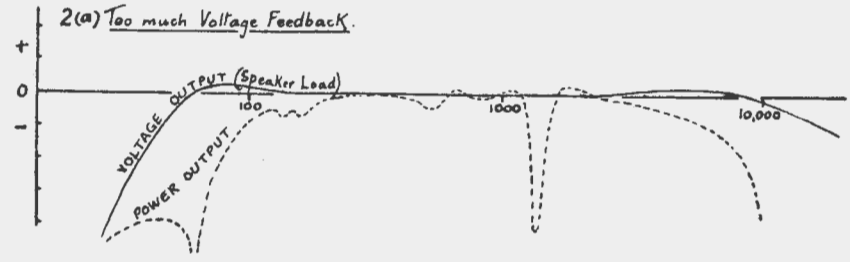
No even harmonics are produced if the operation is 100 per cent. push-pull. Push-pull also has the advantage of increased efficiency, but requires two output tubes (or a 2-in-1) and usually another extra tube, the phase inverter.

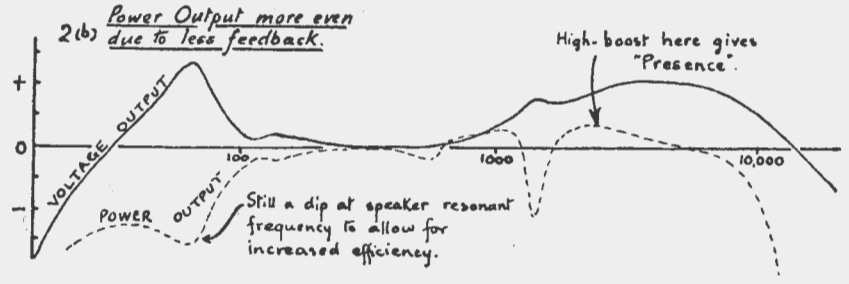
Inverse feedback reduces sensitivity and distortion in approximately the same ratio for small amounts. Large amounts of inverse feedback (over 30 per cent. in one stage) may result in a very distressing whiskery or rattling tone.

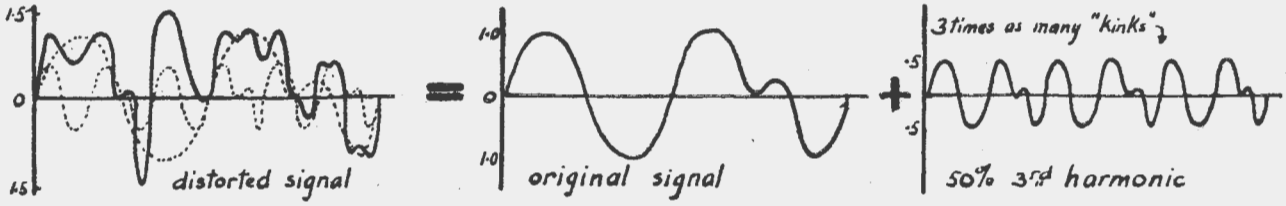
Unfortunately, the usual negative voltage feedback results in an output such that the voltage across the speaker is the same at all frequencies (for the same input). This is wrong. What should be aimed at is a constant power, for it is acoustic power that we hear.

The dropping frequency characteristic, although the least desirable method from a theoretical point of view, is by far the most popular and is used by many designers without their realising it. If the output of an amplifier or receiver contains a large percentage of harmonics, the tone is "improved" or made more tolerable, by using a different speaker or by shunting a condenser across the output.

A poorer speaker that reproduces none of the "very highs" may sound







better because the harmonics of the higher notes are cut off. The condenser has the same effect.

Bass Boost

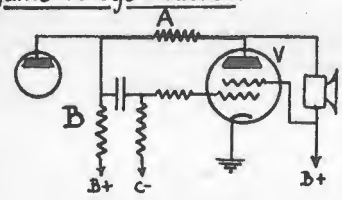
Increasing the output of the lower frequencies has the effect of decreasing their harmonic content.

This may be done in several ways:

(1) Condenser-resistor network.
(2) Removing negative feedback at low frequencies.
(c) Applying positive feedback at low frequencies.

Very often methods 2 and 3 result from the one circuit. Too much positive feedback at low frequencies will result in motorboating, excessive hum, and/or "hangovers" on loud or boomy notes.

3(a) Negative Voltage Feedback.

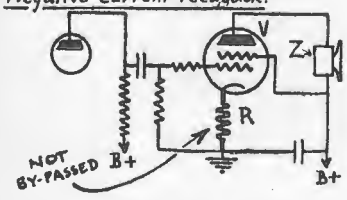


Amount of feedback depends mainly on ratio A/B and gain of V.

Detector Distortion

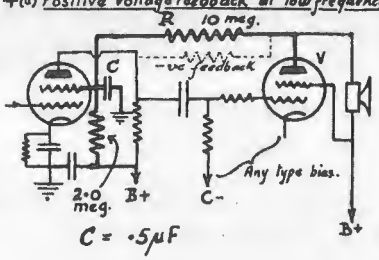
In a radio receiver, large percentages of distortion may occur in the detector stage. The diode detector is the most popular form nowadays, but in its usual form produces as much as perhaps 30 per cent. of distortion on a fully modulated signal. The amount of distortion produced at full modulation, and this is on the louder notes when the output stage is producing its greatest distortion, depends to a large extent on the ratio of A.C. to D.C. load on the diode rectifying circuit. If the diode load resistor is reduced to about .2 megohms, and the bypass condenser decreased to .0001 mF. (so that the A.C. resistance, or "reactance," is increased), then the detector distortion is lowered.

3(b) Negative Current Feedback.



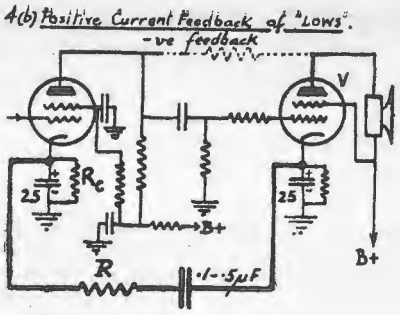
Amount of feedback depends mainly on ratio R/Z and gain of V.

4(a) Positive Voltage Feedback at low frequencies.



Decreasing R gives more bass boost. If R and/or C are too small, instability results.

4(b) Positive Current Feedback of "Lows".



Positive Current Feedback. Value of R is about 20 to 100 times Rc

For good results, a diode detector should be well loaded and should be followed only by a low-gain A.F. amplifier. Any set in which a diode detector feeds into a high-gain pentode and then a beam output without inverse feedback, is bound to have poor

(Continued on page 28)

Shortwave Review

CONDUCTED BY
L. J. KEAST

NOTES FROM MY DIARY

News First and Last

The war has, I think, speeded up listening to the short-waves and paradoxically slowed it up. I expect there are many like myself who are eager to find all the stations that are giving talks or news particularly when in English and find themselves halting at the first one and spending as many minutes as seconds previously with the constant hope that something will be heard a little ahead of the printed word.

Yes, I find myself sticking to known or newly-discovered sources of information rather than giving the customary nightly check up on all bands. This brings me to the thought that perhaps, as events have turned out, I may have launched my frequency check at an unpropitious moment. Several have written in expressing approval of the idea but I am afraid it may be pigeon-holed for a later date.

A.R.P.

After assisting in bagging 9 tons of sand at our flats — yes, I did my share of the actual shovelling—I took what I claim was a justifiable rest. And on that Sunday afternoon as I reclined in my den, I thought of the announcers who are heard no more.

Such names as Edward Startz, who spread happiness from **PCJ** for years. (This man, by the way, spoke seven languages). And Bob Whybrands, who was later heard from the same mike, came before my mind.

Then I thought of that delightful little lady, Zdenka Wallo, of the Czechoslovakian station, and Helena Stepanova-Krouska and Leslie Hill, also from **Prague.**

We just seemed to be getting acquainted with the Tirana announcer when Mussolini marches into Albania and **ZAA**, 7850kc, 38.2m, leaves the air. And there have been many others, but now it seems as though friends, so close, that only a few hours' air-travel separates us, are silent. We miss them off the air, but where are they? How are they? There's Johnny Wightman and Velma Wright, of **KZRM**, who for years have been part of our nightly fare. And does not it make your blood boil to hear **KZRH** still referred to as the "Voice of the Philippines" when the announcer is without doubt a disciple of Shinto?

Then one wanders to Shanghai. What has happened to Carol Olcott, of **XMHA**? Olcott because of his outspokenness often had his very life threatened. And do you remember Don Bell, of **KZIB**, and later with **KZRH**?

But when you fail to hear our old reliable, **ZBW-3**, Hong Kong, one almost thinks the oscillator valve has refused to function on that particular frequency.

And where did we go for a little diversion particularly of a Sunday evening? Why, to the American amateurs, of course. But with one swoop the big switch has been pulled for them. But that never-ending desire to improve their transmissions, their faith that a little alteration here, an adjustment there would enable them to reach a little farther or be received in previous dead areas will, I am sure, hold them in good stead and I would be surprised if their help is not sort by the U.S.A. authorities in the war, as they have shown in calamities, such as earthquakes, floods, bushfires and the like, that they can be of inestimable help when their country is threatened.

"News From Home"

Was delighted on Jan. 10 to hear Howard Marshall again. It transpires he has been away from the studio for six weeks, having visited America and Canada, and had his Christmas dinner, the first away from England, in Montreal. Despite a winter cold he was in fine fettle and, as usual, gave one of those delightful talks that only Howard Marshall can give.

Pip-Pip, O.K.

I was immensely relieved to learn my old friend, Herbert Hodge, the philosophical taxi-driver, was alive and well, looking after a transport section for the authorities in England. I think it is because I seem to have been present at so many final curtains I was fearful something may have happened to this splendid fellow, who alternated with Howard Marshall early last year in "London Log." While dismissing chronological order, some of the last talks I have heard over the air include Sir Hugh Walpole, A. G. MacDonnel, the Athen's announcer, to mention a few. One of the saddest was someone from the High Commissioner's office in Manila, giving an excellent talk on courage, and beseeching the residents of Manila to face the events with calm. Next night no Manila station was audible.

Two Men in a Boat

I have often been amused at the various names given to well-known

Australian towns by A.B.C. announcers, but to hear an ordinary word pronounced differently by the B.B.C. within a few hours is news. Robert Harris was reading the news in the afternoon and referred to some sailors escaping in a dinghy. He said "ding-e." A few hours later in reading the same item, Norman Claridge gave it as "ding-ge." I claim no knowledge of nauticalities, but I figure the latter is more generally used on "our 'arbour."

Some Day Waiting May End

I do not remember how many reports, and well-prepared, I thought, I have sent to Radio Noumea, but I just cannot get a verification. As several members have quite recently received replies, I am not giving up hope, and trust I, like them, will receive a photo of the studio with Mademoiselle Mona Rolly at the mike.

Patience Rewarded

The last American mail brought me a card of which I am mighty proud. It says: "This is to certify that L. J. Keast, with outstanding DX reports and co-operation has proved his qualifications and is hereby appointed Official Universal Radio DX Club Listening Post Observer.—(Signed) CHARLES C. NORTON, President URDXC."

I am grateful to Mr. Norton, and I want to say here that it is the splendid co-operation of the members of our AWDXAW Club and the readers of these pages by their helpful notes that I have been able to send reliable information to the States and earn for "The Australasian Radio World" a reputation that brands it as an authoritative journal.

Pomp and Circumstance

JZJ precede the news at 11 p.m. with a flourish of bugles and, while acknowledging the excellence of their signal, I must say tuning to Tokyo is not a good night-cap.

TOKIO'S BROADCAST PROPAGANDA

Since Japan's entry into the war, Axis propaganda as it affects Australia has changed radically. Japanese propagandists are devoting much attention to Australian activities. In this branch of Axis endeavour Australians are in a very good position to judge the value and truth of Axis statements.

Lies on Short-waves

When our enemies broadcast fantastic falsehoods about Australia they are telling us things about which we have direct knowledge. Australians have been both interested and amused by two remarkable assertions repeated by Axis radio stations. Both Tokyo and Berlin have repeatedly informed the world that forces of Australian troops had been completely routed and destroyed on January 10 and 11. Of course Australian Imperial Forces did not go into action until January 14 and they have since then been notably successful. The second claim advanced by Tokyo and Berlin was that Major-General Gordon Bennett, General Officer Commanding the Australian troops in Malaya, had been captured and/or killed. The world now knows that he is very much alive.

Beware False Conclusions

Both these claims were really naive attempts to extract military information of great value to the Japanese High Command, which was obviously anxious to know the whereabouts of Major-General Bennett and the dispositions of the Australian troops.

Axis propaganda often seeks to achieve success by building up a series of assertions and false conclusions, based on a small element of fact. Even this saving element is completely lacking in another recent Tokyo statement that certain Labour leaders desired to make a compromise between Australia and Japan, presumably as a preliminary to Australia withdrawing from the war.

Another Tokyo claim is that Australia on the one hand refused to send reinforcements requested by the N.E.I. and on the other hand that Australia is unable to get help from the United States because sea communication between America and Australia has been severed. No doubt in making these assertions Tokyo was seeking some definite information on the very active co-operation which exists among the Allies in the Pacific. The information Tokyo desired was not forthcoming.

U.S. Co-operation

Australian leaders, the Prime Minister (Mr. Curtin) in particular, have in recent weeks emphasised the importance of military co-operation between Australia and the United States. Axis propagandists, noting this emphasis, are now warning us of the "terrible danger" that Australia may become subservient to the United States. It is merely a repetition of a line they took two years ago when, in their efforts to divide democratic sentiment, they urged Australians not to be subservient to Britain.

Australians will remain completely unmoved by this spurious Axis solicitude. The more closely that Australia can work with Britain and America, the better Australians will be pleased, since Britain and America are both in this struggle for the preservation of liberty in countries beyond Axis control and the restoration of freedom to those countries which have fallen unhappy victims to Axis wiles and ruthless force. Australians know that the things which have gone to the making of this nation can be preserved by active and trustful co-operation with other English-speaking peoples as well as with our Allies throughout the world.

HELP WANTED

During the morning Dr. Gaden is hearing almost on top of **ZRH**, Johannesburg, 6007kc, 49.95m, what he takes to be an Egyptian station.

(This is in Cairo and on 6010kc, 49.92m. Gives News in English at 7 a.m.—Ed.)

Verifications Received

Mr. Hugh Perkins advises he has received a verification of his report to **VPD-2**, Suva, when they were operating on 19.79m. I have also received an acknowledgment of my report for both 19.79 and 25.22m. The cards are identical except for mention of frequencies. In a letter that accompanied the cars the Fiji Radio Service state that their 15,160kc transmission was purely for test purposes and that should it be put into regular service in the future they would advise me.

Coming Events

Readers are reminded that London, under the heading "London Calling," at 8 p.m., gives particulars of programmes in the Pacific and Eastern services for the following week. At 12.30 a.m. on Wednesdays full wavelengths and frequencies are announced.

And here are a few regular sessions that I find particularly interesting:—Mondays, at 10.30 p.m., "Shipmates Ashore"; Tuesdays, 11 p.m., "Changing Britain"; 11.15 p.m., "Hi Gang"; Saturdays, at 11 p.m., "News from Home" (Howard Marshall); Sundays, 10.30 p.m. "In Town Tonight." 19.82 metres gives a splendid signal.

For and Fro'

Japan on 31.35 metres the other night at 11.30 p.m. announced, "Japan will make the world safe from Democracy. Now will you please stand by and we will present the news in Spanish."

Java now gives news in English at 1.30 p.m. and 8.15 p.m. through YDC.

The MONTH'S LOGGINGS

ALL TIMES ARE AUSTRALIAN EASTERN DAYLIGHT SAVING TIME

OCEANIA

Fiji:

VPD-2, Suva 15,160kc, 19.79m
Schedule: 4 p.m. to 4.30 p.m.
French session. Excellent strength (Cushen). The 25 and 31 bonds ore not used at present. (Verification received for report on tests when using 15,160kc and 11,895 kc.—Ed.)

AFRICA

Algeria:

TPZ, Algiers 12,120kc, 24.76m
On favourable nights is now heard from 6.30 to 7 p.m. Still heard of a morning, around 7 a.m. From 8 a.m. tune to 33.48m.

Belgian Congo:

OPM, Leopoldville 10,140kc, 29.59m
Being heard weakly. Asking for reports (Cushen).

Egypt:

——, Cairo 6010kc, 49.92m
Call-sign and exact schedules unknown, but News heard at 7 a.m. See "New Stations."

Ethiopia:

——, Addis Ababa 9625kc, 36.16m
From just after 1 a.m. till 2.30 a.m. (Gaden). See "New Stations."

Portuguese East Africa:

Mozambique:

CR7BE, Lourenco Marques .. . 9840kc, 30.48m
Still one of the loudest morning stations. Good till 8 o'clock.

Senegal:

FGR, Dakar 9400kc, 31.90m
Heard around 8 a.m.

AMERICA

Central:

Costa Rica:

TIEMC, San Jose 11,900kc, 25.21m
Heard at midnight (Hallett). See "New Stations."

El Salvador:

YSR, San Salvador 6270kc, 47.85m
(Note change in frequency.—Ed.) "La Voz de El Salvador" is being heard with a very good signal from 11 a.m. to 3 p.m. (Dissinger, U.S.A.).

Guatemala:

TGQA, Quezaltenango 6405kc. 46.88m
"Lo Voz del Quezaltenango" heard in parellel with **TGQ,** long wave, from noon to 2.30 p.m. and on Sunday to 4 p.m. (Dissinger, U.S.A.).

TGWB, Guatemala 6470kc, 46.37m
"La Voz de Guatemala" heard in parallel with **TGWA, TGWG** and **TGW.** 11.30 a.m. to 5 p.m.; 4.45 a.m. to 7.45 a.m.; midnight to 1 a.m. (Dissinger, U.S.A.).

TG2, Guatemala 6195kc, 48.50m
"Radio Morse," pronounced in Spanish 'Radio Morsey." 11.30 p.m. to 2 a.m., 10 a.m. to 3 p.m., and Sunday to 7 p.m. (Dissinger, U.S.A.).

Panama:

HP5A, Panama City 11,700kc, 25.64m
Has improved lately at 4 p.m. and seems clear of interference.

North:

WRCA, New York 17,780kc, 16.87m
Quite good with News at 1 a.m. (Cushen).

WRUL, Boston 17,750kc, 16.90m
Has not been heard here yet (Cushen). (Opens at 2.30 a.m., I think.—Ed.)

KKQ, Bolinas 11,950kc, 25.11m
(Heard at various times during the evening when News from Fairmount Hotel is given. See special article.—Ed.)

WNBI, Boundbrook 15,145kc, 19.81m
Fair at 1 a.m. (Cushen).

WCAB, Philadelphio 6060kc, 49.5m
Not much good now. Plenty of interference (Cushen).

WRUS, Boston 6040kc, 49.66m
This is the new call-sign for the old **WRUL** frequency. (See "New Stations.") Used with **WRUL,** 11,790kc, and **WRUW,** 9700kc.

WRUL, Boston 11,790kc, 25.45m

WRUW, Boston 9700kc, 30.93m
Closes at 9.45 a.m. and announces "We will re-open in fifteen minutes on 25 and 31 metre bands." 25, O.K.; 30.93, very poor. At 10 a.m. on 25.58 not too good, and not to be heard on 30.93 (Gaden, Hallett).

WCRC, New York 6170kc, 48.62m
Excellent at 6 p.m. (Cushen).

WGEA, Schenectady 6190kc, 48.47m
Now being used instead of 9550kc from 4.15 p.m.

WRCA, New York 9670kc, 31.02m
Now continues after 4 p.m., giving News at 5 p.m. and 7.45 p.m.
"This is the United States of America broadcasting from the Fairmount Hotel in a round-the-world service." Transmitting in the 6, 7, 9, 10 and 11 m.c. bands.

I have endeavoured to chase the various transmitters, and figure several of the Bolinas stations are being used. Here is my list, but there does not seem to be any regularity re stations or schedules. Those in bold letters ore most frequently heard:

KEL, Bolinas 6860kc, 43.73m
KEE, Bolinas 7715kc, 38.89m
KEJ, Bolinas 9010kc, 33.29m
KER, Bolinas 10,390kc, 29.87m
KEZ, Bolinas 10,400kc, 28.84m
KES, Bolinas 10,410kc, 28,81m
KKQ, Bolinos 11,950kc, 25.11m
and
KGEI, San Francisco 9670kc, 31.02m
KGEI, San Francisco 7000kc, 42.85m
KGEI, San Francisco 6980kc, 42.48m
At 11.30 p.m. I find the signal on 43.73 as a rule very good — and I am inclined to thing 'Frisco has forsaken 31.02.—Ed.
From 11 to 11.30 p.m. **KGEI,** on 43.73m, give the world's news in the Japanese language. At 11.30 latest News in English is given on 6, 7 and 10 metre bands.

Mexico:

XEQQ, Mexico City 9680kc, 30.99m
Has been heard signing at 5 p.m. (Cushen).

XEWW, Mexico City 9503kc, 31.57m
The best at 4 p.m., also heard at midnight (Cushen).

XEBT, Mexico City 6005kc, 49.96m
The best of the 49m. Mexicans (Cushen).

South:

Bolivia:

CP-5, La Paz 6200kc, 48.39m
"Radio Illimani," Government station, Ingavi 321. Heard very well from 10.15 p.m. to midnight and from 10.30 a.m. to 3 p.m. (Dissinger, U.S.A.).

CP-38, La Paz 9480kc, 31.63m
"Radio Nacional de Bolivia." 9.30 a.m. to 1.30 p.m. Station in parallel is **CP-3** and not **CP-2** (Dissinger, U.S.A.).

Chile:

CB-1180, Santiago 11,975kc, 25.05m
Still heard at good strength at 3 p.m. and around 11 p.m. (Cushen).

NEW STATIONS

WRUS, Boston, 6040kc, 49.67m: This is a new call-sign, U.S. for United States of the World Radio University. Actually they are using an old assigned frequency of **WRUL.** Open at 8 a.m. in chain with **WRUL,** 11,790kc, and **WRUW,** 9700kc. Quite a good signal, but **WRUL,** 25.45m, is the daddy of the lot.

HVJ, Vatican City, 6005kc, 49.96m: This is a new frequency for the Vatican station, and is being heard around 6.15 a.m.

A South African "secret" station is reported as being heard in South African at 3.45 a.m., on 6.00mc, 50.00m. (Globe Circler). Awkward hour for me. Will someone else oblige?—Ed.

GRE, London 15,750kc, 19.05m
This is the station deferred to in January issue as heard by Mr. Hugh Perkins. Sergt. Clack supplied the frequency and says he hears them on a Tuesday night from 9.30 to 9.45 in a session for Malaya. At 9.25 p.m. on Friday, January 30, I heard a very strong whistle. At 9.30 a female announcer said, "This is London calling China, Hongkong and Malaya. You will hear the News in ——. I think she may have said "Urdu," which, I understand, is the principle dialect in Malaya.

VUY-2, Dacca, 6072kc, 49.41m: This is a new Indian and from a new destination. Is being heard from midnight till 2.15, when an English announcement is made.

Secret Philippine Station, ——, Manila(?), 9643kc, 31.11m: Mr. Alan Beattie, of New Lambton, reports, "The Freedam Station operating from somewhere in the Philippines." A good signal at night, spoilt by **KZRH.** (There has been a German Freedam sender here for a good while.—Ed.)

Malaya:

——, Singapare: On approximately 16m I heard a new Singapore station giving News, followed by N.B.C. Strength excellent at 11 a.m. (Beattie).

WCRC, New York, 6170kc, 48.6m: This was mentioned in Stop Press in January issue. Still being heard from 6 to 9.15 p.m.

XGAP, Peking, 6100kc, 49.18m: Also mentioned in January issue. Further advice from Mr. Hallett is that English is given from midnight to 1 a.m. At 1 a.m. they relay **XGAP,** 640kc.

DWX, Berlin, 6130kc, 48.95m: This is a new German transmitter. Heard in mornings with News in English at 5.30 a.m.

DHE4C, Berlin, 11,880kc, 25.25m: Tronsmits irregularly to North America from 8.15 a.m. to 3 p.m.

——, Addis Ababa, 9625kc, 31.16m: While we have often heard **12AA,** Addis Ababa, while under Italian control, on 9650kc, 31.09m, the station under review must be classed as new. I am sure all will welcome this outlet of Emperor Haile Selassie. Best heard about 2 a.m., when apparently News in Italian is given, followed at 2.12 by a record. Precisely at 2.15 a gong is struck, then a female says in French, "Ici Radio Addis Ababa"— gong —News in French till 2.22, then "Marseillaise." At 2.25 a man announces in French, "Hullo, Ici Radio Addis Ababa," followed by talk. At 2.29½ —"This is Radio Addis Ababa. We are now closing down." This announcement is in English. Maybe there is an English session, but, if so, I have missed it.

TIEMC, San Jose, 11,900kc, 25.2m: Here is the call-sign of the new Costa Rican mentioned in January "Stop Press" and heard by Roy Hallett and Dr. Gaden.

VLG-7, Melbourne, 15,160kc, 19.79m: Has been heard in tests to North America at 9.45 a.m. This was reported by Mr. Hugh Perkins and mentioned in January issue.

VLQ-10, Sydney, 9590kc, 31.28m: Also reported heard in tests.

ZHN-9, Singapore, 7200kc, 41.67m: This is a new outlet for Malaya and is heard nightly.

Colombia:
HJCF, Bogota .... 6235kc, 48.08m "La Voz de Bogota." Heard on this new frequency 11 a.m. to 3 p.m. (Dissinger, U.S.A.).
HJCD, Bogota .... 6160kc, 48.70m "Nuevo Granada." Heard with powerful signal from 2 to 3 a.m. and 8 a.m. to 3.30 p.m. (Dissinger, U.S.A.).
HJDE, Medellin .... 6145kc, 48.76m "La Voz de Antioquia." Most powerful Colombian station. Heard from 1.30 a.m. to 2 p.m.
Brazil:
PRA-8, Pernambuco .... 6010kc, 49.92m Quite O.K. at 6.30 a.m. (Gaden).
Uruguay:
CXA-6, Montevideo .... 9600kc, 31.19m Erroneously shown in January issue as **CXA-8.**

THE EAST

Burma:
XYZ, Rangoon .... 6007kc, 49.94m Very good and interesting (Cushen).
China:
XGRS, Shanghai .... 11,700kc, 25.64m This is where I heard them when making these notes. A few evenings previously they were using 11,641kc, 25.77m, and are reported to have also spent a night or two earlier on 11,895kc, 25.22m.—Ed.
XLMA, —— ——kc, ——m Dr. Gaden says he has moved a trifle and at 10.30 p.m. is found on approx. 32.00m.
Dutch East Indies:
PMA, Bandoeng .... 19,380kc, 15.48m News is now given at 11.45 p.m. Signal is generally good, but indications are that this is not a good frequency for us at this hour. Try **YDC** for News at 8.15 p.m.
YDC, Bandoeng .... 15,150kc, 19.81m Now more or less a continuous service, as also **PLP,** 27.27m; **PLS,** 28.94m, and **YDB,** 31.41m. Now gives News at 1.30 p.m. and 8.15 p.m. This seems like an answer to my prayer.

French Indo-China:
Radio Saigon, Saigon .... 11,780kc, 25.47m Quite a lot of Japanese talks are sent over this station and can often be heard on the old Formosa station on 9695kc, 30.94m.
India:
VUD-3, Delhi .... 15,290kc, 19.62m Have heard ot 10.30 p.m. (Gaden).
VUY-2, Dacca .... 6072kc, 49.41m This is a new Indian, reported being heard from midnight to 2.15 a.m.

Japan:
Formosa:
JIE-2, Taiwan .... 9695kc, 30.94m English at 10.30 p.m. (Gaden). Often heard in parallel with Saigon.—Ed.
JZJ, Tokyo .... 11,800kc, 25.42m Heartbreaking at 8 and 11 p.m., but a wonderful signal.
XGAP, Peking .... 6100kc, 49.18m Still giving English between midnight and 1 a.m. (Hallett).
Malaya:
ZHN-3, Singapore .... 11,950kc, 25.10m Heard with relay for A.B.C. at 10.30 p.m. (Cushen). News at 10.45 a.m. Note slight change in frequency.—Ed.
ZHN-9, Singapore .... 7200kc, 41.67m Heard nightly on this new frequency.

Philippines:
KZRC, Cebu .... 6100kc, 49.18m The only Philippine station left. Relays News from **KGEI** at 10.30 p.m. (Cushen, Gaden).
KZRH, 31.12m, and **KZRM,** 31.35m. Being used by Japanese announcers.—Ed.
Great Britain:
GRE, London .... 15,750kc, 19.05m Opens nightly at 9.30 with female announcer. See "New Stations."

EUROPE

Germany:
DWX, Berlin .... 6130kc, 48.95m This new German gives English News at 5.30 a.m. (Cushen). See "New Stations."
DHE4C, Berlin .... 11,880kc, 25.25m Transmits irregularly to North America,

LOGGINGS (Continued)

8.50 a.m. to 3 p.m. (Globe Circler).

Vatican City:

HVJ .... 6005kc, 49.96m Heard at 6.15 a.m. (Cushen, Gaden). This is a new frequency for **HVJ**.—Ed.

Russia:

Transmission from either Moscow or Kuibyshev. Still difficult to give any reliable schedules, but the following can be tried:

LATER NOTES RE 'FRISCO BROADCASTS

KGEI have definitely left 31.02m, and here is the schedule of News as I find it:
6 p.m.: 7250kc, 41.38m:Talk on Japan.
7 p.m.: 7250kc, 41.38m: News.
8 p.m.: 7250kc, 41.38m: News.
9 p.m.: 7250kc, 41.38m: News.
10.30 p.m.: 7250kc, 41.38m: News.
10.30 p.m.: 6860kc, 43.73m:News.
11 p.m.: 7250kc, 41.38m: Dutch and French.
1 a.m.: 7250kc, 41.38m: Chinese.

One of the best sessions and heard well is the 8 p.m. Following the News an excellent commentary is given by William Winter.

Occasionally 'Frisco broadcasts can be heard on 10,410kc, 28.81m, but signal at 10.30 p.m. is poor. However, 41.38m from 6 p.m. is splendid, and some great programmes are heard.

—— .... 15,230kc, 19.69m Heard from 10 a.m. till about 11.50 a.m. News at 10.10 a.m.

——, Sverdlovsk .... 12,060kc, 24.88m English from 7 p.m.

Switzerland:

HER-3, Schwarzenburg .... 6165kc, 48.66m Still heard of a morning with a musical programme, but no English. Only chance of hearing English from Switzerland is on Saturdays and Tuesdays from 12.45 a.m. through **HBH,** Geneva, 18,480kc, 16.23m., or **HBJ,** 14,535kc, 20.65m, at 4.45 p.m. on the first Sunday of the month.

LATEST LOGGINGS

Australia:

VLG-7, Melbourne .... 15,160kc, 19.79m Used in special session for North America from 3.25 a.m. to 3.55 a.m.

VLQ-10, Sydney .... 9590kc, 31.28m This is another that may be brought into use very shortly.

VLG, Melbourne .... 9580kc, 31.32m For British Isles. 5.55 to 6.20 p.m.

AFRICA

Morocco:

CNR, Rabat .... 8035kc, 37.34m 5 a.m. to 11 a.m. Best at 6.30. See "New Stations."

Egypt:

Radio Cairo, Cairo .... 5980kc, 50.17m Reported heard in music till 7 a.m. News in English till 7.15 a.m., when same News is given in French. Closes at 7.30 a.m.

——, Cairo .... 9690kc, 30.96m Heard this station at 1.30 a.m. one morning (Gaden).

SOUTH AMERICA

Peru:

OAX4J, Lima .... 9340kc, 32.12m Have just received most attractive QSL card (Perkins).

NORTH AMERICA

KKQ, Bolinas .... 11,950kc, 25.11m Has now replaced **KEE,** 38.89m (Perkins).

WGEA, Schenectady .... 6190kc, 48.47m News at 9 p.m. being heard quite well, except for static, which is usual at this hour.

WLWO, Cincinnati .... 15,250kc, 19.67m At 5 p.m. relays News from **WRCA,** 31.02m (Hallett).

THE EAST

China:

XGOY, Chungking .... 11,900kc, 25.21m As was to be expected, News times have been increased. News is now heard at 7.30, 8.30, 9.15 and 10.30 p.m.

XGOY, Chungking .... 5950kc, 50.42m News at 11.30 p.m. Good signal also at 7.10 a.m. News in Chinese at 7.15 a.m.

XGOX, Chungking .... 15,190kc, 19.75m Special session for U.S.A. from 11 a.m. to 1 p.m. with News at mid-day. Reception only just fair here. Probably O.K. in Queensland.

XGOI, Chungking .... 9660kc, 31.06m Heard at 11.5 p.m. on February 6, playing "Doo Dah, Do Dah Day," followed by gongs at 11.10, with announcement, "This is **XGOI,** The Voice of China. The time is now 10.10, and here is the first edition of the News." News read in English, station onnouncement, then "With a Banjo on My Knee."

Portuguese China:

CR8AA, Macao .... 6074kc, 49.39m Very loud signal at 11.35 p.m., when apparently a Chinese band was playing, News in foreign language followed.

French Indo-China:

Radio Saigon .... 10,240kc, 29.29m Appears to have replaced the old 25.47m transmitter. Excellent strength. News at 9.15 p.m. and 10.30 p.m.

India:

VUD-4, Delhi .... 11,830kc, 25.36m Heard them announce at 11.10 p.m. on February 2, "A special daily programme for Singapore will be broadcast from tomorrow morning at 23.30 G.M.T. or 74 Singapore time (9.30 **a.m.** Sydney). Wavelengths: 25.36, 31.3 and 41.15m."

Malaya:

ZHN-3, Singapore .... 11,935kc, 25.13m Relays B.B.C. News at 10 p.m., followed by local commentary, then children's session. Cannot hear ZHP-1, 9700kc, 30.92m, any more. At 10.30, "Hullo, A.B.C.! Hullo, A.B.C.! Here is our observer, Henry Stokes, calling from Singapore." Headquarters communiques are given. At 10.34 Henry Stokes said "Good-night." Transmission wos excellent. After about five minutes of music, Dutch announcement is heard as to frequency, etc., and more music follows.

Dutch East Indies:

—— .... 15,230kc, 19.70m Heard on Sunday, February 8, at 11.40 a.m. in same religious service at **YDC,** 15,150kc, 19.80m. At 9.45 p.m. on same date received ring from Roy Hallett that he had heard them in News session at 8.15 p.m.—Ed.

GREAT BRITAIN

GRN, London .... 6194kc, 48.43m Excellent signal at 7.15 a.m.

GRE, London .... 15,750kc, 19.05m As far as I can find out, this station is only used on Tuesdays and Fridays from 9.30 p.m. to 9.45 p.m. and at 12.30 a.m. on Wednedays and Saturdays.

EUROPE

Fronce:

Radio Vichy, Vichy .... 9520kc, 31.51m Heard with good signal at 6 p.m. (Hallett).

MISCELLANEOUS

Canada:

CBFY, Montreal .... 11,705kc, 25.63m Was heard at good strength with News at 1 a.m. recently (Cushen). Very "sotto voce" at Randwick in late evening.—Ed.

CFRX, Toronto .... 6070kc, 49.42m Opens around 10.30 p.m.

CNR, Rabat, 8035kc, 37.34m: This station, new to us, is, according to American magazines, operating from 5 a.m. to 11 a.m. daily. Best time here is around 6.30.

——, Cairo, 6010kc, 49.92m: Heard News at 7 a.m. Signal good but lot of noise on top. This may have been only a test, as a Cairo station is also reported as being heard on 50.17m and 30.96m.

——, Cairo, 9690kc, 30.96m.: A new one reported by Dr. Gaden as heard at 1.30 a.m. Announced as Egyptian Broadcasting Co.

Radio Cairo, Cairo, 5980kc, 50.17m: This is another outlet of the Egyptian Broadcasting Co. and is heard at 7.30 a.m. Doubtless one of the two 49-metre outlets will be depended upon.

VLG-7, Lyndhurst, 15,160kc, 19.79m: Now heard from 3.25 a.m. to 3.55 a.m.

AMPLIFIER (Continued)

One point of great importance, however, is the matter of the battery polarity. The utmost care must be exercised to make quite certain that the battery is connected in the correct way so as to give the grids of the output valves their proper negative bias. To connect the battery incorrectly and apply a positive voltage to the grids and then switch on the full high tenison would be almost certain to ruin the output valves within a minute or two.

Not quite so drastic, but important to remember, is not to insert the plug unless the battery is connected. Insertion of the plug will short out the self-bias. Needless to mention, we hope, the valves must not be operated without bias at all.

The Circuit

Mr. Hughes reports most favourably on the use of the 6V6G as a phase-changer valve, preferring this valve to the 6J7G often specified for this type of work.

BAFFLES (Continued)

sions of a slightly different enclosure are given for several different sizes of speakers:

	A	B	C	Volume
8"	9⅞	16	22⅛	3495
10"	10⅞	19¾	26¼	5640
12"	11⅜	22	28⅞	7230
15"	12⅜	23¾	31⅞	9370
18"	14⅛	26½	34¾	13020

The linear dimensions are inside measurements, in inches, and the volumes are in cubic inches. The diameter of the speaker mounting hole is not given, since it depends upon the speaker to be used. The vent (or port) area likewise depends upon the particular speaker involved and can be easily calculated by the formula $A = 3.14 \times S (R + r)$, where A is the area in square inches, S is the slant height as shown in Fig. 4, and R and r are one half the diameter of the mouth of the cone and of the voice coil, respectively. Shape of the vent is unimportant — either round or rectangular being equally good.

BATTERIES (Continued)

ground stopper. However, a little goes a long way and, as might be expected, the cost of the chemicals is as nothing compared to the cost of a set of "B" batteries, if available at all.

The Formulae

For the electrolyte solution with which we soaked the blotting paper we mixed up 8 ounces of boiled water, 2 ounces of sal ammoniac, and an ounce of glycerine and half an ounce of chloride of zinc.

For the solution to mix up the depolariser paste we made another solution of 4 ounces of boiled water, half an ounce of sal ammoniac, an ounce of glycerine and half an ounce of chloride of zinc. This solution was used to dampen down a mixture of about four parts of powdered carbon and one part of manganese dioxide (by measure, not weight) until it made up a paste of similar consistency to the paste taken from the rundown battery.

A Messy Job

Taken all round, the job of making or re-making batteries is inclined to be a messy one and we strongly advise the use of overalls rather than the Sunday suit. Care is also required to clean up afterwards as the electrolyte is slightly corrosive. If you use your best screwdriver for stirring and mixing you may find later that it becomes badly pitted and corroded. Otherwise, however, the chemicals seem to be harmless enough, although we will not accept any responsibility for cases where the glycerine mixture becomes nitroglycerine by mistake!

Who Knows?

The reason why our home-made batteries do not have quite the same efficiency as the commercial batteries is hard to explain. Unfortunately, there is little data available, and people with an inner knowledge of the game seem to be sadly lacking. A thorough search has been made of all literature available, and also quite a deal of actual experimenting, but there still seems to be something lacking somewhere. We wonder if any of our readers have been more successful with home-made batteries?

SPEEDY QUERY SERVICE

Conducted under the personal supervision of A. G. HULL

A.H. (Thirroul) has just built a "1933 Standard" and is troubled with distortion at low volume. He also mentions a white glow at the base of one of the 58 type valves.

A.—Incorrect alignment of the intermediates is a frequent cause of distortion at low volume with a set of this type. It was quite a good scheme to replace the diode load resistor with a potentiometer of half a megohm, running the grid to the rotor. This gives you an auxiliary volume control which can be adjusted to have the detector running with the most efficient loading, and fixing up every trace of the distortion you mention. With regard to the white glow, however, we are at a loss to offer an explanation of this. Since it occurs with two different valves it does not seem to be due to the valve itself, but rather to thd socket.

P.S. (Ayr) wants further details of the 100-watt amplifier mentioned recently in these columns.

A.—Sorry, but no further details came to hand. The output valves used were really of transmitting type and, as such, are not to be bought and sold in the ordinary way of business.

CRYSTALS (Continued)

quency. This was regarded at the time as extraordinarily good practice.

A number of Australian broadcasting stations were allotted new wavelengths in 1935, and seventeen were fitted with crystal control by A.W.A. in time to comply, as from August 31, 1935, with new requirements of the Commonwealth Government that a station may not vary from its allotted frequency by more than 50 cycles.

The cutting and grindng of crystals from the crude quartz is a delicate business. The axes of each native crystal are first determined by means of a precision optical instrument, and the crystal is then cut relative to these axes with an accuracy of 20 minutes (one-third of a degree) of arc. The actual cutting is done by revolving disc of mild steel, phosphor bronze or copper. This "saw" can be loaded with diamond dust or fed with carborundum powder mixed with water, glycerine or oil.

Number of "blanks" are made by grinding the crystals on a mild steel disc, which also is feed with carborundum powder. The blanks are made about one-ten thousandth of an inch thicker than required. They are finished by hand with fine emery powder on a glass lap to within a few hundred thousandths of an inch of the dimensions stated by the designer. At this stage they are turned over to the finishing section and final adjustments to within one-hundred-thousandth are made by hand lapping with repeated measurements to test the frequency and temperature co-efficient. Great care must be exercised as the slightest amount of over-grinding means that the crystal is useless for the particular frequency aimed at. It might be useful for a higher frequency, but must be completely re-finished all over again.

A recent A.W.A. development is the production of crystals much less susceptible to variations of temperature. This feature is combined with the use of sealed holders, which, by preventing the influence of atmospheric humidity, raises the efficiency of the crystal control still further.

Amalgamated Wireless recently sent a consignment of crystals to the great Marconi company in England and was informed that they were at least equal, if not superior, to the best manufactured in Great Britain. Before A.W.A. commenced using Australian quartz, all raw crystal was imported from Brazil.

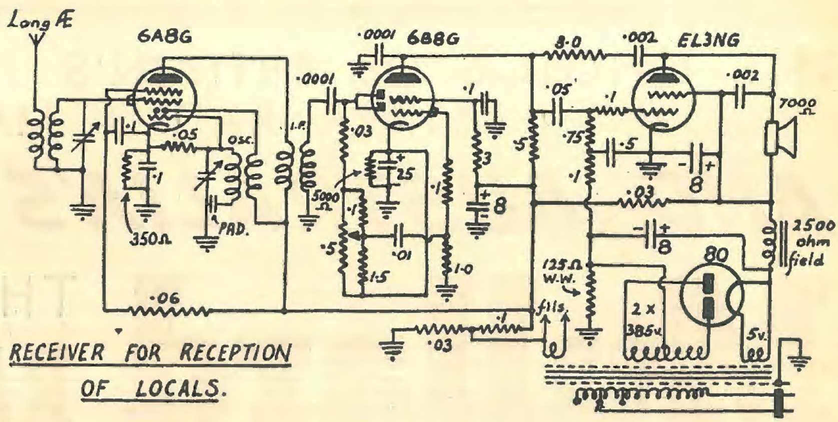


Diagram 5

DISTORTION (Continued)

tone when the volume control is turned up because the output valve becomes overloaded long before the diode is sufficiently loaded by a suitable signal.

Other types of detection, e.g., infinite impedance or "reflex" detection (no, I don't mean a valve amplifying at both I.F. and A.F.!) are being gradually brought into general use.

The Diagrams

Diagram 1 shows how a distorted signal is equivalent to the original signal, together with harmonics, whether the original signal is a simple sine-wave or contains harmonics itself.

Diagrams 2a and 2b show the output curves of receivers (or amplifiers) with (a) negative voltage feedback, giving unequal power; (b) sufficient feedback of the right type to give equal power.

Diagram 3 shows simple circuits for negative voltage and negative current feedback.

Diagram 4 shows two simple ways of getting a "bass boost" by using positive feedback at very low frequencies. In each case, feedback at higher frequencies is prevented by the bypass condenser C. If this is too small, continuous oscillation may result.

Diagram 5 shows a receiver designed for excellent reception of locals only. It is essential that a good aerial be used in order to provide the diode with a large signal. Points to note are the low value of diode load resistor, the decrease in this to even lower values when volume is reduced, the heavy damping of the single I.F. transformer ensuring no cutting of "sidebands" (which really means the circuit is damped sufficiently to allow the very rapid modulation of the I.F.), the small amount of inverse feedback and the bass boost by the condenser in the feedback circuit.

Yes, there's a bridge --

but he won't use it

His progress is impeded by a river over which he can easily cross by the bridge. He doesn't know that it's there. And there are hundreds like him. Hundreds of radio dealers whose Philips valve sales are limited because they do not realise that RADIOSERVICE is the bridge to permanent, profitable radio business.

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WHAT STUDENTS SAY

"You will be pleased to know that I have just got a new job with the Agency here, in charge of the Service Department. Thanking you for the great help you have given me, wishing the A.R.C. the success it deserves."
—W.A.S., Devonport, Tas.

"I might state that I appreciate the manner the College handles the postal lessons. They are explained fully and clearly to the very last details — an excellent system, considering the various intricacies of such a subject."
—L.G., Bendigo, Vic.

"I would like to add that I owe my present position in the field of Radio entirely to the Australian Radio College and to the great help and co-operation of the instructors with whom it was my pleasure to work."
—C.C., Vaucluse, N.S.W.

"It may interest you to know that I have been passed into the R.A.A.F. Reserve as an electricion. While I had some experience in electricity, I should like to acknowledge the great assistance I have received from the course."
—J.P., Cooma, N.S.W.

PASSPORT TO PROSPERITY FOR ONE

To L. B. GRAHAM,
Principal of Australian Radio College,

Dear Sir,—

Please send me, without obligation on my part, the free book, "Careers in Radio and Television."

NAME.....

ADDRESS.....

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