THE AUSTRALASIAN

Radio World

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★ **An analysis of the merits of pentode and triode output valves.**

★ **Some suggestions for post-war re-organization of radio services.**

★ **Alternative high-tension supply systems for battery sets.**

★ **Guide to short-wave reception conditions & best listening times.**

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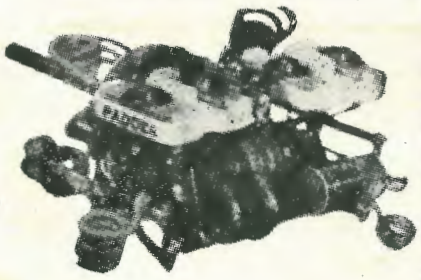

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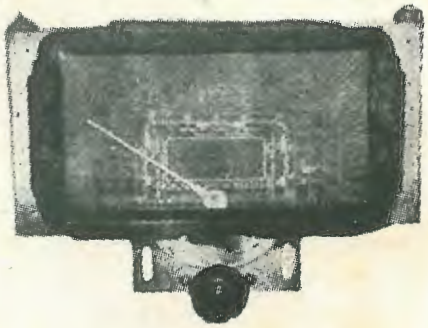

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ALL-WAVE ALL-WORLD DX NEWS

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EDITORIAL

Post-war plans are popular topics for discussions, so let us not forget the place of radio.

War-time radio has been responsible for tremendous developments which are not yet fully appreciated by all of us. Every plane in the bomber squadron keeps in constant touch with every other plane, as well as with its base; even the fighter pilots take their instructions by radio. Practically every unit of a modern mechanised army has its own transmitter and receiver. Tanks keep in constant touch with each other by radio, even the infantry battalions carry radio.

All of which goes to indicate how radio can be applied to post-war conditions.

Imagine the time which can be saved if all taxi-cabs carry radio and keep in touch with headquarters; if fleets of delivery trucks from the big stores are so equipped; as well as the fire brigades, ambulances, and the road patrols.

Imagine the possibilities of radio transmitting as a hobby for the hundred thousand men who have been taught the theory and code in their army, navy or air force training. There is room on the air for at least fifty thousand radio "hams" and every prospect of them receiving official encouragement in recognition of the service they have given.

In broadcasting there is ample room for development too, especially in th direction of television, and super high-fidelity sound on short-wave or with frequency modulation.

Encouraged under the control of a man of wide vision and progressive ideals there is no limit to the possibilities of post-war radio development. Our only fear is that radio may be left in the grip of the P.M.G's Department, at the mercy of some old-fashioned official who sees in radio only a competitor to the telegraph and the telephone.

R.C.S

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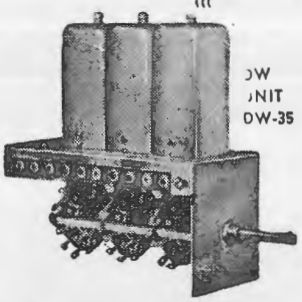

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PHILIPS FACTORY BOMBED BY ALLIES

The name of Philips being so well known in radio circles, the recent news of the Allied bombing attacks on the Philips factory have held more than usual interest.

It seems strange that our forces should be dealing with Philips in this way, but such are the fortunes of war.

Lest it should be thought that Philips is an alien Company, this story of their efforts to assist us makes timely and interesting reading.

Needless to add, radio is a vital factor in modern warfare, every plane, ship and tank being radio-equipped.

By

J. O'CONNOR HOWE

AN Anglo-Dutch company, Philips, with many factories distributed over England, is particularly keen to give of its best and to step up production. Although this company has thousands of British employees, many of the members of its executive and research staff are Dutch. Their technical skill, together with British workmanship, is helping to give the men who are fighting the equipment which will enable them to win.

Thousands Employed

Many years ago, at Eindhoven, a small country town in the south-east of Holland a new enterprise was started, which gradually grew until just before the war it was the largest concern of its kind in the Netherlands, even in Europe, employing nearly 25,000 people, making valves, radios, lamps, X-ray tubes and equipment and many other modern lighting and electrical devices.

Escape of Technicians

When war broke out there was no doubt for whom the workers had sympathy.

Then when Germany invaded the Netherlands, these works put into operation their emergency plans. British authorities had already called in the assistance of many of their technical experts, and some highly important experimental work was going on. Delicate laboratory apparatus was placed in cars which had been assembled at a given point by a prearranged signal. But when the drivers started them up, they exploded or refused to move, for fifth columnists had placed hand-grenades beneath the bonnets and connected them to the ignition system. Many of the technicians, however, managed to escape to England, where many others were already working in the British factories of the company on highly technical work for the British services.

One of the newest buildings of the group which comprises the Philips' factory in Holland.

But in many small ways, the parent factory in the Netherlands is still able to send hints of its latest developments to its technical heads here in London. It cannot be revealed how this is done, but there is a Dutch proverb which says: "A good listener needs only half a word." And often if you give a technical man the germ of an idea, his specialised knowledge enables him to fill in the gaps and to see the possibilities.

Now Dutch scientists and British scientists work together at the laboratory bench. When an Air Ministry official walks in and coolly demands some fantastic number of valves of a very high specification, a valve which has perhaps not even left the experimental stages, the laboratories begin to hum.

Production Problems Solved

The Dutchmen apply the knowledge they carried away from the occupied Netherlands, remembering how certain production features had been solved in Holland. The British scientists know what they can demand from British resources, and the factory and production managers know how to plan the flow of articles and assemblies through the factories to ensure the steady output the Air Ministry demands.

Effects of Humidity

As an instance of how small factors may throw a thing out of gear, there is the case of a special type of condenser which used to be made exclusively in the Netherlands. Feature for feature, exactly the same assembly was made in England, but when the finished article was tested, it was found to be useless. Feverishly it was taken to pieces, and everything was found as it should be. Then one of the Dutch scientists had an inspiration. He measured the humidity of the atmosphere in the room, and it was found that this was of a degree which rendered the condensers useless before they were sealed and made vacuum tight. When air-conditioning plant

(Continued on page 8)

PENTODES FOR POWER

A discussion of the merits of each type as an output tube

By
J. W. STRAEDE, B.Sc., A.M.I.R.E.
7 ADELINE STREET,
PRESTON, VIC.

OWNERS and builders of amplifiers are very often loud in their praise, or condemnation, of beam tubes, stating that they are either very superior to, or very inferior to, the triode type. Triode users claim superior, "smoother" tone, whilst those who favour tetrodes and pentodes point out the higher power and improved efficiency obtainable from those types. Each type has its own advantages.

Power Efficiency

It is an undeniable fact that the triode is a sad loser in the race for efficiency. Pentodes of the American type are somewhat better, whilst "beam" (tetrode) tubes and pentodes of the modern Continental type approach the theoretical maximum. That, of course, is for a single output tube.

The tetrodes and pentodes also have greater sensitivity, but this is not so important nowadays, although it was a big factor in establishing them.

The accompanying table shows the power input and output for a typical example of each of the types. The theoretical maximum efficiency for a single class A tube (for sine wave) is 50 per cent. Triodes vary from 12 to 28 per cent., tetrodes from 35 to 48½ per cent, American type pentodes are about 40 per cent and hi-gain tubes such as the EL3 or 6AG6G approach the 50 per cent mark. The 1.4 volt battery tubes are surprisingly efficient, especially the output section of the 1D8GT.

Typical examples of tetrodes and triodes in push-pull operation are shown in the Radiotron circuits A504 and A503. These have approximately the same power output, but look at the power transformers. As a typical example of pentodes in push-pull, the Phillips circuit is added for comparison. This, like the A504, has a shade more power on peaks than the A503.

Distortion

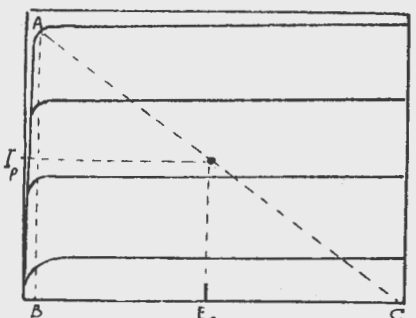
There are two main types of distortion: frequency and amplitude (or harmonic). Let us consider frequency distortion first. This is due to the variation in speaker impedance and efficiency with frequency (we are considering the actual acoustic output, not the voltage across the voice coil). At high frequencies the impedance rises. With triodes valves, this results in a loss of power, so that there is a natural high-cut effect. (The voltage across the voice coil will rise—if it doesn't, then there is a greater high-cut.) With tetrodes and pentodes, the result of increased speaker impedance is to increase the output, so that these tubes have a very pronounced high-frequency output — usually too high for those accustomed to triodes!

At very low frequencies the speaker impedance falls away, resulting in diminished response from all types of output tubes. However, there is generally a rise of impedance around a certain bass frequency giving a bass boost effect with tetrodes and pentodes. This is desirable for low volume work only. For high or medium power, the distortion from the increased impedance is undesirable. With triodes, the rise of impedance gives a bass-cut effect and a reduction in distortion.

The response curves shown for the A503 and A504 circuits are for voltage across the voice coil. The actual **acoustic** output depends on the impedance and efficiency of the loud speaker at the various frequencies.

Amplitude Distortion

The distortion that increases with volume, often called "harmonic" distortion, depends for its effect mainly on the combination tones due to the non-linearity of the amplifier. This is shown by the fact that an amplifier can be driven much nearer "flat out" with a single note input as from an electric guitar, than from a scratchy record of a symphonic orchestra.



CURVES of IDEAL TETRODE or PENTODE.

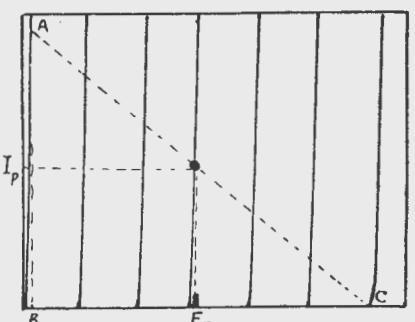
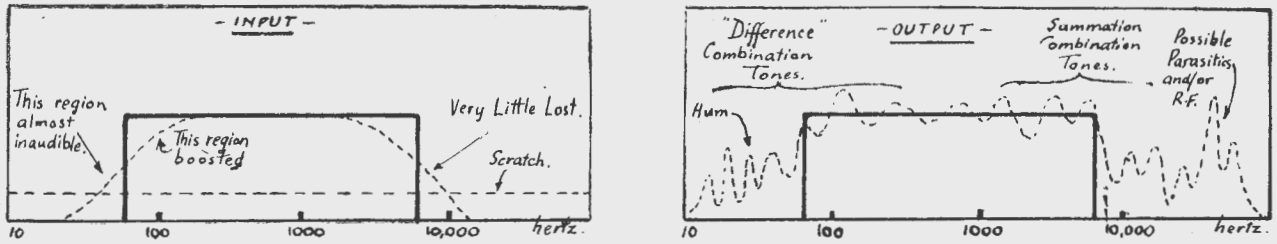


PLATE CURVES of IDEAL TRIODE.

If two frequencies, a and b, are supplied to an amplifier that is non-linear, there will be, in the output, additional frequencies a+b, a—b, a+2b (i.e., "a" with the second harmonic of "b"), a—2b, 2a+b, etc. The a+b and a—b tones are not so bad; we are accustomed to them. The a+2b, **a—2b**, 2a+b, etc., however, are distasteful, and it is these that help in producing



Graphs of frequency response to indicate the advantages of restriction, instead of attempting high-fidelity.

---BUT TRIODES FOR TONE

the so-called "pentode tone." Triodes produce the a+b and a—b tones quite plentifully (as much as 20 per cent or more) but only three or four per cent of the others.

Removal of Combination Tones

Many of the objectionable tones occur outside the normal frequency range and may be removed by sharp cut-off filters. This restriction of frequency response is not so bad as it sounds. After all, we are accustomed to a 14 db drop at 5,000 hertz from a selective radio, so why worry about a complete cut off at 6,000 hertz if the drops at 5,000 is only 1 or 2 db? Again, notes of frequencies below 60 hertz are barely audible and any bass loss due to their removal can be compensated for a **very** slight boost around the 100 hertz mark.

Any unnecessary parts of the frequency spectrum should be restricted before the amplifier as well as after, especially at the low-frequency end to avoid that "judder" that occurs at high volume levels. This applies to all types of amplifiers, voltage or power, triode or pentode.

In a "straight" amplifier, the amount and type of harmonic is a guide to the degree of linearity.

Ideal and Real Valve Curves

Four of the valve curves (plate current—plate voltage graphs by the way) show typical triodes, tetrodes and pentodes. The same graphs indicate the load line and give an idea of why the triode is least efficient. Two valve curves show what might be termed "ideal" curves — the triode all vertical, and the pentode all horizontal, lines.

Push-pull Operation

Class A push-pull is very good as regards tone for both tetrodes and triodes, as the removal of even harmonics means the removal of the a+b and a—b combination tones, and the reduction of some of the others. Pentodes, however, do not perform so well as much of their distortion is of the odd-harmonic type. (Possibly someone will invent a three-phase output system to eliminate third harmonic?)

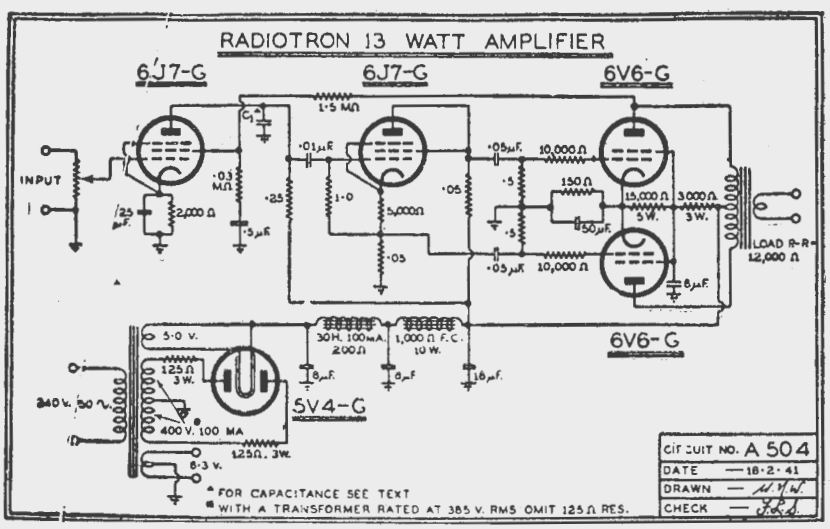
Class AB1 operation is an advantage to all types, as the increased power means that the A.F. amplifier can be operated well within its range and grid current distortion is thereby removed. The power-efficiency is increased at the same time, the theoretical-maximum (for a sine-wave) being approximately $\sqrt{2} \div 2$ or 70 per cent. In practice, the efficiency may be around 30 to 40 per cent. for a triode, 45 per cent for a pentode, or 55 per cent for a beam tube. These are only approximate figures, the efficiencies varying widely with output load, bias voltage, etc.

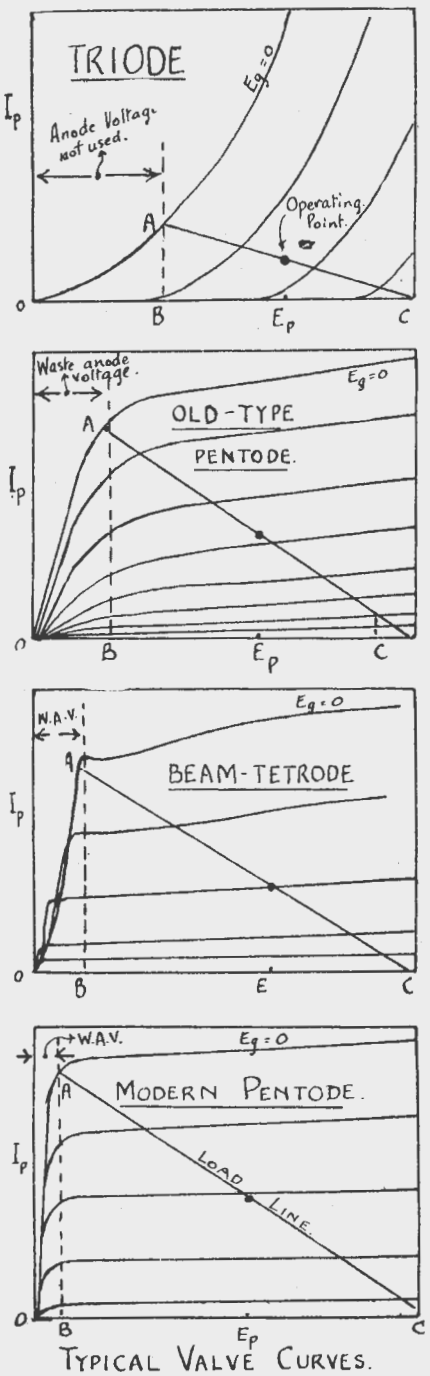
Type EL3 pentodes, when used in push-pull, are remarkably efficient, 50 ma. at 250 volts giving an output of about 8 watts.

"Pentode Tone"

The different tone from pentode output valves is due partly to the different type of combination tones, and partly to the increased response to the "highs" and "lows".

(**Continued on page 8**)



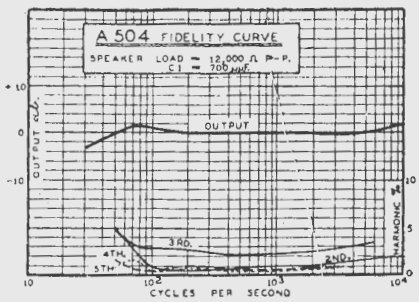


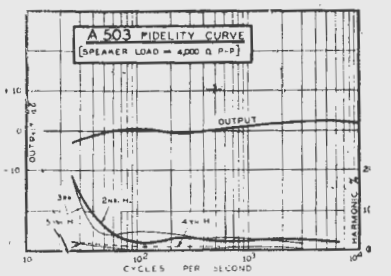
TYPICAL VALVE CURVES.

TRIODE v. PENTODE

(Continued)

Objectionable combination tones can be reduced by the application of inverse feedback. This levels off the





voltage across the voice coil, so that the frequency response of the pentode becomes nearer to that of the triode. If a slight cut is made in the bass and in the highs, the illusion is almost complete. Triodes usually restrict the

PHILIPS

(Continued from page 5)

was installed, the condensers were all right and another manufacturing difficulty had been overcome.

But what of the workers in the Dutch factories? Are they working for the Germans? It is known that the Germans have paid the Dutch workmen the highest compliment he could desire. He calls him lazy, unwilling and stupid. The German is unable to see that he refused to work for a regime which is alien and abhorrent.

Great as is the debt owed to the men who have made these things possible because of their ingenuity, as well as to the industrial research laboratories, the skilled workmen, the glass-blowers, and the tool-setters who are able to translate the drawings and experimental work of the inventor into actual equipment and to make the valves and equipment in the huge quantities needed, on the conveyer-band principles.

Our debt to-day is even greater now that in the interests of the United Nations this vast and complete organisation has had to be bombed out of existence.

highs in an additional manner due to their higher inter-electrode capacities. After all, a triode is really a tetrode with 100 per cent feedback via the screen. Look at the connections for a "46" valve as class A triode.

Summing Up

Triodes are desirable for low power amplifiers and where simplicity of circuit is desired. Tetrodes are essential for high power work and provide a tone equal to that of triodes, but the circuit is complicated somewhat by inverse feedback and possibly by high-and-low-cut filters. Tetrodes and pentodes give more watts per £.

It is noteworthy that manufacturers of quality "high fidelity" receivers in America make use of four types of output systems:—

1. Single beam tubes.
2. Beam tubes in push-pull.
3. Pentodes in push-pull.
4. Triodes in push-pull.

Inverse feedback is used in each of the first three cases, usually from the voice coil to the driver.

The "Harries", or critical-distance tetrode, which has triode tone and tetrode efficiency, is not discussed in this article as no tubes of this type are available in Australia.

Next month we are publishing the cricuit diagram of a push-pull amplifier featuring: Beam Output Tubes A.V.C. and A.V.E., Individual Tone Controls, and an output of over 20 watts.

VALVES IN PUSH-PULL	VOLTS ON PLATE AND SCREEN	BIAS RESISTOR (OHMS)	LOAD PLATE TO PLATE	POWER (WATTS)	H.T. CURRENT TOTAL APPROX	
					STATIC	DYNAMIC
EL3	250	140	10,000	9	54	68
6V6	300	250	8,000	14	75	85
6F6	300	225	10,000	12	92	95
6B5	400 SUPPLY	140	10,000	20	100	120
6L6	300	200	5,000	24	120	140

Chart for Push-pull Power Valves.

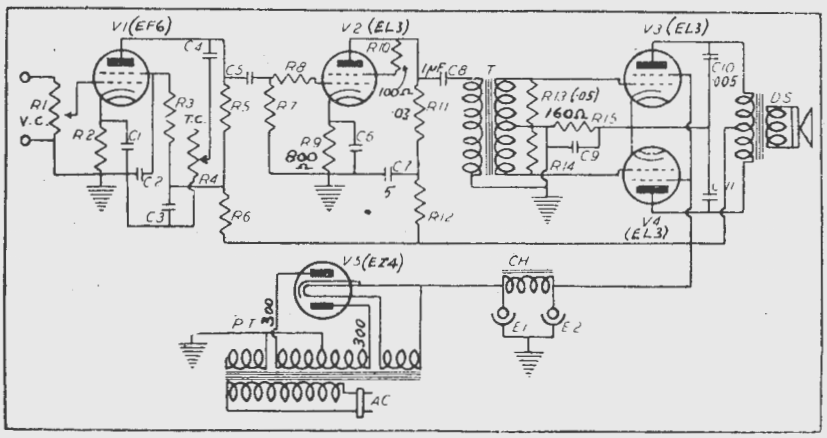
References

The Reduction of Harmonic Distortion. Aus. Radio World, Feb., 1942.

Intermodulation Distortion (by A. C. Shaney) "Radiocraft." May, 1939.

Radiotron A503 Amplifier. Aus. Radio World. Oct., 1939.

Radiotron A504 Amplifier. Aus. Radio World. July, 1941.



Above: Circuit of push-pull amplifier for EL3 valves. Below: A chart to show power efficiency.

VALVE TYPE	PLATE VOLTS	OUTPUT VALVE CHART SCREEN VOLTS	BIAS R. (OHMS)	LOAD (OHMS)	PLATE CURRENT	OUTPUT WATTS	EFFICIENCY %
45	275	-	1550	4600	36	2	20
6F6	250	250	410	7,000	35+9	3·1	28
6V6	250	250	232	5,000	47+7	4·5	33
EL3	250	250	150	7,000	36+4	4·5	45
1D8GT	90	90	-9v.	12,500	5+1	·2	37

TASTE IN REPRODUCTION

Some years ago I made a set for high-quality reproduction programmes from the local station, some fifteen miles away as the wireless wave waggles. It was rather an elaborate affair, containing eight or ten valves, and one of its features was that it had separate AF and output circuits yoked to separate loudspeakers, for the low and high audio frequencies. Each of the two AF circuits had its own volume control. I got the idea from a big American set, and it worked very well indeed. You didn't get more bass by cutting the "top"; you turned up the VC responsible for the lower audio frequencies. The other VC made speech and music more or less brilliant at will. By working the two controls together you could produce what appealed to your ear as the ideal balance. Each VC was given a graduated dial, and I asked every musical friend who came to visit me to adjust the pair until he considered reproduction to be as nearly perfect as possible. I kept a record of the dial readings, and it is interesting to note that no two people agreed exactly in their settings. From this one deduces that it would be impossible to make a high-fidelity receiver that would satisfy the requirements of every musical ear; some kind of tone control, which is, I suppose, really a distortion-producing device, must be provided in order that each listener, or group of listeners, may be able to arrive at the most pleasing balance of upper and lower audio frequencies. It's a queer business altogether, this matter of the individual human ear.

—By "Diallist," in the Wireless World (London).

HINTS FOR BETTER SOLDERING

Lack of a working knowledge of the art of soldering has turned many people from the fascinating pastime of radio or model construction. It is impossible to wire a modern radio chassis without at least a few soldered connections — the uses of soldering in addition to this particular work are legion.

Radio chassis soldering may be placed in a class of its own — the simplest class. No matter what the size or circuit may be, the soldered connections will always be made in the same way with the same materials. Boiled down, this means that the only type of soldered junction in a circuit consists of one tin lug and one or more wire ends. By the time we have completed a chassis we have had plenty of practice at this particular soldered joint! But how do we start?

Radio Soldering

We must have a source of heat to melt the solder and also to bring the joint to the same temperature as the molten solder. The most convenient source of heat is a hot "iron," which, strange to say, is always made of copper! The soldering iron enables us to direct both heat and molten solder just where we want it and nowhere else.

An electric soldering iron is undoubtedly the best type, not only because of convenience and cleanliness in working, but because once it has reached the proper temperature it stays so until the current is switched off.

Chaps who have no power available can get along quite all right with the ordinary iron (a small one), which is heated over a spirit lamp or fire, etc. If a fire is used it is a good idea to poke in first a piece of water pipe and then slide the iron inside this pipe. By so doing we keep ashes away from the tinned surface.

The other two items of equal importance are the solder and the flux. For radio work these are best used combined in the form of "resin cored solder." A tin of paste flux will also be handy for "tinning" the iron and the occasional untinned lug of wire, etc.

Tinning

The point of the iron must always be "tinned," which simply means that it is brightly coated with solder. If the iron was not tinned, the formation of copper oxide would not allow the heat to properly reach the solder and joint. Furthermore, the tinning allows us to melt a piece of solder and carry this "blob" to the joint.

To tin the iron we heat it, quickly file the point until bright metal shows, dip it in the tin of paste and then rub it over with solder. From now on we know that the iron has reached the proper heat when solder pressed on the point of the iron melts **immediately.**

Most wires and lugs will have already a bright coat of tin, but occasionally we come across a plain copper or brass lug or copper wire. These items must be given a coat of solder before the joint is made. As before, we scrape until bright metal shows, apply a little paste, and rub over with a hot tinned iron.

Making a Joint

Say we are going to join a piece of push-back" hook-up wire to a lug on a power transformer or valve socket, etc. Here we go, step by step, assuming that the iron is already **properly** hot:—

(1) Press the point of the iron and the end of the resin-core solder on to the lug until the solder runs and forms a "blob"—not pasty, but liquid in appearance.

(2) Slide back the insulation of the wire for half an inch. Dip the projecting end of the wire in paste flux and then coat with solder.

(3) With one hand hold the tinned end of the wire against the blob of solder on the lug. At the same time rest the wrist on the chassis.

(4) Press the wire into the blob with the iron until the solder melts and the wire is covered. Hold steady until the solder sets.

(5) Give the wire a good "yank" to make sure that the joint is all that it should be!

—N.Z. "Radiogram."

FLOATING GLASS

That common substance, glass, seems to be constantly increasing in usefulness. A new type of opaque glass, that floats like cork, is extremely light and rigid, and can be sawed or drilled with ordinary tools, has been developed. It is produced by firing pure carbon with ordinary glass. When the glass softens, the carbon produces gas which acts on the glass in a manner similar to baking powder or yeast in bread.

EVOLUTION OF THE LOUDSPEAKER

***The third of a series of articles showing how radio has grown up.**

LOUDSPEAKER design is divisible into two parts — the method of producing mechanical vibration from a fluctuating electric current and the way in which the vibrations so formed are converted into air vibration or sound. Of the latter, there are two main systems: either a **large** diaphragm is directly connected with the source of vibration and this diaphragm moves the air directly, or else there is a **small** diaphragm first set in vibration and this small diaphragm is coupled to the external air by a horn which acts as an acoustic transformer.

From the Telephone

The first loudspeaker was merely an ordinary iron-diaphragm telephone receiver with a cone attached to the ear-piece. Sometimes an inverted horn was made by placing a pair of phones in a glass or porcelain bowl. Quality didn't matter. Volume was so low that quite a lot of the distortion was inaudible. Another idea was to connect (acoustically) a telephone receiver or loudspeaker unit to a gramophone horn in place of the sound box. Straight-sided horns had nasty resonant effects, one note being terrifically over-emphasised. To overcome this, one manufacturer used a sloping end to the horn (fig. A), whilst another drilled a series of holes in the horn to provide damping. Horns of wood, fibre, metal and paper-maché were used and all four of these materials have been used again within the last four years for speaker horns, showing that nothing is ever completely "dead" in radio.

Came the Cone

After the attainment of low volume (about 1/10-watt), cone speakers came to be used. Some of these were very disappointing at first, on account of their lesser efficiency, and compromises were made.

At this time there was a big increase in the efficiency of horn units and several long and reflex horns appeared. The Amplion "Radiolux" had a reflex horn of metal and was enclosed in a neat wooden box.

One famous speaker, the Brown, employed a tiny cone unit together with a horn. The unit had a diaphragm of aluminium alloy and was driven by a soft-iron reed held close to an electromagnet. The resonance points of horn and diaphragm-plus-reed were well separated, giving quite a good tone for the time when it was marketed.

Cone speakers finally achieved success when balanced armature units were employed. These were comparatively free from the large even-harmonic distortion produced in both the telephone type and reed units.

Some of these balanced armature units were of two-pole type, others were four pole. The armature either twisted about a pivoted (fig. C) or else vibrated laterally against springs. Two very famous speakers, the Philips "PCJJ" and the "R.C.A. 100" were based on balanced armature units. The former had a "floating" armature held at each end by cross springs or blades of metal. The unit fitted almost inside the cone, which in turn fitted in a bakelite baffle. The latter had an armature which rotated and drove via a lever, a corrugated cone behind which was a layer of felt to give acoustic damping. The baffle for the latter was of the box type. The R.C.A. 100B speaker also featured a transformer to keep direct current out of the loudspeaker unit.

Magnetic speakers are still in use and in demand in America to-day, especially in the 3½ and 5 inch sizes, which sell at a little over a dollar. They are used principally in intercommunication equipment, "cigar-box" sets and as microphones.

Moving Coil Units

The moving coil speaker unit had a very slow entry into popular radio. Not only did it require field excitation, but it was expensive and needed quite a lot of power to make it worthwhile. Magnavox put out a unit with a small metal diaphragm and a curved speaker horn about 20 inches long. About 1½ amperes from a 6-volt battery were required for the field.

Later, Philips came into the field with a permanent-magnet unit complete with a very artistic heptagonal baffle, whilst Magnavox produced a dynamic speaker of more or less modern appearance, without any baffle or trimmings.

Since then the moving coil speaker in either electro-magnetic ("dynamic") or permanent-magnet form has been supreme, only details of design having changed. Sensitivity and power handling ability have risen, whilst resonance has been decreased and damping improved. Cone material has gone through a number of changes, paper and paper-like materials, filled cloth, paper impregnated

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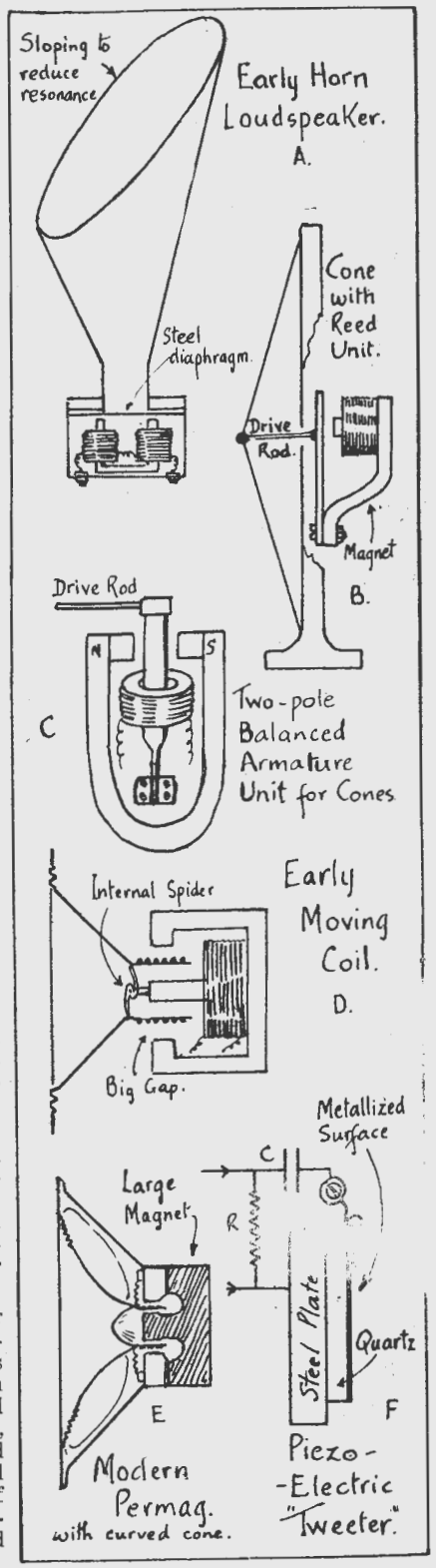


SPEAKERS
(Continued)

with plastics and moulded materials being used.

To-day, most manufacturers make use of a cone moulded from a mixture of fibrous materials, although one Australia manufacturer still uses a cone made by bending up flat paper.

Cone suspension has changed from internal to external "spiders".

The internal spider did look something (but not much!) like a spider in that it had legs, but the external "spider" is merely a disc with a large number of concentric corrugations. Dust-proofing has advanced, this being very necessary with permag. types to prevent particles of iron or steel from fouling the voice coil.

Resonances have been reduced by having a number of resonant frequencies rather than one or two main ones.

Cones are corrugated so that the central part has a comparatively high resonant frequency, whilst the outer part has a very low characteristic rate of vibration.

Permanent-magnet speakers have improved tremendously since the introduction of Alni, Alnico, Hipermag and other alloys capable of being strongly magnetised. It is largely due to the efficiency of these magnetic materials that the baby magnetic speaker can put up such a good performance.

A modern speaker is not complete without its baffle, which may be a flat board (early type), open-backed box, completely-enclosed box of large volume (peri-dynamic system), box enclosed except for opening in front beside the speaker (bass reflex system) acoustic labyrinth, "infinite" baffle (usually less infinite than the labyrinth), exponential horn, modified exponential horn, etc., etc. Sometimes it's a freak baffle, in fact, the sound may be baffled as to how to get out.

Tweeters for Highs

Various kinds of tweeters or speakers for the ultra-high frequencies have been introduced from time to time, but are not very popular because most radio's cannot reproduce the highest audible frequencies (limit of average radio: 5,000 hertz, limit of audibility, 15,000 to 30,000 hertz). Types of tweeters include small cone with stiff suspension, iron-diaphragm telephone type unit with short horn and piezzo-electric or "crystal" reproduces. Possibly when radio design advances again after the war, other types of tweeter will be introduced using eddy-currents to heat a bi-metal diaphragm or making use of magneto-strictive oscillations in a nickel rod to drive a miniature duralumin cone.

Revivals in Design

A few of the revivals in speaker design: horns for efficiency, iron diaphragms (now used in some types of tweeter), "magnetic" speakers, metallic diaphragms for moving coil speakers (now used in some public-address units), use of resonance to increase frequency response, reflex horns to save space.

* Previous articles in this series were about detection and the variable condenser.

References

Radio World, Feb. 1942: Baffling the Loudspeaker.

Radio, Sir (Philips) 1930-31: Types of Speakers.

Radio World, Feb. 1940: Long Horn Speakers for P.A.

Radiocraft, May, 1939: Baffle for Multiple Resonance.

HIGH TENSION FOR BATTERY SETS

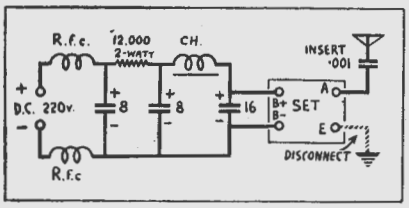
Constructional details of three units to replace the H.T. Battery

DRY batteries are scarce at present, and at any time are rather an expensive way of providiig high-tension current.

Most radio experimenters remember the good old days when a set required anything up to 25 milliamps at 135 or more volts.

To-day the requirements are less, but the problem still exists.

Let us consider the ways that experimenter and set-builders have



Battery sets can draw high tension from D.C. mains, but several safety precautions must be observed, as negative is not necessarily at earth potential.

united. First came the rechargable battery, or high-tension accumulator. By suitable switching, such a battery can be recharged from a 6-volt accumulator.

Early H.T. accumulators were usually far from rugged and didn't last long. The Faure, or past plate, was O.K. for large accumulators, but not for the small cells of an H.T. supply. Planté cells, although expensive to make, in that they require frequent charging and discharging before having an appreciable capacity, are quite as reliable as an ordinary car battery.

A home constructor can make them!

Experimenters soon tired of the H.T. accumulator and decided to draw their H.T. supply from the main, using a transformer, rectifier and filter in the same way that is used in A.C. sets to-day.

"B" Eliminators, once costing around the £10 mark can to-day be built for about the 40/- mark (as low as 25/- in peace time!), using modern components. Unfortunately, the "B" Eliminator is of use only where A.C. supplies are available.

Similar eliminators can be made, without the transformer or rectifier, for D.C. mains, but care must be taken to insulate the chassis and controls of the receiver and an external "earth" must not be employed. All parts of the set, including the knob screws, must be insulated.

With the advent of car radio, vibrators were soon devised to convert D.C. to A.C. and then rectify it after it had been stepped up by a transformer. We described last month, a vibrator pack designed for use with a powerful battery amplifier. This month we give the details of a similar, but less powerful unit, which has R.F. filtering making it suitable for radio use.

A Planté H.T. Accumulator

Quite a simple 'storage battery' can be made from strips of lead foil and glass jars, or test tubes. The lead strips form the electrodes as well as the connectors between the cells. The electrolyte, or liquid between the electrodes, is diluted sulphuric acid, prepared by **slowly** pouring one part of "C.P." sulphuric acid into seven parts (by volume) of distilled water. The cells are all in series and at first there is no positive or negative.

After the first charge, which should be about ¼-amp. for 6 hours, the battery is discharged by connecting a 230-volt lamp (any size) across it.

Then it is recharged and again discharged.

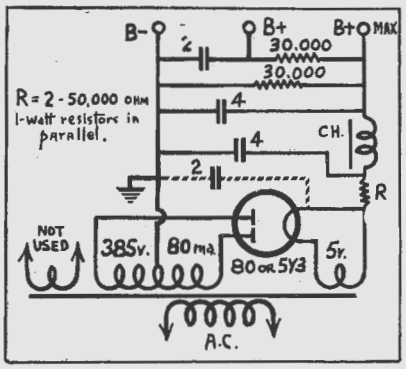
After the fourth or fifth charge, the battery is ready for use. The capacity of the battery increases with use. Each cell in the battery gives about 2 volts, so 40 to 50 cells are required for sets with 1.4 volt valves and 50 to 70 for sets with 2-volt tubes.

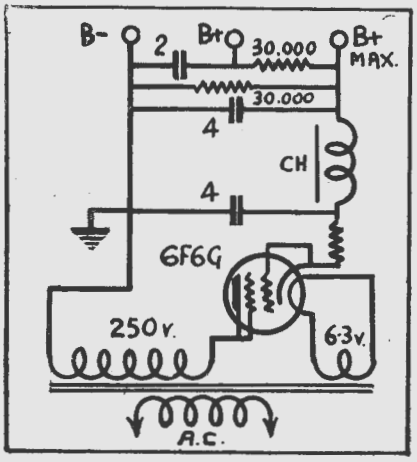
Between the electrodes in each cell a thin layer of glass (not steel!) wool can be placed, to prevent shorting.

Perforated waxed cardboard can be used.

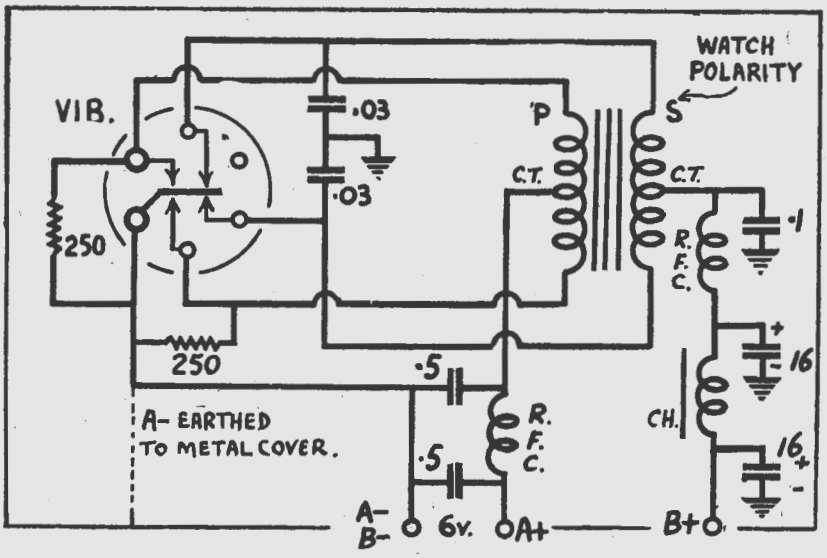
By connecting the cells in groups of three, a switching device can be

(Continued on page 15)





Two types of power packs for A.C.



A vibrator unit with additional filtering.

H.T. UNITS

(Continued)

used to connect the cells in series for use, but in series-parallel for charging from a 6-volt car battery.

The switch can be made from a length of cylindrical broom handle varnished with shellac) and strips of brass, and should be mounted about a foot away from the battery so as not to be affected by the acid fumes.

Wires from the battery to switch are coated by dipping them in molten paraffin wax. Contacts on the switch are smeared with car oil or grease to prevent corrosion.

H.T. Eliminator for A.C. Mains

A H.T. supply for battery sets is similar to the power pack of a radio except that voltages are lower and less current is supplied. Battery receivers vary so much in their requirements that we cannot give details for all, but the pack, or "eliminator", described will suit most 1.4-volt portables and most of the 2 and 3 valve "Reinartz" sets.

Our job was built up from parts of the junk box and we estimated the total cost to be about 10/-.

For a valve we used a defective 6F6G, which had been discarded because the grid and cathode touched occasionally.

As the grid and cathode were connected in the circuit, that did not matter. If you are using new parts, then we suggest the use of an "80" or 5V3G.

Almost any kind of power transformer can be used so long as there is a winding for the filament of the rectifier and the H.T. voltage is not too high.

Either full wave rectification can be used with a "80", etc., or half-wave, using an output tube as the rectifier.

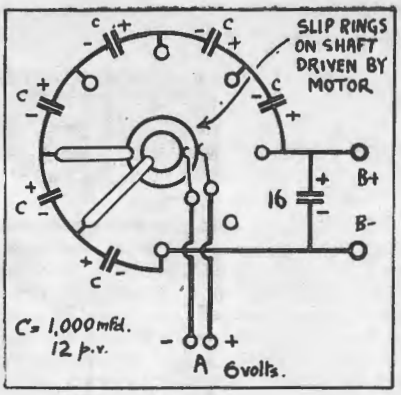
The output voltages from the eliminator can be raised if necessary by reducing the value of the filter resistor, or by using a larger bleed resistor.

The values shown give rather a low voltage, as we'd hate to have you ruin a set of "1.4" valves with excessive voltage!

Although the photo shows the parts all packed up together, there is no reason why a larger base should not be employed for convenience in wiring. Either paper-dielectric condensers in metal cans, or pigtail electrolytics can be used for the filtering. If no power choke is obtainable, the primary winding of a 7,000 ohm speaker transformer can be used as in our set.

THUNDERBOLT POWER

A thunderbolt, literally, as well as in name, is the new Thunderbolt fighter plane. When the full armament of this plane is functioning, it delivers kinetic energy to the bullets at the rate of 118,200,000 ft. lbs, per minute!



A rotating switch to charge condensers can operate as a high tension supply.

Vibrator Pack for Battery Radio

This unit was originally designed for a certain portable which was temporarily out of action due to lack of battery. We designed the unit to be as compact as possible and to provide only the bare minimum of current, as we proposed using 1.5 volt torch cells as our supply. As regards the last point, results were hardly up to expectations but the unit works well from four cells of the "buzzer" type (or from a car accumulator), the drain being less than a third of an ampere of an output of 9 ma. at 90 volts.

The drain depends largely on the buffer.

Quite a lot of substituting and improvising was necessary. For the buffer condensers, ordinary .03 mfd., 600 volt tubulars were used as the voltages are not so high as in the pack described last month. If you can't get two .03 condensers, use one .02 and one .05 mfd., or two .02 mfd.

A speaker transformer was used as the filter choke and the vibrator transformer was built from another speaker transformer. For the choke, the primary winding of almost any speaker transformer over 5,000 ohms will do, the higher the better, but for the transformer the exact type must be used, otherwise different primary windings and buffers are required.

To make the vibrator transformer, a pre-isocore Rola transformer rated at 10,000 C.T. was used.

The thick secondary, or voice-coil

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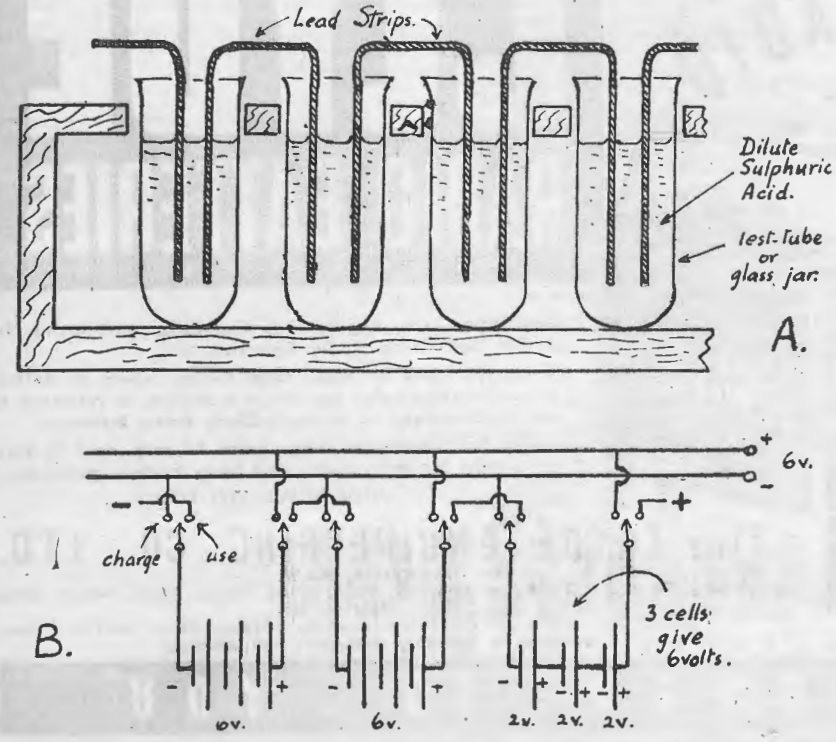


Left: The high tension accumulator illustrated can be charged from a six volt supply by the switching circuit below.

H.T. UNITS
(Continued)

winding was unwound from the outside.

Then a strip of aluminium foil ("tin foil") was wrapped almost, but not completely around to form an electrostatic shield.

A piece of thin bare copper wire was placed under the foil. The other end of this wire was later earthed. Over the tinfoil a layer of waxed paper was wrapped and then 140 turns of 28 gauge wire were wound on. This winding, which must be tapped at the centre, forms the new primary winding, whilst the old primary winding has now become the secondary, or H.T. winding.

R.F. chokes for the input side are made by winding about 80 turns of 24 gauge enamelled wire on a ½-inch dowel, or an old 100 turn "honeycomb" coil can be used.

The R.F. choke in the H.T. circuit is an ordinary type. Correct polarity of the input must be observed or the electrolytics are wrongly connected.

Complete shielding is necessary to prevent the picking up of "hash" by the receiver, and it is not a bad idea to use shielded wire for all the connections to the vibrator unit. It is a good idea to check the voltage on load, before using.

A Fourth Method

Later on we hope to give details of an experimental unit based on a new method. A number of low-voltage, high-capacity condensers are charged in turn by a rotating switch. Each condenser is charged to 6 volts by the low-tension supply and as the condensers are in series, a high voltage is obtained.

The problem is not so simple as it sounds as the condensers are being continually discharged and the actual voltage is lower.

By a rapid motor-driven switch and the use of 1,000 mfd. condensers, a fair voltage can be obtained.

References in past issue of "Australasian Radio World."

Aug. '40: Rotary "Vibrator."
Nov. '40: H. T. from Accumulator.
May, '41: Vibrator Units.
Feb. '42: Rebuilding Radio Batteries.
Aug. '42: Servicing Vibrator Sets.

HEARING THE RADIO SIGNAL

The principle of detection and how various types of detectors operate are explained in this article—the twelfth of a series for beginners.

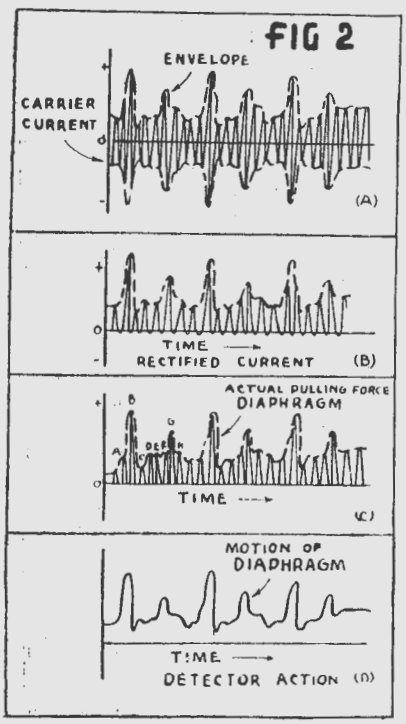
ONE of the earliest forms of detector, widely popular many years ago, is the crystal detector. This consists of a device using a fine wire, known as the cats-whisker, held lightly in contact with a crystal of a particular mineral such as galena.

These crystals have the peculiar property that while they will allow current to flow readily in one direction, in the other it scarcely flows at all.

How The Crystal Works

Fig. 1 shows the circuit of a simple crystal set. "L" and "C1" comprise a simple tuned circuit, with a crystal and a pair of headphones connected in series across it. When a modulated radio frequency signal as represented in Fig. 2 (a) is applied to the tuned circuit, it is tuned to resonance by the variable condenser "C1."

The action of the crystal on the signal now becomes apparent. During one set of half cycles of the alternating current, the resistance of the crystal is very low, so that current is able to flow through it easily but with the half cycles flowing in the opposite direction, the crystal resistance is high, and very little current is allowed through. The result is depicted in fig. 2 (b), which shows the rectified pulsating current.



These pulses or fluctuations of current are far too rapid to actuate a 'phone diaphragm. With a station broadcasting on a wavelength of 500 metres, they are occurring at the rate of 600,000 times per second, and no diaphragm could be made that would respond to this speed.

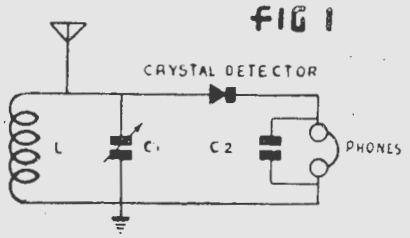
The effect, however, is that each successive wave-train actuates the diaphragm, and its motion follows more or less faithfully the shape of the envelope of the rectified carrier current, as illustrated by fig. 2 (c). Since this envelope is the same shape as the waveform of the sound impressed on the microphone at the broadcasting studio, it follows that the movement of the headphone diaphragm sets up similar sound waves that are heard by the person listening in.

Condenser Across 'Phones an Improvement

The volume and quality of the received signal is often improved by connecting a fixed condenser "C2" across the headphones. When a signal impulse flows through the headphones, "C2" becomes charged. During the next half cycle no current flows through the detector, but "C2" commences to discharge through the headphones, the discharge current flowing in the same direction as that of the impulse which charged the condenser. This action assists considerably in keeping the diaphragm in position until the next impulse comes along. There is, then, during each wave-train a more continuous attraction on the headphone diaphragm, with improved reproduction, since the diaphragm then follows more closely the envelope of the retified signal current.

However, often it will be found that there is sufficient capacity existing in the headphone windings and cord to provide this effect without the necessty for adding further capacity.

Once widely popular, crystal detectors are little used nowadays, having been supplemented almost entirely by the valve detector.



The Diode Detector

The closest valve equivalent to the crystal is the diode, consisting essentially of two elements, a filament (or heater) and plate. With a signal applied to the plate, the filament-to-plate electron flow will be stimulated on the positive half-cycles and repressed on the negative, as illustrated in fig. 2.

Triode Power Detector

Another type of detector that found wide favour in the days of the early a.c. receivers is the power, or "C" bias, detector. More sensitive than the diode, it is appreciably less so that so the leaky grid detector though it has the important advantage over the latter of being able to handle a far more powerful signal.

The action of a triode power detector is similar to that of the triode when used as an audio amplifier (explained in a previous instalment), with the important exception that instead of working on the straight portion of the plate current grid volts characteristic curve, the valve is biased back so that the operating point falls on the bottom bend.

This is illustrated in fig. 3, the

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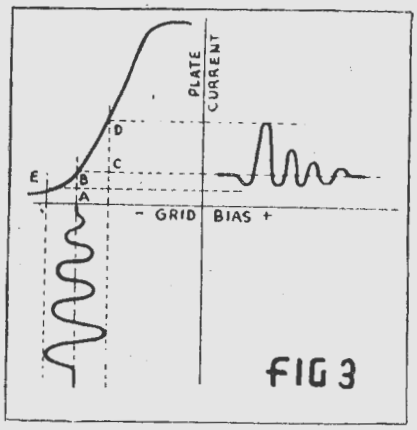


DETECTION
(Continued)

valve being biased so that the operating point is set at "B." When a signal is applied as shown, the maximum swing to the right takes the point to "D." The grid bias is decreased, and hence the plate current increased by an amount represented by "CD."

The next swing, to the left this time, takes the operating point to "E." The bias is increased, so the plate current decreases — by an amount represented by "AB." The distance "CD" is appreciably greater than "AB", and so rectification is obtained (not complete, because the negative swing is not completely cut out). This rectification is due to the curvature of the characteristic.

The power detector has the disadvantage that it is not very efficient, and also it distorts when the input is small. Hence it is necessary to have one or more stages of radio frequency amplification ahead of the detector to present as large a signal as possible to it.

Another widely popular method of detection is the leaky grid detector. Its main advantage is that it is highly sensitive, though its power handling capacity is limited. Power grid detection is a compromise bebetween the power and leaky grid detector, in that it is an adaptation of leaky grid detection to allow of bigger inputs without distortion. These two methods of detection will be outlined in detail next month.

RADIO QUIZ

QUESTIONS

(1) What do Hecto and Centi mean?

(2) What valves would do to replace types (1) LA; (2) PZ; (3) PZA?

(3) A wire has a diameter of .018 inches. What would be the standard wire gauge of this wire?

(4) Bronze is an alloy. What proportions of other metals do you require to make bronze?

(5) A resistor which had to be replaced had an orange body, black and yellow dot. What was its value?

(6) An Octode is a coil having 8 connections. True or false?

(7) What is the colour code of a 4,000 ohm resistor?

(8) Where is Station HBJ?

(9) You have two condensers, a .001 and .002. What would be the resultant capacity if you joined them (A) Series, (B) Parallel.

(For Answers see page 26)

ELECTRONIC MICROMETER

A micrometer accurate to .000002 inch is being used to measure the stretch of a bolt that holds together two sections of the crankshaft of an aircraft engine. The bolt is tightened under 1,500 foot pounds pressure until it stretches exactly .008 inch.

•

DANGEROUS PRICKLY PEAR

It seems that prickly pears are danger us in more than one way. It is reported that a new explosive called Cactardita, only 3 per cent. less powerful than TNT is made from this pear.

•

ELECTRIC ORE WASHER

A new process for separating valuable metals from low grade ores has recently been laboratory tested. In this process the ore is "sprayed" by an electrical charge. The separator then "washes" out the desired metal by a principle similar to the attraction of iron filings to a magnet. In tests 95 per cent. of the tin present was removed from a low-grade oil.

IDEAS FOR MODERN CIRCUITS

6-Volt Filament Supply

THESE are days of economy and improvisation and occasionally we are faced with parts that do not "match up."

In the "good old days" when 4-volt A.C. tubes had a markedly superior performance when compared with their 2.5 volt brothers, there were plenty of power transformers made with 4-volt filaments. Others, again, were made with 1½, 2½ and 5 volt winding (the 1½, of course, was back in the dark ages of the 226 tube!). The problem is to adapt these old transformers for use with modern 6.3 volt tubes. When there are two or more windings, the problem is not so bad, but if there is only one, then it must be stripped off and rewound.

If there are two 4-volt windings, one of which is centre-tapped, then all of one winding and half of another gives 6 volts. This is a bit lower than the 6.3 required, but the reduced current drain means a slight rise in voltage, and, anyway, modern tubes are not very critical, most of them working on anything between 5½ and 7 volts. If the transformer has 1½ and 5 volt windings, then these in series give 6½, which is near enough. (I have come across examples of "servicing" where two 2½ volt windings in series have been employed for a 6-volt output tube, but this is not recommended.)

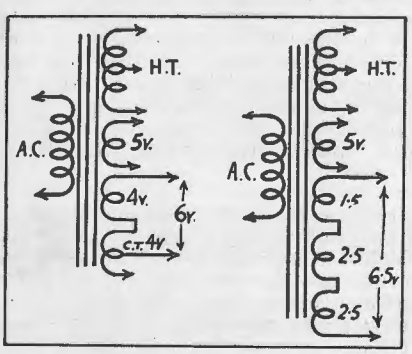
One thing to look out for is the possibility that each of the filament windings may be earthed inside the transformer, or the C.T., of one may be connected to the C.T. of the high-tension supply. In the latter case, the filaments should not be earthed at any place, or a back-bias resistor may be shorted, thus causing a strain on the output valve.

Battery One-Tube Reflex

Last month we published the circuit of a novelty A.C. one-tube reflex using a 2-in-one tube such as the 6AD7 or 6H7M. This month we give a reflex built around the 1D8GT, a three-in-one tube with a 1.4 volt filament. The pentode section functions as an aperiodic R.F. stage as well as an A.F. output stage, while the triode is also reflexed as R.F. and A.F. amplifier with the diode as detector, thus giving the single tube five functions. Naturally, such high efficiency means that things are rather critical, careful shielding being necessary. The primary of the A.F. transformer may need reversing.

Coupling between the pentode (first R.F.) and triode (second R.F.) is by means of a conventional tuned R.F. transformers, while the R.F. coupling to the diode is by a small condenser.

Thus only one tuned circuit is employed, simplifying construction somewhat and reducing the chances of unwanted oscillation, always a possibility in a reflex.



Two ways of getting a six-volt filament supply from obsolete transformers.

This month's collection is:

1. **6-volts from 4-volt P.T.**
2. **1D8GT as Reflex.**
3. **Screen Voltage Source.**

The diode load consists of the primary of the A.F. transformer, the secondary of which feeds the detected signal back to the triode section. After amplification at audio-frequency by the triode, the pentode section comes into use again, receiving its A.F. signal from the triode in the normal resistance-capacity coupling manner.

The speaker should be of the permag. type with an impedance of 12,000 ohms or over. (Anything up to 25,000 is O.K., the higher impedances being more suited to lower operating voltages.)

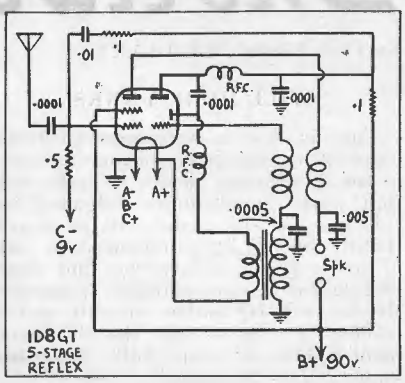
Such a circuit as this has plenty of gain, but tone generally suffers in a reflex, the R.F. by-pass condensers reducing the high-note response.

However, for those who like a "mellow" tone, this is quite in order and the high-cut is not much worse than in some "supers."

Screen Voltage Supply

There are two methods, not often used, of supplying a small voltage to the screen grid of a detector or A.F. pentode.

This voltage is only small and may be taken from the bias resistor of the output stage if the latter employs self-bias. If the output stage is a single pentode, or beam tube, then the screen can be connected directly and the cathode by-pass condenser acts as the screen by-pass also. If the output tube is a 45, 2A3, or other triode, then the voltage may be too high and then the bias resistor must be tapped, or a pair of resistors can be connected across it, forming a simple voltage divider.



The one-valve reflex circuit, which has amazing possibilities, unfortunately both in regard to performance and difficulties.

The resistors also act as decoupling. A separate condenser is required for the screen by-pass, a low-voltage type being suitable.

Should the output stage contain a pair of tubes in class AB, or class AB2, then the voltage will not be quite constant, giving rise to either a drop or gain in the amplification of the pentode, and this may be accompanied by distortion.

Another source of voltage in the case of a battery-operated amplifier, is the low-tension battery. If a 12-volt battery is used with the negative side earthed, the 12-volt potential from the positive side is enough for the screen of an A.F. amplifier.

In a battery amplifier built some time ago, the battery furnished SG voltage for two tubes, as well as bias voltage for the outputs!

In a previous article of this series a circuit for semi-fixed bias was shown. This used the battery as well as a cathode resistor.

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BUG VARNISH

Do you know that shellac is produced not by a chemical or paint factory, but by a small insect called the lac bug? In parts of Burma, Siam and India this little bug, only one-fortieth of an inch long, feeds on the sap of certain trees and exudes a substance which is used for shellac.

Shortwave Review

CONDUCTED BY
L. J. KEAST

NOTES FROM MY DIARY

STILL MORE YANKS

This is not a reference to troop movements, but just another instance of the Americans' desire to make sure that their programmes intended for this part of the globe will be heard. Hardly had WJQ commenced to fade of an evening before we find them testing for a more suitable frequency. Result is WJQ makes an exit and in comes "a station on the 38 metre band." This is more fully described under "New Stations."

BOSTON GIVES THEM BEANS FOR BREAKFAST

And while we can listen to America of an evening and right into the night if ones cares to stay up and tune to KGEI, we are certainly assured of a choice of transmitter from, say, 6.30 to about 9.30 or 10 a.m. Perhaps the daddy of the lot is our old friend WRUL, Boston, who, on 25.45 metres is a moral to have something of interest. News is given at 7 and 9.

At 7 a.m. one or two other Americans can be heard, WGEO, New York, 31.48 metres, and WLWO, Cincinnati, 25.62 metres, being reliable.

At 7.15, WBOS, Boston, 25.27 is O.K., and at 7.30, KWU, 'Frisco, opens with news on 19.53 metres and a mighty fine signal. A little later WHL-5, New York, comes into the picture with news at 8, 9 and 10. WHL-5 is on 30.31 metres, while WHL-6, on 30.77 metres, is audible.

Closing at 8.15, WLWO opens again at 8.30 on 19.67 metres and WNBI, New York, 31.02 metres is heard from 8.15. Thus two more opportunities are available to listen to "One of the United Nations Stations."

Going back to Boston, on Sunday, February 28, at 9.15 I heard news read from The West Indies Radio Newspaper, evidently a new feature (and certainly the Caribbean page was worth hearing); it is to be put over every Sunday.

ICELAND

With justifiable pride Mr. Condon hastened to advise picking up this country! and, in entering same in my "bible," I find two notes culled from "The Broadcaster" that are interesting: "Iceland's Althing, or Parliament, the oldest in the world, recently voted for complete independence and severance of the union with Denmark. The Althing celebrated its 1,000th birthday in 1930. It first met in the open air, on a rocky plain carpeted with moss and heather, beneath the glaciers at Thingvellir. The assembly presided over by a speaker, was called once in two years. Assessment of blood money due to a dead man's family from the murderer was often among the more urgent business. To-day the Parliament meets in a convenient building at Reykjavik."

"Iceland, with its forbidding name, has recently made a new appeal to popular imagination. Taking advantage of the innumerable hot springs of water there, British and American military forces have been cultivating secluded valleys and parts of the coast and have just revealed the fruits of their success at a show where they exhibited grapes, melons and bananas —all grown in the open."

BBC MICROPHONE
"Synonym for Truth"

The microphone with the BBC label figures prominently nowadays in most photographs of British broadcasters in action. The device was introduced only a year or so ago when such photographs, or reproductions of them, began to be sent abroad in considerable quantities.

Its introduction represented the expression of a legitimate pride; for the BBC microphone had already begun to command not only the attention, but the respect of the world. Those three leters BBC have now come to be recognised in every part of the world as a symbol and a synonym for truth as surely as the swastika has come to be recognised as the symbol of all that is crooked and cruel.

As Mr. Robert Foot, Joint Director-General of the BBC, said in opening the "BBC at War" Exhibition at Glasgow:

"Britain's radio voice has always set the seal of truth. Its news bulletins, read in 22 European languages and 46 altogether in the world service, proceed, all of them, from the same foundation—the foundation of truth. There may be 46 languages, but there is only one BBC; and its news bulletins are heard throughout the whole world, and wherever they are heard they are trusted."

Here is an achievement of which all British people may be justly proud. For, remember, it was not a foregone conclusion in September 1939. There was no guarantee that the world at large would regard the words of the BBC in any different light from the words of the Nazis. The microphone was an untried weapon of war and there were many ways in which it could have been used or abused. But the BBC was resolved upon the decision that, come what might, its own microphone would be preserved as a vehicle for telling the whole world, allied, neutral, and enemy, nothing but the truth.

Magna est veritas at prevalebit. There is a wisdom in the old tag that has stood the test of centuries. It has nothing in common with the cynical maxim of "Mein Kampf" to the effect that people will believe any lie if only it is made big enough and repeated often enough, a maxim that failed to foresee in the microphone the most sensitive and dispassionate detector of a lie ever known.

That the truth will always prevail is due to this peculiar quality in the microphone and to the inherent power of truth itself. Yet to the BBC must go the credit of ensuring that the truth is now being spread far and wide for all who have ears and the will to hear, not least in those countries ruled or occupied by an enemy so afraid of the truth that those who listen to it must do so in peril of their very lives—yet still do so.—"London Calling."

THE BRONZE NETWORK

On November 1, with little publicity, the war-time union of U.S. international broadcasters with government agencies, the O.W.I. (Office of War Information) and COLAA (Co-ordinato of Latin American Affairs) was formally effected.

Under the new set-up all transmitting facilities of our short-wave stations have been leased by the government for the emergency period (not to exceed five years). Programming will be done entirely by OWI, NBC, and CBS, and programmes will originate from studios at NBC, CBS, KGEI, KWID or OWI. The new network, known as the Bronze Network, is managed by F. P. Nelson, with John R. Sheehan, formerly of WGEA-WGEO, as assistant manager. Headquarters of the unified organisation is in the OWI building at 224 West 57th Street, New York City. The best programmes of NBC and CBS are being retained, and to them are being added many new programmes to fulfill the wartime need. Additional transmitting facilities will be added to the Bronze Network as fast as they can be built. The one object of the unified voice known as "The Voice of America," will be to tell the truth to the peoples of the world about what is happening from day to day; about America's part in the war effort.

—"The Globe Circler."

And to the above we might add,

and what fine programmes they are sending over, and hardly a week passes without a change in wavelength, aiming for better and greater reception. That the programmes are followed and frequencies chased is proven by the number of letters received advising of the changes.

THE BRAIN TRUST

No, I'm not going to tell you again how much I follow this excellent session of the BBC, but I'm going to tell you about another Brain Trust that recently met in Adelaide. There, in "The City of Culture," in the still of the night (anytime after 10 p.m. in that city) a bunch of Radio enthusiasts armed with shortwave lists, time charts and a volume of the Australasian Radio World, decided to explore the ether. With commendable decency they made their discoveries known and under "Loggings" we have been able to give you "the dinkum oil" as a result of their burning of "the midnight oil." Oh! before I forget, the Brain Trust consisted of Austin Condon, Rex Gillett, Dudley Spencer, Ern. Suffolk, M. Esterhuizen and Wally Young. They met at Wally Young's, which place, I am told, is always open for the DX-er and so successful was the session that another was arranged at Laura, where Austin Condon "combs the ether."

Well, that's the way to do it. At no time has shortwave listening offered so much in return as at present. At any tick of the clock something of the great struggle can be heard and the studied opinions of the world's greatest thinkers are on the air if we care to tune them in. Compare this with shortwave listening of a few years ago.

Yes, sir, I think with all due respects to our local Broadcast programmes, it behoves each of us to spend a goodly period on the higher frequencies.

ON AND OFF

On April 4 clocks will be advanced in London one hour, making this 2 hours ahead of Greenwich Mean Time.

As advised elsewhere, in Australia where, since September 27, 1942, we have enjoyed Summer Time, we must remember at 2 a.m. on March 28, to put the clock back one hour.

WITH THE R.A.F.

Readers of these pages will remember the excellent reports sent along by Reg. Clack, and long after he joined the forces he still found time to tune-in, and what was more rushed his finds down to me so that our members could reap the benefits of his discoveries. Where he is now, he says, only enables him to log the Yanks, an occasional Indian and Chinese or two. Broadcast listening is impossible on account of static, and he suggests he knows now why the N.I.R.O.M. transmitters all operated on frequencies above 1550 kc. They would never have been heard through the interference.

Mr. Clack received a letter from XEWW, Mexico City, regretting they had run out of QSL cards, but promised to send one at a later date. They advised they were acquiring a new 25 KW shortwave plant, but did not know on what frequency it would operate, yet.

A bunch of ARW's have been sent to Sergeant Clack and I know the good wishes of the members of the AWDXAW club go with them.

ALGIERS

Latest copy of "The Globe Circler" states new call signs for the two Algerian stations are AFH, 12,120kc., 24.76m. (late TPZ), and AFH-2, 8960kc., 33.48m, (late TPZ-2).

AND HOW!

Anxious to know how VLQ and VLQ-3 were being received in the districts for which they were intended, I wired Dr. Gaden and Hugh Perkins. Sure enough within an hour or two I was advised that reception throughout transmissions of both stations was perfect. Well, this is as was expected, but what intrigues me most is the alertness of these two listeners. Hardly is the station on the air, but they can furnish a reply regarding reception. Hugh Perkins could not have been more enthusiastic regarding "our very own" transmitters, had it been actually located on the Atherton Tablelands.

In the same enquiry I asked about WBG-4, (now WKRX) 38.4 metres, and they were very pleased with this new choice of frequency. As a matter of fact, that seems to be the general opinion. Reports from South Australia, Victoria, and my own observations in Sydney welcome this new outlet of "The Voice of America." It is indeed fortunate we have this additional opportunity as WGEO (whose programme WKRX carries) is blotted out very early in the evening, particularly at my listening post.

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RUSSIA'S SLOGAN

When I think back over the many armies that I have seen since war began, I have come to the conclusion that the Russian armies are the best equipped and best cared for. They are, as it were, number one priority in the Soviet Union. "Everything for the front," which is a slogan you see plastered on Russian walls, is more than a slogan: it is a living fact!

—(Phillip Jordan, speaking in a BBC Radio Newsreel on 'The Russian Army.')

NEW STATIONS

WBG-4, New York, 7820kc. 38.4 metres: This station, as from February 3, replaced WJQ. Is heard from 8 p.m. till 11 p.m. Excellent signal and carries same programme as WGEO, 31.08 metres. Just before 8 p.m. a short unexpected announcement tells you this you this WBG-4, Press Wireless, New York, transmitting on 7820kc. After a second or so on comes the familiar announcement, "This is Voice of America. The United States of America, one of the United Nations stations coming to you through WGEO on the 31 metre band and a station on the 38 metre band." At no time during the programme do they mention the name af the station, but after announcer has, at 11 p.m., mentioned programme was heard through WGEO in the 31 metre band, WRUL in the 19 metre band (which I do not think would be audible in Sydney), WCDA in the 25 metre band and a station in the 38 metre bond. Just after he leaves the air, in comes the Press Wireless announcement and station leaves the air at 11.1 p.m.

By the way the first time I heard "One of the United Nations' Stations' was on February 9.

(Since writing the above, announcement is: " . . . and WKRX in the 38 metre band.")

VLQ-3, Brisbane, 9660kc., 31.05 metres: Heard testing on Sunday, February 14, from 11.32 a.m. till 1.50 p.m. This transmitter intended to give better reception in Northern Queensland, commenced operation February 17.

VLQ, Brisbane, 7240kc., 41.44 metres: Heard testing on Tuesday, February 16, at 8.40 p.m. Announced at 9 p.m.: "This is VLQ, Sydney, testing on a carrier frequency of 7240kc., or a wave-length of 41.44 metres, Station VLQ will now close down, opening again in approximately 15 minutes as VLQ-3 Sydney on 9.66 m.c., 31.05 metres."

This is also being used in Queensland service, see Loggings for schedules.

TFJ, Reykjavik, 12,235kc., 24.52 metres: I am including this under New Stations, as it will be new to most of our readers. When it first opened I am not sure, but a note in "My Diary", taken from "The Listener In", of December 27, 1937, says: "This station broadcasts an English session at 4.40 a.m. each Monday. Musical items, news and talks are featured in the programme. The Director of the Icelandic State Broadcasting Service welcomes reports from overseas listeners and is interested particularly in suggestions for the improvements of programmes."

I understand, at the beginning of the present World War, this station closed down, but a few months ago, since the American occupation, has been calling the United States at 7.45 a.m. and at 10.15 a.m. for 15 minutes.

I have an idea Ray Simpson once logged these people, but the fact that Austin Condon has heard them on several occasions is areat news (See "Loggings" for particulars.)

Radio Tananarive, Tananarive, 8355kc., 35.90 metres: Another outlet for Madagascar, brought to our notice by Messrs. Condon and Gillett of South Australia. See Loggings.

ZOY, Accra, 7284kc., 41.2 metres: We have for so long been trying to "tease" ZOY through the noise surrounding 49.98 metres, at 6 a.m., this find of Mr. Gillett will be welcome. This notice just missed February issue, when Mr. Gillett wrote to advise of his catch. Heard at surprsingly good strength this Gald Coast station signs with "God Save the King" at 6.15 a.m. As winter approaches, programmes should improve.

The MONTH'S LOGGINGS

ALL TIMES ARE AUSTRALIAN DAYLIGHT SAVING TIME

But remember Daylight Saving Time ends at 2 a.m. on March 28.

Please have reports sent to L. J. Keast, 23 Honiton Avenue West, Carlingford, to arrive by 24th of month. Urgent reports 'Phone Epping 2511.

Australia:

VLI-3, Sydney ..... 15,315kc., 19.59m 9.15 to 10.45 p.m. for Asia (in Mandarin, English, Malay and Dutch.) Excellent signal (Condon).

VLG-6, Melbourne ..... 15,230kc., 19.69m From 1.15 to 1.45 a.m. for Asia in English.

VLG-6, Melbourne, ... 15230 kc., 19.69m National programme from 11.45 a.m. to 1.30 p.m. Mondays to Saturdays.

VLG-7, Melbourne .... 15160kc., 19.79m National programme 6.30 a.m. to 8.10 a.m. Monday to Saturday. Opens again at 7 p.m. with news till 7.18 p.m. each night. On Sundays programme opens at 6.45 a.m. closing at 8 a.m. Opens again at noon, closing at 1.50 p.m.

VLI-7, Sydney ..... 11,880kc., 25.25m For Eastern States of North America from 11 to 11.45 p.m.

VLR-3, Melbourne .... 11,880kc, 25.25m National programme from 11.45 a.m. to 6.25 p.m. Monday to Saturday. From 12.50 p.m. to 6.30 p.m. Sundays.

VLI-2, Sydney ..... 11,870kc, 25.27m For British Isles. 5.55 to 6.25 p.m.

VLG-4, Melbourne ..... 11,835kc., 25.36m 9.15 to 10.45 p.m. for Asia (in Mandarin, English, Malay and Dutch.)

VLW-3, Perth .... 11,830kc, 25.36m 8.30 a.m. to 11.45 a.m.; 1.30 o.m. to 8.45 p.m. Relays W.A. National programme. Tune at 9.45 a.m. for BBC News.

VLR-8, Melbourne .... 11,760kc, 25.51m National programme from 6.30 a.m. to 10 a.m. Monday to Saturdays From 6.45 a.m. to 12.45 Sundays.

VLG-3, Melbourne ....11,710kc., 25.62m From 4.55 to 5.40 p.m. for Tahiti (in French). 5.55 to 6.25 p.m. for the British Isles, 6.20 to 6.50 p.m. for New Guinea (in Japanese). 7.25 to 8.25 p.m. for New Caledonia (in French)

VLG-8, Melbourne ..... 9680kc., 30.99m 4.10 to 4.40 p.m. for Western States of North America,

VLQ-3, Brisbane .... 9660kc, 31.05m 6.30 a.m. to 10 a.m.; 11.45 a.m. to 6.35 a.m. Mondays to Saturdays. 6.45 a.m. to 12.45 p.m. Sundays(See "New Stations") R5-6 signal (Perkins). Very good signal (Condon). Perfect (Gaden).

VLW-2, Perth .... 9650kc., 31.09m 9 p.m. to 1.30 a.m. relays W.A. National programme.

VLI-6, Sydney ..... 9590kc., 31.28m 4.10 to 4.40 p.m. for Western States of North America.

VLG, Melbourne ..... 9580kc., 31.32m For Western States of North America from 2 a.m. to 2.45 a.m.

VLR, Melbourne .... 9580kc., 31.32m National programme from 6.45 p.m. to 7.35 p.m. Monday to Saturday. From 6.45 p.m. to 11.30 p.m. Sundays

VLG-2, Melbourne ..... 9540kc., 31.45m For Eastern States of Nth America from 11 to 11.45 p.m. To Asia in French and Thai from midnight to 1 a.m.

VLQ, Brisbane .... 7240kc., 41.44m 7.50 to 11.30 p.m. Monday to Saturdays 6.45 p.m. to 11.30 p.m. Sundays. (See "New Stations.") R8-9 signal (Perkins) Good signal here (Condon and Gillett, S.A.) Dr. Gaden says "Perfect throughout."

VLI-4, Sydney ..... 7220kc., 41.55m Excellent when giving special programme for Forces in S.W. Pacific from 8.30 to 9 p.m. Good (Gaden).

VLN-8, Sydney .... 10,525kc., 28.51m Again being heard with session to North America from 4.10 p.m. to 4.40 p.m. (Condon).

Oceania:

New Caledonia:

FK8AA, Noumea .... 6162kc., 48.68m From 6,15 p.m. to 8 p.m. with news at 7 p.m.

Note slight change in frequency. (Closes at 7.15 on Sundays). Very good signal at present. New wave length seems to suit.

AFRICA

Abyssinia:

——, Addis Ababa ..... 9620kc, 31.19m From 2.40 a.m. to 3.15 a.m, News at 3 a.m.

Kenya Colony:

VQ7LO, Nairobi ..... 10,730kc, 27.96m 3 a.m. to 6 a.m. News at 3.15 a.m. and 5 a.m. R4 at 3 a.m. (Gillett).

VQ7LO, Nairobi .... 6060kc., 49.5m Same as 27.96m.

Algeria:

TPZ, Algiers .... 12,120kc. 24.75m Irregular 6-7 a.m. See "Diary."

TPZ-2, Algiers .... 8960kc, 33.48m Mondays only from 6 to 7.30 a.m. English programme is given. R4 around 6.30 a.m. (Perkins).

French Equatorial Africa:

FZI, Brazzaville .... 11,970kc, 25.06m 6.30 a.m. to 7.30 a.m. News 6.45 a.m. Opens again from 5 to 5.30 p.m. in French programme.

Madagascar:

FIQA, Tananarive .... 9700kc, 30.93m 2 a.m. to 3 a.m. Signs off with "Marseillaise."

Radio Tananarive, Tananarive, 6162kc, 48.68m Said to be heard at 1 a.m. with good signal.

Radio Tananarive, Tananarive, 8355kc, 35.90m Mr. Condon says, "Defnitely identified this time. Fair signal at 3.45 a.m. Mainly musical programme. Station's identification given at 4 a.m. closes at 4.45 a.m. All French session run by Free French authorities." Mr. Gillett, also of South Australia, heard this one at 3.45 a.m.

(This is certainly a fine catch.—Ed.)

Portuguese East Africa:

CR7BE,Laurenco Marques .... 9845kc, 30.7m 5.25 a.m. to 7.40 a.m. News 6.52 o.m.

Gold Coast:

ZOY, Accra, ... 6002kc, 49.98m 2 a.m. to 7 a.m. News 6.30 a.m.

ZOY, Accra .... 7284kc, 41.2m Heard at surprisingly good volume, closes at 6.15 a.m. Closes with "God Save the King." (Gillett). See "New Stations".

South Africa:

ZRK, Capetown .... 6097kc 49.20m Said to be heard closing at 7.45 a.m.

ZRH, Johannesburg .... 6007kc, 49.95m Also said to be heard closing at 7.45 a.m. (Latest list give schedules: 1 a.m. to 7 a.m. and not audible here after 6.30.—Ed.)

ZNB, Mafeking .... 5890kc, 50.90m This African is said to be in same relay as ZRK and ZRH, but my latest list shows ZRK and ZNB as on the air from 2.45 p.m. to 4.45 p.m. at which time I doubt if they would be heard.—Ed.

A late message from Hugh Perkins advises, R6 at 6.45 a.m.

Egypt:

SUX, Cairo .... 7865kc, 38.15m Very good signal in Arabic around 6.30 a.m. R6-7 (Perkins).

SUP-2, Cairo .... 6320kc, 47.47m From 3.10 a.m. to 4 p.m.

Senegal:

FGA, Dakar .... 9410kc, 31.88m 6.15 a.m. to 9.05 a.m. On favourable days can be heard around 6.30 to 7.

AMERICA

Central:

Costa Rica:

T14NRH, Heredia .... 9740kc, 30.80m Sundays 2.30 p.m. to 3.30 p.m. On favourable nights can be heard around 11 p.m.

TIEMP, San Jose .... 10,050kc, 29.85m Said to be on air from 2 to 3 p.m.

Panama:

HP5A, Panama City .... 11,700kc, 25.64m Midnight to 4 a.m. 12.10 p.m. to 4 p.m. Heard around midnight.

Guatemala:

TGWA, Guatemala City .. 15,170kc, 19.78m 7 a.m. to 9.15 a.m. on Mondays.

TGWA, Guatemala City .... 9685kc, 30.98m 3 p.m. to 4 p.m. on Sundays.

North:

WCB, Hicksville .... 15,580kc, 19.28m Heard with fair signal from 8.15 a.m till 9 a.m.

KWU, Dixon .... 15,355kc, 19.53m 7.30 a.m. to 9.15 a.m. News 7.30, 8 and 9 a.m. Very good signal (Gillett)

WRUW, Boston ....15,350kc, 19.54m 1 a.m. to 5.30 a.m.

WGEA, New York .... 15,335kc, 19.57m 12.01 a.m. to 6.30 a.m. News hourly on the hour.

KWID, 'Frisco .... 15,290kc 19.62m 8 a.m. to 12.15 p.m. News hourly on the hour.

WLWO, Cincinnati .... 15,250kc, 19.67m 12.30 a.m. to 4.30 a.m.; opens again at 8.30 for Latin America, closing 10.45.

WBOS, Boston .... 15,210kc, 19.72m 12.01 a.m. to 3.45 a.m. News hourly on the hour.

WNBI, New York .... 15,150kc, 19.81m 12.01 a.m. to 7.30 a.m. News hourly on the hour.

WDO, Ocean Gate (N.J.) 14470kc, 20.73m 5 a.m. to 7 a.m.

WRCA, New York .... 11,893kc, 25.22m 5 a.m. to 7.45 a.m.

WBOS, Boston .... 11,870kc, 25.27m 4 a.m. to 9.30 a.m. Good at 7 a.m.

WGEO, New York .... 11,847kc, 25.33m 12.01 a.m. to 11 a.m.

WCDA, New York .... 11,830kc, 25.36m 5 a.m. to 8.30 a.m.

WRUL, Boston .... 11,790kc, 25.45m 4.30 a.m. to 9.30 a.m. News 7 and 9 a.m.

WLWO, Cincinnati ...., ... 11,710kc, 25.62m 4.15 a.m. to 8.15 a.m. Good at 8 a.m. (Gillett).

KWV, Dixon ....10,840kc, 27.68m 5 p.m. to 7.30 p.m. Very good signal (Goard, Ferguson). Sporting results at 6.45 p.m.

KES-3, 'Frisco .... 10,620kc, 28.25m 3 p.m. to 9 p.m. Quite good (Goard, Ferguson).

WJQ, New York .... 10,010kc, 29.97m Now withdrawn from service. (See WBG-4, "New Stations.")

WHL-5, New York .... 9897kc, 30.31m 7.45 a.m. to 10.15 a.m. News on the hour. Very good at 9.15.

WDL, Ocean Gate (NJ.) .... 9750kc, 30.77m 7.15 a.m. to 10.15 a.m. News 9 a.m.

WRUW, Boston .... 9700kc, 30.93m 5.45 a.m. to 11 a.m. News 7 a.m. and 9 a.m. Good at 8 a.m. (Gillett).

WNBI, New York .... 9670kc, 31.02m 8.15 a.m. to 7 p.m. Good at 8.30, but missing for best part of day till around 4 p.m. Now over-powered by VLQ-3.

WGEO, New York .... 9650kc, 31.08m 8 p.m. to 11 p.m. News hourly on the hour. (Often poor by 10 p.m. Tune to WBG-4, WKRX, 38.4m.

WLWO, Cincinnati .... 9590kc, 31.28m 11 a.m. to 3 p.m. News 11.30 a.m. Opens again at 11 p.m. for Sth America at good strength (Gillett, Condon, Gaden).

KWID 'Frisco .... 9570kc, 31.35m 12.30 p.m. to 9 p.m. News on the hour. Sporting resuts at 6.45 p.m. Good signal. (Goard, Ferguson)

WGEA, New York .... 9550kc, 31.41m Heard with fair signal around 8.30 a.m.

WGEO, New York .... 9530kc, 31.48m 6.45 a.m. to 8.15 a.m. News at 7 and 8

(Continued on page 24)

LOGGINGS
(Continued)

a.m. Very good at 8 a.m. and 9.15 p.m. (Gillett).

KEI, Bolinas 9490kc, 31.61m
3 p.m. to 4.05 a.m. News on the hour.

WCL, New York 9390kc, 31.95m
R5 signal at 8 a.m. (Gillett).

KES-2, 'Frisco 8930kc, 33.59m
9.15 p.m. to 12.30 a.m., 12.45 a.m. to 4.05 a.m. Poor signal (Ferguson).

WBG-4, New York 7820kc, 38.4m
8 p.m. to 11 p.m. This is a new outlet for "The Voice of America," "One of the United Nations Stations." (See New Stations).
Now announces as WKRX (Gillett, Condon), (Ferguson, Gaden).

KWY, 'Frisco 7565kc, 39.66m
7.45 p.m. to about midnight. Good signal (Goard Ferguson).

KGEI, 'Frisco 7250kc, 41.38m
4 p.m. to 3.05 a.m. News on the hour.

KWID, 'Frisco 7230kc, 41.49m
9.15 p.m. to 12.30 a.m. News hourly. 12.45 a.m. to 4.05 a.m.

WBOS, Boston 6140kc, 48.86m
Heard from about 5 p.m. to 8 p.m.

WLWO, Cincinnati 6090kc, 49.26m
Heard from about 5 p.m. to 8 p.m.

WRUS, Boston 6040kc, 49.67m
5 p.m. to 9 p.m.

Mexico:

XEFT, Mexico City 9550kc, 31.40m
Heard just before closing at 5 p.m. on some days.

XEWW Mexico City 9503kc, 31.57m
4 p.m. to 4.45 p.m. Good in afternoons and is heard some nights at 11.30 p.m.

South America:

Chile :

CE1170, Valparaiso 11,700kc, 25.64m
Fair at 3 p.m.

CE970, Valparaiso 9735kc, 30.82m
Only fair about 10.30 p.m.

CE960, Santiago .... 9600 kc 31.25m
Best on Sundays around 4 p.m

Ecuador:

HCJB, Quito 12,460kc, 24.08m
I thought this frequency had been dropped and American reports confirmed this, but both Mr. Perkins and Mr. Condon advise hearing them in parallel with 9950kc, at 9 a.m.

HCJB, Quito 9958kc, 30.12m
10.45 p.m. to 12.45 a.m.; 3.30 a.m. to 6.30 a.m.; 9 a.m. to 1.45 p.m. Slogan: "The Voice of the Andes" (Perkins, Condon.)

THE EAST

China:

XGOX, Chungking 15,195kc, 19.74m
Heard at 11.5 a.m. with fair signal in Chinese programme (Condon). (Not audible here.—Ed.)

XGOY, Chungking 11,900kc, 25.21m
5.30 a.m. to 7 a.m. 9 p.m. to 10.30 p.m. News 9 p.m. Good in news at 9 p.m. (Condon).

XGOA, Chungking 9720kc, 30.86m
5.30 a.m. to 7 a.m. 10 p.m. to 2 a.m. News 1 a.m. R7 at 10 p.m. (Gillett, Perkins). Good at 1 a.m. in English (Condon).

XGOY, Chungking 9625kc, 31.25m
Irregular broadcasts to U.S.A. at 11 p.m.

XGOY, Chunking 6130kc, 48.92m
9.30 p.m. to 3.30 a.m. News 11.30 p.m., 1 a.m. 1.30 a.m. and 3 a.m. Excellent signal.—Ed.

India:

VUD-3, Delhi 15,290kc, 1962m
2.30 p.m. to 8.30 p.m. News 2.30 and 6 p.m.; 9.30 to 11.15 p.m. R7 at 10 p.m. (Gillett, Perkins, Ferguson).

VUD-4, Delhi 11,840kc, 25.34m
11.20 p.m. to midnight, news 11 p.m.

VUD-3, Delhi 11,790kc, 25.45m
9.30 p.m. to midnight. News 11 p.m.

VUD-3, Dehli 9670kc, 31.02m
9.30 p.m. to midnight; News 11.30 p.m. At 11.30 p.m. announces "This is the United Nations Calling".

VUD-2, Delhi 9590kc, 31.28m
10 p.m. to 3.30 a.m., News 11 p.m. and 1.50 am. R5 at 10 p.m. (Gillett)

VUD-4, Delhi 7260kc, 41.32m
Midnight to 5 a.m. (Good, Gillett).

VUM, Madras 6150kc, 48.78m
9 p.m. to 2.30 a.m. News 11 p.m. Good at 2 a.m. in Hindustani (Condon, Gillett).

VUD-4, Delhi 6130kc, 48.94m
Midnight to 5 a.m.

VUC, Calcutta 6010kc, 49.92m
10 p.m. to 5 a.m. Good in Hindustani at 11.45 p.m. News in English at midnight. Leaves the air for a while at 12.18 a.m. (Condon). (Good at 4 a.m. in native programme.—Ed.)

GREAT BRITAIN
"This is London Calling"

GSH 21,470kc, 13.97m
9.45 p.m. to 2.15 a.m. Fair at 10.10 p.m. (Gillett, Condon) (Not audible here now.—Ed.)

GVO 18,080kc, 16.59m

GRQ, ... 18,030kc, 16.64m
9.45 p.m. to 2.15 a.m. Heard nightly, good (Ferguson).

GRP, ... 17,890kc, 16.77m
Not reported.

GSV, ... 17,810kc, 16.84m
5.45 p.m. to 8.45 p.m.; 9.45 p.m. to 12.15 a.m. 2.30 a.m. to 5.15 a.m.

GSG 17,790kc, 16.86m
Not reported

GRA 17,715kc, 16.94m
Fair, some nights after midnight (Condon).

GRD, ... 15,450kc, 19.42m
6 p.m. to 8.45 p.m.; 9.45 p.m. to 12:30 a.m

GRE, ... 15,390kc, 19.49m
6 p.m. to 8.45 p.m.; 11.15 p.m. to 2 a.m. 2.30 a.m. to 6 a.m. Heard nightly, Good (Ferguson).

GSP, ... 15,310kc, 19.6m
4.45 p.m. to 8.45 p.m.; 9 p.m. to 9.30 p.m.

GSI 15,260kc, 19.66m
9.45 p.m. to 12.15 a.m.; 2.30 a.m. to 7:45 a.m.

GSO 15,180kc, 19.76m

GSF 15,140kc, 19.82m
4.45 p.m. to 8.45 p.m.; 9.45 p.m. to 2.15 a.m.; 2.45 a.m. to 4.25 a.m.

GRF 12,095kc, 24.80m
5.30 p.m. to 9.30 p.m.

GRV, ... 12,040kc, 24.92m
4.45 p.m. to 7.45 p.m.; Mr. Condon reports good signal at 3.10 a.m.

GSE 11,860kc, 25.29m
2.30 a.m. to 7 a.m.; 7 a.m. to 8a.m.

GSN 11,820kc, 25.38m
9.30 p.m. to 2.30 a.m.; 6 a.m. to 7.45 a.m. Good at midnight (Goard). Good in English in African service at 5 a.m. (Condon).

GSD 11,750kc, 25.53m
4.45 to 5.45 p.m.; 9.45 p.m to 2.15 a..m.; 2.30 a.m. to 7.45 a.m.; 8.15 a.m. to 3:45 p.m.

GRG, ... 11,680kc, 25.68m
4.45 p.m. to 8.45 p.m.; 6 a.m. to 7.45 a.m.; 8.15 a.m. to 3.45 p.m. Fair at 1.45 p.m. Good at night (Goard).

GRH 9825kc, 30.53m
4.45 p.m. to 7.45 p.m.; 8.15 a.m. to 3.45 p.m. Good in afternoons. Poor from 9 a.m. to 1.45 p.m., then OK. Good in evenings (Ferguson).

GRX 9690kc, 30.96m
5.30 p.m. to 9.30 p.m.; 9.30 p.m. to 2:30 a.m.; 3 a.m. to 9 a.m. Fair at midnight (Condon).

GRY, ... 9600kc, 31.25m
4.45 p.m. to 5.30 p.m.; 4.30 a.m. to 7:45 a.m.; 8 a.m. to 9.45 a.m.

GSC 9580kc, 31.32m
3 a.m. to 8 a.m.; 8.15 a.m. to 3.45 p.m.

GSB 9510kc, 31.55m
4.45 p.m. to 8.45 p.m.; 9.45 p.m. to 11 p.m.; 12.30 a.m. to 2.15 a.m ; 2.30 a.m. to 4.15 a.m.; 4.30 a.m. to 8 a.m.; 8.15 a.m. to 9 a.m.

GRU 9455kc, 31.75m
5.30 p.m. to 9.30 p.m.

GRI 9415kc, 31.86m

GRJ, ... 7320kc, 40.98m
3 a.m. to 9 a.m. (foreign language). Splendid at 8.30 a.m. (Gillett).

GSU, ... 7260kc, 41.32m

GSW 7230kc, 41.49m
3a.m. to 9 a.m. (foreign language).

GRK 7185kc, 41.75m

GRT 7150kc, 41.96m
5.30 p.m. to 9.30 p.m.

GRM 7125kc, 42.11m
1.45 p.m. to 3.45 p.m.; 4.45 p.m. to 7.45 p.m.

GRS 7065kc, 42.46m
5 a.m. to 9 a.m.; 2 p.m. to 3.45 p.m.; Good with programme for the Forces at 7.30 a.m. (Condon).

GRN 6195kc, 48.43m
5.30 p.m. to 9.30 p.m.; 8.15 a.m. to 3:45 p.m. Good on opening in North American service at 8.15 a.m. (Condon).

GRO 6180kc, 48.54m
4 a.m. to 8.45 a.m. Great signal (Gillett).

GRW 6150kc, 48.78m
4 a.m. to 8.45 a.m.

GSL 6110kc, 49.1m
5.30 p.m. to 9.30 p.m.; 3 a.m. to 9 a.m.; 9.45 a.m. to 3.45 p.m. Very good signal (Gillett).

GRR 6080kc, 49.34m
5.30 p.m. to 9 p.m.

GSA 6050kc, 49.59m
5.30 p.m. to 9.30 p.m. 3 a.m. to 9 a.m.

NOTICE TO DX CLUB MEMBERS

Members of the All-Wave All-World DX Club are advised that they should make a point of replenishing their stock of stationery immediately, as all paper prices have risen, and we expect that it will be necessary to increase prices by at least 25%.

Already it has been found necessary to abandon the log-sheets and club stickers. However, while stocks last, the following stationery is available at the prices shown:—

REPORT FORMS.—Save time and make sure of supplying all the infarmation required by using these official farms, which identify you with an established DX organisation.
Price .... 2/- for 50, post free

NOTEPAPER.—Headed Club notepaper for members' correspondence is also available.
Price ....2/- for 50 sheets, post free

ALL-WAVE ALL-WORLD DX CLUB, 119 Reservoir Street, Sydney

(foreign languages). Heard around 8 p.m. (Condon). (Morning session generally spoilt by swirling noise.—Ed.).

GRB 6010kc, 49.92m
Not reported.

GRC 2915kc, 102.9m
This one has not been reported. Understand is used for broadcasts to Canada and U.S.A. in both N.A. and African services (Clack).

EUROPE

Italy:

Vatican State:

HVJ, Vatican City 15,120kc, 19.84m
2 a.m. to 2.20 a.m. on Wednesdays. 8.30 p.m. to 9.05 Sundays.

HVJ, Vatican City 5969kc, 50.26m
5.30 a.m. to 7 a.m. Talk daily every Mondays at 6.15. Good at 5.30 (Gillett).

HVJ, Vatican City 9660kc, 3106m
Fair signal in P.O.W. session at 3 a.m. directed to the British Isles. (Condon, Gillett)

HVJ, Vatican City 11,740kc, 25.55m
6 p.m. is best time for this one ,when it is strong (Gillett). R6 at 4 p.m. (Perkins).

Portugal:

CSW-6, ... 11,040kc, 27.17m
5 a.m. to 9 a.m. Audible till just before 8 a.m. R5 at 6.30 a.m. (Perkins)

Russia:

——,Moscow 15,745kc, 19.05m
10.40 p.m. to 11.20 p.m. News and talks to Great Britain. Fair Signal.

——, Moscow, ... 15,228kc., 19.7m
8.15 am to 840 a.m.; News 8.25. Opens again at 9.47 a.m. with war bulletin. Signal good till closing at 10.25 a.m. English throughout.
News and talks again from 2.15 till 2.40 p.m.

——, Moscow 15,110kc,, 19.85m
Same schedule as 19.7 and signal in afternoon slightly better.

——, Moscow 12,190kc, 24.61m
9.15 p.m. to 10.25 p.m. Talks and music.

Leningrad Radio Leningrad 10,807kc, 27.76m
Mr. Condon says: "After a lot of trouble I finally identified this one. Gives the news in German at midnight. Closes at 12.37 a.m."

——, Moscow 10,445kc., 28.72m
One of the best signals on the air at 10.35 p.m. with Kremlin Bells. at 10.40 p.m. special news and talks to Great Britain and America. Also heard about 5 p.m. in Russian and foreign languages.

——, Moscow 9870kc., 30.4m
9.15 p.m. to 10.25 p.m. Talks and music.

——, Moscow 9765kc, 30.72m
2 a.m. to 3 a.m. News 2 a.m. Good with English commentary at 2 a.m. (Condon).

——, Moscow 9545kc, 31.43m
10.40 p.m. to 11.20 p.m.

Siberia:

RW-15, Khabarovsk 9566kc, 31.36m
6.50 a.m. to 8.30 a.m. Physical exercises at 7.15 a.m. 7 p.m. to midnight.

——, Khabarovsk 5910kc, 50.76m
9 p.m. to 1 a.m.

Spain:

EAQ, Madrid 9860kc, 30.43m
5 a.m. to 6 a.m. Gives news at 5.5 a.m. Signal is fair and from end of news till closing is in Spanish.

Switzerland:

HER-6, Berne 15,305kc, 19.60m
7.45 p.m. to 9.15 p.m.

HER-3, Schwarzenburg 6165kc, 48.66m
5 a.m. to 9.05 a.m.; 4.20 p.m. to 5.40 p.m. Still heard well at 8 a.m. (Giliett).

Scandanavia:

SBT, Stockholm 15,155kc, 19.8m
2 a.m. to 3a.m. News 2 a.m.

SBP, Stockholm 11,705kc, 25.63m
4.56 a.m. to 5.15 a.m. 6.40 p.m. to 7.30 p.m. and on Sundays 7 p.m. till midnight. Good towards midnight (Condon).

MISCELLANEOUS

Arabia:

ZNR, Aden 12,115kc, 24.77m
3.15 a.m. to 4.30 a.m.; gives identification in English as ZED-N-R every 15 minutes.

SPEEDY QUERY SERVICE

Conducted under the personal supervision of A. G. HULL

A.B.C. (Rackdale) asks for valve replacement types for his set and supplies present types (A415, A409, B405). (Circuit is Reinortz.)

A.—Your best plan is to replace these with 2-volt valves using only one section of your 4-volt accumulator. If your sockets are of the UX or American type, then only one of them will require changing, the third one, which will need to be replaced by a 5-pin UY type. (UX sockets have two large and two small holes.) If the first two sockets are of the English type with four equally-sized holes then these must be replaced by UX types. The A415 and A409 are both replaced by type 30 valves, whilst the B405 is replaced by a 1D4, which is a pentode and will give more gain and volume. If the increased gain causes motor-boating, or low pitched hum, try reversed the G. and F leads to the second A.F. transformer. If, on the other hand, a harsh roar gradually builds up just as you tune in a station, connect a .1 meg resistor between the G. and F terminals of the first A.F. transformer and try reducing the plate voltage on the first valve. (Some type -30 valves are a bit microphonic and need a heavy cap or "hat" of lead foil.)

The output valve 1D4 has an extra connection which is taken to the positive side of the B battery. Any voltage between 90 and the 135 you have for your maximum will do. The grid bias voltage on the 1D4 is much less than for the B405, only 4½ to 6 volts being needed. The latter will give you a slight drop in volume. but your batteries will last longer.

✶

J.H. (Shoreton) osks for circuit diagram and wiring diagram for a battery amplifier to work from 2 volts.

A.—We are unable to give you a layout or wiring diagram as that would take too long to prepare. However, layout isn't very critical with battery amplifiers and any neat "breadboard" system is O.K. The circuit shown gives about 2 watts with 180 volts B supply and takes only a few milliamps. when volume is low. With 135 volt supply, the output is about ¾-watt and the drain is about the same, because the bias on the output tubes has to be reduced to 6-volts. Reliable vibrator units for 2-volt operation are impossible to obtain at present, and the chief research officer in a large factory tells us that 2-volt vibrators require reeds of specially thin steel and so you can't rewind a 6-volt vibrator. Another alternative is to build up the vibrator pack published last month, wiring a 10,000 ohm 3-watt resistor in series with the chake to reduce the voltage to 180 volts. You would then have to borrow someone's car battery when you wanted to use the amplifier! Another possibility is to build up a power unit on the lines suggested in "Radio World" for August, 1940, using o small motor and a transformer.

✶

D.S.S. (Rakamea) osks if there are valves which will work from a high-tension supply of only 32 volts.

A.—Yes; but there is no converter which will operate from 32 volts so far as we know. The Philips valve chart shows tetrodes which work from voltages as low as 20, but these are probably of the space-charge type and are not available at present. Valves for deaf-aid apparatus usually work from voltages between 22½ and 45. Again, the actual voltage on the plate of a resistance-coupled valve may be as low as 20-volts so if chake-coupling is used, then the 32 volts will be O.K. Output is a bit of a problem. A pair of 1S4 tubes in push-pull would give you about 1/10th-watt on 32 volts, about the same as the lowest-powered portables, but with an efficient speaker that would probably do. Alternatively, 1C5G valves could be used in push-pull. The remainder of the set would have to be on T.R.F. lines with probably a regenerative detector.

If you have only a 32-volt D.C. supply, your best plan is to use a vibrator type power pack, or again you could use a voltage-doubling vibrator to give you about 55 to 60 volts, which would make things much easier.

✶

A.R.J. (Ringwood) asks, What is a perikon detector?

A.—Sorry, we left it out of our dictionary! The perikon detector, a form of crystal detector, used two crystals of different composition held together by a spring. Zincite and bornite were the two most popular crystals for the pair. The perikon was intermediate between the carborundum and catswhisker-galena as regards stability and sensitivity.

✶

B.E. (Hillston) is trying to wind a power transformer and wants information as to the current in the H.T. secondary.

A.—The actual A.C. current in the H.T. secondary is more than half the D.C. taken from the rectifier. In fact, for a condenser-input filter with large condensers, it may exceed it! For a choke input filter, the A.C. current is about .707 times the D.C. obtained, but we suggest you consider it to be equal to it for safety's sake. For condenser input, the A.C. current wil be between .95 and 1.15 times the D.C. current and we suggest 1.33 as a working figure.

Note !

BACK NUMBERS

On and after April 15 the special offer of back numbers at reduced price will be withdrawn, and all back numbers available will be supplied only at 1/— each, post free.

H.T.E. (Silverton) asks about the additional licences required where more than one set is in operation.

A.—We don't think there is any doubt that you would be legally liable if you failed to take out additional licences for all the extra sets which are capable of receiving broadcast programmes, yet in your particular case it would only be reasonable to expect that any Radio Inspector would use a certain amount of discretion, if the worst came to the worst, and you happened to be unlucky enough to be investigated.

We could not possibly take the responsibility of doing other than advising you to adhere strictly to the law.

✶

P.P. (South Melbourne) enquires about corrosion and the various potentials of metals.

A.—Sorry, but this subject is beyond our scope. It has been established that certain metals have potential values and to place two metals of different potential together is to run the risk of excessive corrosion. There is a lot more to the theory, however, and we can only suggest you get in touch with the Department of Aircraft Production for further information as to the solution of your problem.

RADIO QUIZ — ANSWERS

(1) Hecto means a hundred times, while Centi means a hundredth part of.

(2) (1) 6A4, (2) 47, (3) 2A5.

(3) 26 S.W.G.

(4) 66 per cent copper, 34 per cent. tin.

(5) 300,000 ohms.

(6) False, an Octode is a valve having six grids in addition to the anode and cathode.

(7) Yellow body, black end, red dot.

(8) Berne, Switzerland.

(9) A .00066 and .003.

In the considered judgment of leading engineers...

When important decisions are made about radio valves it is not uncommon for an Eimac valve to win the honors. *Reason:* the designers of Eimac valves have consistently held as their objective the anticipation of the future requirements of the radio industry. Efforts have not been confined to the production of a valve for yesterday's requirements.

This policy has kept Eimac valves ahead of the industry...a factor that is logical because the efficiency and progress of radio depends almost entirely upon the development of new ideas...new improvements in radio valve performance. Take the Eimac 250T, for example, which now possesses the most recently developed refinements. Check these features illustrated below and then check the performance of Eimac valves in your transmitter. You'll see then why Eimac valves are to be found in most of the important new developments in radio.

Follow the leaders to **Eimac TUBES**

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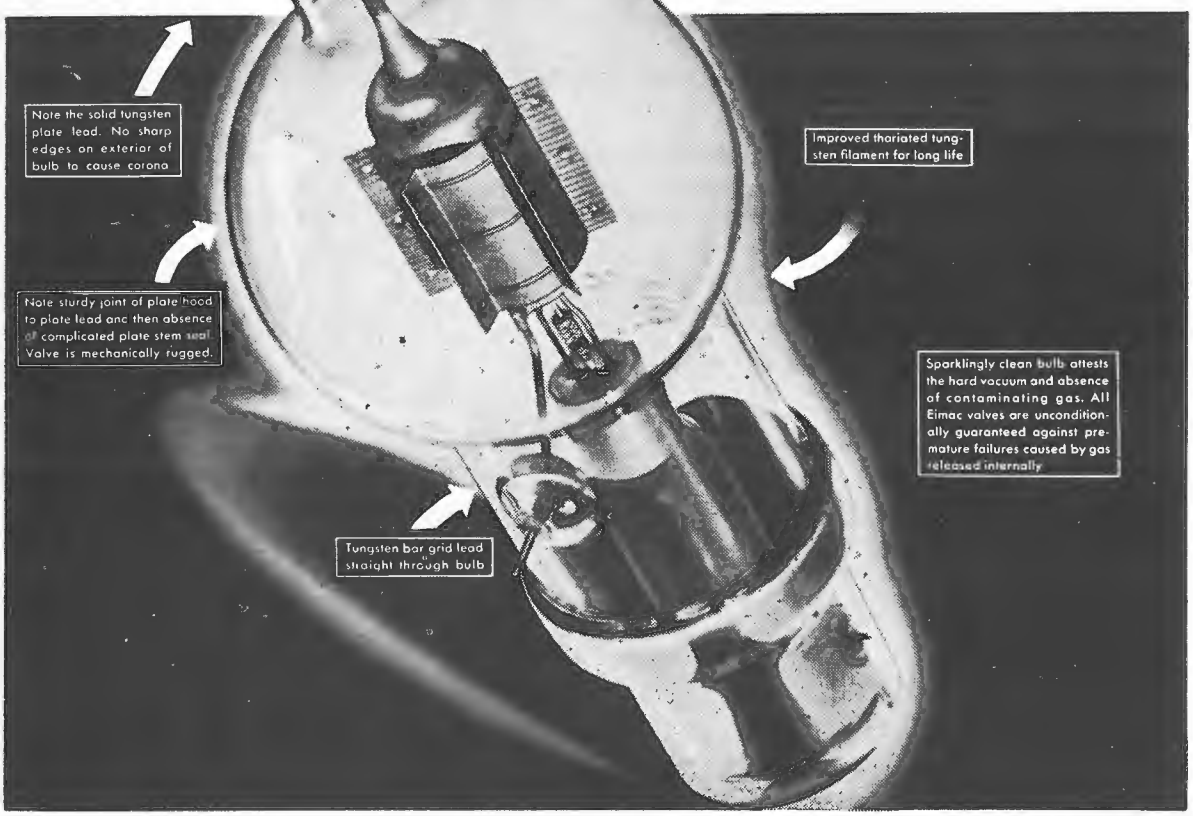

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