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VOL. 8 . . . . . NO. 7 DECEMBER 15 1943

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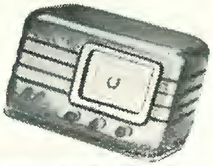

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Saturdays: 10 a.m.–12 noon

★ Editorial Office —
117 Reservoir Street, Sydney

★ Subscription Rates —
6 issues 5/3
12 issues 10/6
24 issues £1
Post free to any address.

★ Service Departments —
Back Numbers, 1/- ea. post free
Reply-by-mail Queries, 1/- each

Vol. 8. DECEMBER, 1943. No. 7

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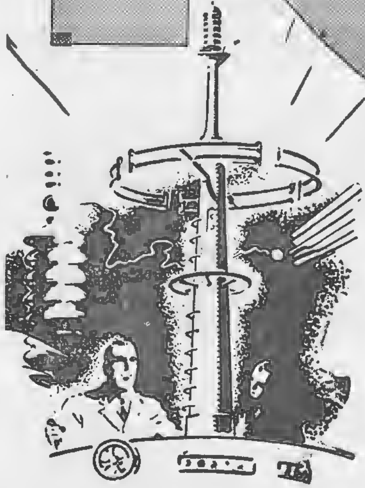
EDITORIAL

In a recent issue we reprinted some remarks about a court-case in America, dealing with radio patents and more particularly, the part which Marconi played in the invention of radio communication. This article aroused considerable comment, especially from those who are loyal supporters of Marconi.

It has been pointed out often enough that wireless waves, as such, were first known as hertzian waves, after Hertz, German scientist who holds credit for their discovery.

A correspondent has pointed out, however, that in December, 1889, an engineer, named Huber, wrote to Hertz and suggested the use of his oscillations for communications, but Hertz turned down the idea! Another correspondent points out that the preliminary experiments in the use of hertzian waves for communications were carried out by a Russian named Popov, who demonstrated reception before the Russian Physical-Chemical Society on May 7, 1895. This demonstration was not the mere starting of Popov's experiments, either, as he had lectured on the subject at the Marine Officers' Club in Kronstadt in the spring of 1889.

Dealing with the recent interpretation by the Supreme Court in U.S.A., it is still far from clear that the court ruling did anything which could be defined as a contradiction of the generally-held view that Marconi was the father of radio communication. There seems little doubt that Marconi and his organisations reaped the honour, glory and financial reward to which they were rightly entitled.



ELECTRONICS IN INDUSTRY

A brief, but comprehensive discussion of the uses of electronic devices in industry.

By

JOHN B. STRAEDE, B.Sc.

A COMPLETE list of each industrial application of electronics with a description of each circuit would require a huge volume (or several volumes!). In this article we attempt to give a number of examples, each of which represents quite a wide range. Electronic devices use not only the familiar high-vacuum rectifier and amplifier tubes of radio, but also gas tubes of various types, rectifiers that are triodes instead of diodes and huge power tubes, both rectifiers and amplifiers. In addition there are, of course, photo-electric cells which act very much like triodes, the grid or controlling electrode being replaced by a light beam. First we will consider the high vacuum tubes and their uses, for these tubes or their radio equivalents are already known to most readers.

High-Vacuum Tubes

These include rectifiers and triode-amplifiers. In industry, rectifiers are used for the production of D.C., sometimes a large D.C. at a low voltage for welding, battery charging, or electroplating (although gas tubes are generally preferred for low voltage high-current work), sometimes at only a minute direct current at an extremely high voltage for cathode-ray work, X-rays (industrial radiography is an immense subject) or for electrostatic dust precipitation. In old-fashioned equipment for high-voltage generation, a spark coil, or transformer, together with a mechanical rectifier being used. These devices produced large amounts of radio interference and are replaced today by transformers and vacuum tube rectifiers.

Dust Precipitation

Dust precipitation processes generally involve the charging of dust particles (if they are not already charged) and their attraction to charged plates or wires. The removal of dust, smoke and fumes from factories is a great factor in maintaining the health of employees, and obtaining maximum production. The high-voltage devices are relatively simple to make and a circuit diagram is given. The current drawn depends on the number of charged particles picked up each second.

Vacuum diodes are often used when a moderate supply of medium or high-voltage D.C. is required, and it is undesirable to generate any radio-frequency disturbance.

Vacuum triodes find application in amplifiers and oscillators. Mechanical relays to work from very small currents are quite delicate and are replaced by 2- or 3-valve current-amplifiers, i.e., amplifiers designed to amplify current rather than voltage or power. Delicate galvanometers are also replaced by such devices — the old lamp, scale and mirror galvanometer have gone and a 3-tube amplifier with rugged meter is used instead. Alternatively, the movement of the light spot of a mirror galvanometer may be used to actuate a photo-cell connected to amplifier and ammeter.

Oscillators are another application of vacuum-amplifiers. An oscillator is really an amplifier with some of its output fed into its input to keep it generating. Oscillators are used to produce alternating curents of different frequencies, high frequency currents being used for induction heating of metal components, currents of frequencies from 20 to 100 Kc/sec. being used for the generation of supersonic vibration and lower-frequency currents for generation of sound and/or vibration for testing the sound-and/or-vibration insulating effect of materials.

Variation in frequency due to a moving object may be accomplished in two ways: either the inductance or the capacitance of the oscillator circuit is changed by the presence of the object. This variation is recorded by a meter so that the approach of an object may operate some mechanical device when the object approaches within a certain distance.

Supersonics

Vibration at a rate too rapid for the ear to perceive as sound is called supersonic vibration. It has both a dispersing and coagulating effect on mixtures of substances. Solids may be more rapidly separated from suspensions in a liquid by shaking the suspension with a supersonic generator. On the other hand, crystals may be shattered and molten alloys more thoroughly stirred by application of supersonic vibration of the correct fre-

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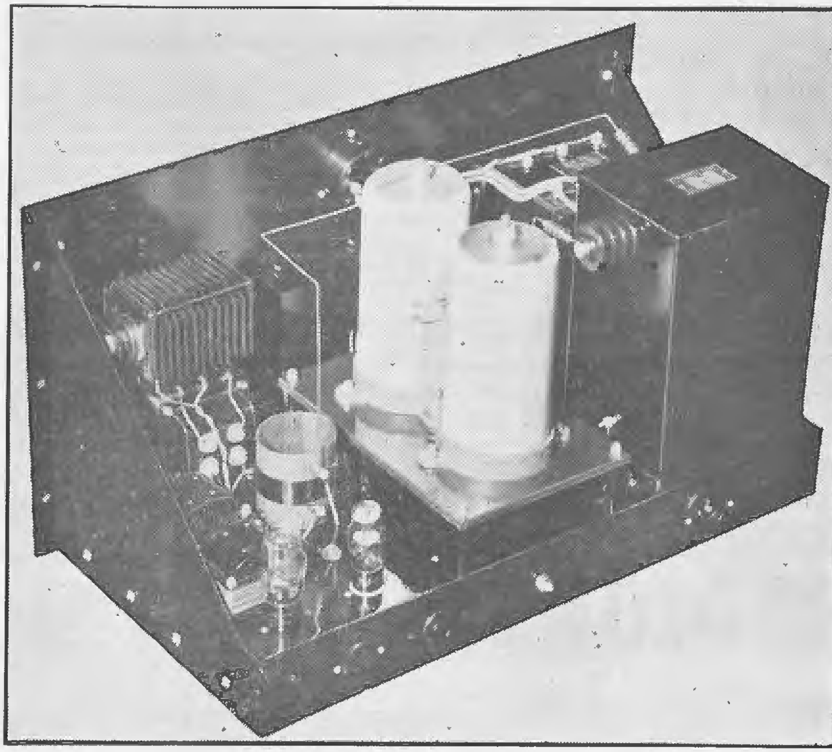


Hilco Automatic Cable Tester

ELECTRONICS

(Continued from page 5)

quency. The high-frequency current from a valve oscillator (often with a power amplifier) can be converted to vibration in a number of ways, the two most popular being by magnetostrictive vibration of a nickel or nichrome rod or by piezo-electric vibration of a quartz plate (as in crystal-controlled oscillators). The former method is used for lower frequency ranges, the latter for higher. For large powers, a mosiac of quartz crystals is used in place of a single crystal. One side of the mosiac is clamped against a steel plate, the other side, the generating side, is gold-plated and contact is made to it by a fine silver-plated brass spring. By using a concave mosiac, the beam of vibration may be focussed to a point as the vibration leaves the surface almost at right angles to it. Supersonics are also used for settling of smoke and dust.

High Voltages

A valve oscillator provides a means for converting D.C. to A.C. — quite an efficient means for certain values of power and for certain voltage ranges. Battery-operated television receivers have been proposed — the D.C. from the H.T. battery operates an oscillator, the voltage of the output being stepped up by means of a tuned transformer and then rectified in the usual way by a diode. The photograph shows an Australian made Cable Tester, which tests insulation at 10,000 volts. This electronic device automatically locates the fault and stops the machine. It can test 200 feet of cable per minute.

D.C.—A.C. Conversion

Special tubes have been devised for converting large quantities of D.C. at a comparatively low voltage to A.C. by means of oscillator circuits.

The low voltage D.C. is supplied as filament current and "high-tension" current to a pair of special valves in a push-pull oscillator tuned to the frequency required for the alternating current. With careful design and suitable tubes, quite high efficiencies are obtained, at least as high as a motor-generator.

Gas Tubes

The behaviour of a diode or triode containing gas, seems rather erratic to the designer who has been accustomed to using high-vacuum tubes. Gas-filled rectifiers handle comparatively large currents with fairly high efficiency, but usually generate considerable R.F. interference. Due to the heat produced, some gas tubes do not require a current supply to heat the cathode. These tubes are called "cold-cathode" tubes (although the cathode is hot!) — filament-less rectifiers is a better name.

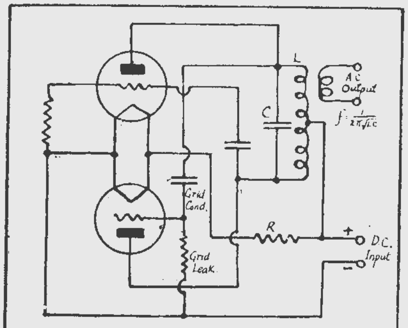
Some gas tubes (like the ordinary neon lamp) have a definite breakdown voltage at which large current flows — these tubes are used as voltage regulators by shunting them across the line and also as relay tubes operated by the change in anode voltage.

Gas-filled triodes (there's not much gas there, but they're always **full** of gas, for it expands to fill the entire space!) have a double characteristic —one as the grid becomes more positive, one as it becomes more negative. Some of these triodes are very critical and a "breakdown" may be produced by light striking the grid. The "breakdown" consists of a very sudden increase in plate current as the tube is taken just into a region of instability.

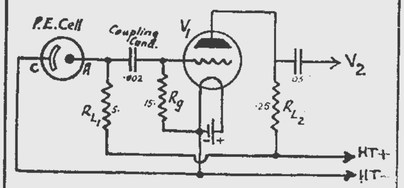
Photo-Electric Cells

There are two kinds of photo-cells: high vacuum and "gas-filled" (only a trace of gas!)

Certain metals, when struck by light of a certain colour, emit electrons, particles of negative electricity. If the metal is in a vacuum, these electrons continue to travel out and may be collected by a positively charged electrode: the anode. The current formed from the electrons may be passed through a resistor and the resultant voltage applied to an amplifier. The metals commonly used are sodium rubidium and caesian; these are metals that rapidly oxidise in air (it takes only a fraction of a second for caesian to oxidise!). Sometimes a trace of an inert gas is introduced into the tube, the gas being



ELECTRONIC "INVERTER".



BASIC PHOTO-ELECTRIC CELL CIRCUIT.

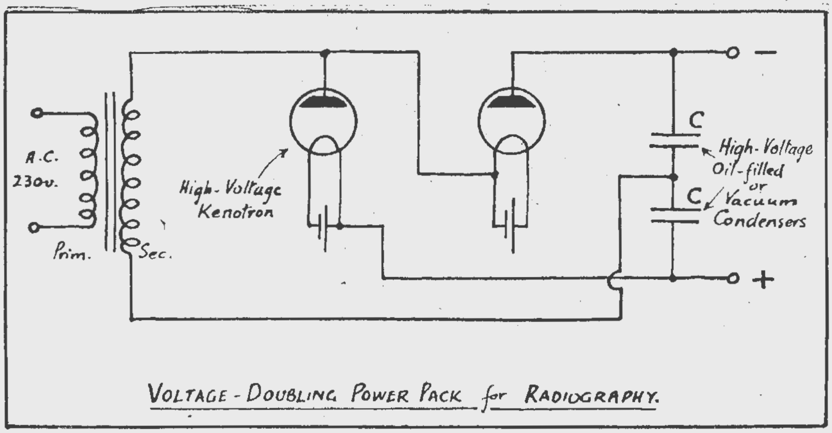
ionised (split up into charged particles or ions) by the electrons and the ions assist in providing the photo-electric current. Probably the photo-cell application commonest to everyone is that of the talkie picture, where variations in area or density of blackening on a film produce variations in light striking a photo cell and variations in photo cell current, after amplification, produce sounds in a loudspeaker. Photo cells have also been used to reproduce music from records, the chief virtue being lack of wear.

Industrial applications of photo cells include automatic counters of parcels on a conveyor, checking of heights, widths and areas of components, automatic opening of doors (the approaching person breaks a light-beam, the photo-cell current changes, a relay clicks and motors turn, or raise, the doors).

We expect to see much more use made of photo cells (and their associated amplifiers) after the war. Mr. Money-bags drives his car (or has it driven) up to the gates, which automatically open. Street lights and factory lights will be switched on, not at some arbitrarily-chosen lighting-up time, but whenever lighting conditions fall below a certain standard.

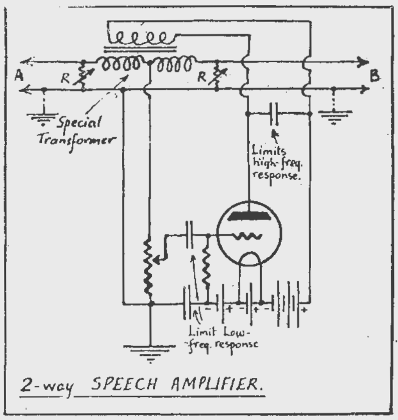
Heating by Electronics

Just as the doctor uses electronic devices to generate heat for therapeutic purposes, so the metallurgist automobile and airplane manufacturer and valve maker use electronics for industrial heating. The basic principle in every case is the same: High-frequency eddy currents are induced in the metal object to tbe heated. The reason for the high frequency is that inducing coil and the metal object act as a transformer and it is usually impracticable to introduce an iron core (unless the object is hollow). Electronic heating is clean, rapid and efficient, besides being controllable and reproducable.



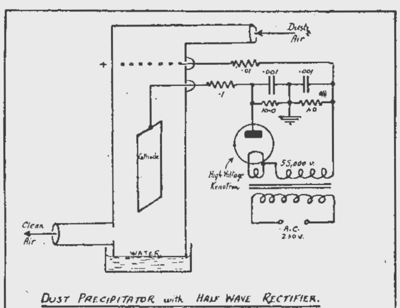
VOLTAGE-DOUBLING POWER PACK for RADIOGRAPHY.

It is interesting that valves are used in the manufacture of valves! Before the final evacuation, the metal electrodes of the valve being made are heated to free them from any trace of occluded gas. This heating is done by passing the valves through the rapidly alternating magnetic field of a coil connected to a valve oscillator.

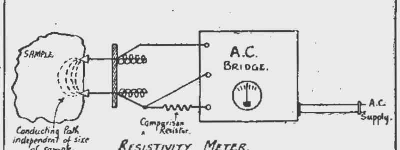


2-way SPEECH AMPLIFIER.

Electronic heating has been found useful in speeding up airplane manufacture. One firm puts in rivets in inaccessible places by the following means: Each rivet has a small quantity of high explosive, such as dynamite placed in the end to be flattened out. The rivets are inserted from the accessible side; then electronic heating explodes the dynamite (or whatever is used) and the explosion folds over the end of the rivet. Thus, electronic heating allows the building of structures which would be otherwise impossible to build.



DUST PRECIPITATOR with HALF WAVE RECTIFIER.



RESISTIVITY METER.

Industrial Radiography

It is standard practice now in many important industries to X-ray metal components as a check against hidden flaws. An X-ray tube is really a power cathode ray tube in which extremely high voltages are used.

The high voltages make the electrons (the "cathode ray") move very fast so that when they strike the target, a button of tungsten set in a copper block, the atoms of tungsten are "excited" and emit X-rays. An X-ray is similar to a wireless wave in that it is an electromagnetic radiation, but is of extremely short wavelength and, consequently, very penetrating (an ordinary radio wave has practically no power to penetrate a metal plate).

The production of voltages for X-ray work also provides an application of electron tubes as rectifiers, though some X-ray tubes are self-rectifying and can be fed with high voltage A.C.

Besides testing components radiographically, direct electrical methods are often used.

The ability of a component to conduct ordinary D.C. to conduct low or high frequency A.C., or to conduct sonic or supersonic vibration, may be used.

The electrical resistance of a piece of metal is often a guide to its purity. It is possible to measure the conductivity of a lump of copper without reducing it to a standard size. The testing device has two sharp prongs which are pushed by a standard force (the release of an adjusted spring) into a reasonably flat surface of the sample, and the resistance is measured directly by a near-balanced bridge and meter. This method is especially valuable as the elements, arsenic, antimony and bismuth, which are most injurious to the use of copper by the metallurgist, are also those which have a great effect on the resistivity of the material.

The same test shows high resistivity if the sample should contain oxide or occluded gas.

Ferrous alloys are tested magnetically rather than electrically. Steel components are checked for magnetic "hardness" (which, for any one alloy, corresponds fairly closely with physical hardness) by measuring their permeability, coercive force or some

(Continued on next page)

ELECTRONICS

(Continued)

such value. Sometimes the hysteresis loss due to a test components in an alternating magnetic field is balanced against the hysteresis loss due to a "standard" component placed in the same magnetic field.

Motor Speed Control

To reduce the speed of an electric motor, a resistor may be inserted in series, but this is not efficient, as power is dissipated in the resistor. Recently, more scientific methods using electron tubes have been developed. In one system, the motor is really switched on and off very rapidly, so that no loss in efficiency occurs. The controlling system consists of a relay valve (an electronic switch) driven by an oscillator. Speed control is effected by varying the bias on the relay valve, changing the fraction of each cycle for which the motor is switched on.

PHOTO-TUBE CHART

A handy four-page chart of Radiotron phototubes has just been released by Amalgamated Wireless Valve Co. Pty. Ltd. This chart gives the characteristic in tabular form of all Radiotron phototubes, including the latest types 931, 934, and 935. Curves of average anode characteristics are given for each type, together with outlines, dimensions, socket connections and spectral sensitivity curves.

In order to conserve paper, only a limited impression has been made and a request has been made by the company that only those directly interested in phototubes should apply for a copy. Copies are available free on personal application to the offices of the company in Sydney, or 3d. each posted.

Two-way Amplifiers

We are all familiar with the usual one-way amplifier in which a sound supplied to a microphone is reproduced by the loudspeaker. But supposing, at the same time, a sound supplied to the loudspeaker has to be reproduced by the microphone! Two-way amplifiers have been used by telephone companies for years (they call them "repeaters"), but radio enthusiasts are almost unaware of their existence.

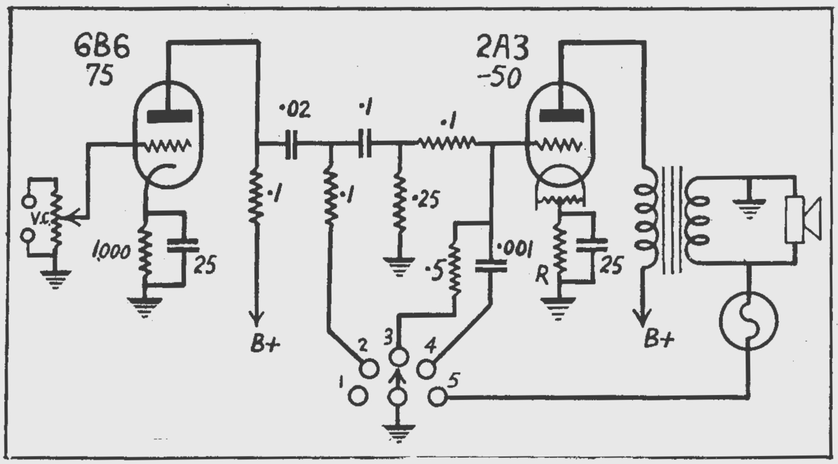
As each is both an input and output, great care is needed in adjustment, and only a limited gain is possible, as otherwise the amplifier would burst into oscillation.

In Conclusion

For the last few months one of our advertisers has been presenting you examples of the uses of electronics. We refer, of course, to the Eimac advts., two of the recent ones dealing with "Radar" and "Electronic Heating."

FIVE - WAY TONE CONTROLS

IN the Nov., 1941, issue we published a circuit which gave an effective means of varying the tonal output of a pentode, or tetrode, valve. The control was built around a 5-way tapping switch, the moving contact of which was earthed, thereby avoiding the necessity for insulation. Inverse feedback was present at all times, only the merest trace being employed when the switch was in the "DX" position. Besides the DX position (giving maximum gain), there were four other positions for "bass," "treble-boost," "high-fidelity" (maximum feedback) and "volume expansion." Later, a variation on the circuit for voice-coil feedback was given, but this second circuit was not so good as the first one. These original circuits were not suitable for triode output valves, nor for triode "drivers," but were very effective when used with pentode and beam tubes.



Circuit for use with a triode valve in first stage.

Twin Circuits

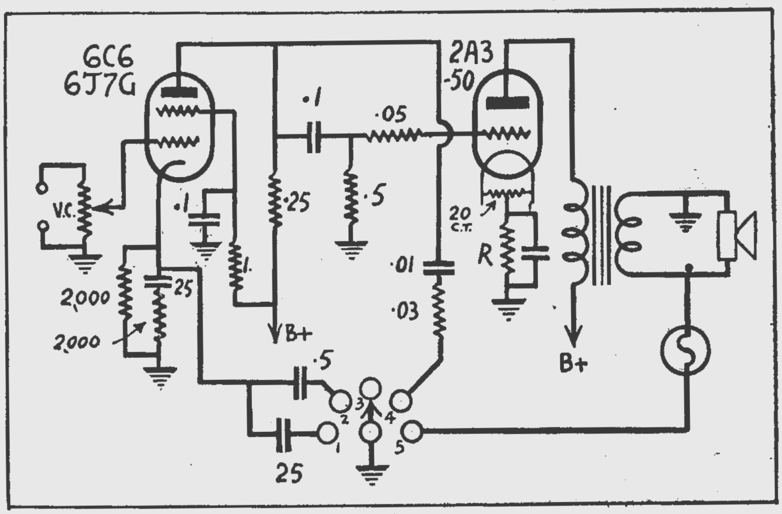
We now publish a pair of circuits — one for a triode such as 2A3, preceded by a high-gain pentode or screen grid valve. Volume expansion is obtained as before by shunting the voice coil with a pilot light. (A 6-volt .15 amp. bulb gives moderate expansion with fairly rapid action, whilst a 4-volt .3 amp or 2.5 volt .3 amp bulb gives greater expansion, but has rather a large time delay.) At full output, the lamp absorbs about 1 watt of power, so the circuit is unsuitable for a 45 valve.

Variations in frequency response are obtained by cathode and anode-circuit shunting by condensers. The cathode of the driver is not completely by-passed, giving negative "current" feedback. To obtain a high-frequency boost, the bypassing is increased at high frequencies by the addition of a separate condenser in parallel. Current feedback by an unbypassed bias resistor is not used on the output valve as that would mean a loss in power output, triode output valves already being short of power.

Triode to Triode

The second circuit is for a triode driver in front of a triode output valve. The driver should have a high gain in order to provide the voltage swing demanded by a triode power valve. If a magnetic pick-up is employed, an extra voltage-amplifier valve may be necessary. Volume expansion again uses the pilot-light shunt (the decreased load resistance causing greater power output and making up for the loss in the lamp), but the tone control is slightly different. The treble effect is obtained by a reduction of the lows, this being accomplished by varying the characteristics of the condenser-resistor coupling circuit. As the driver is a triode, a condenser must not be connected between its anode and the chassis, as that would reduce the anode load too much at high frequencies where distortion is very noticeable. Instead, the "bass" effect is obtained by connecting a small condenser between the grid of the output valve and chassis. The grid "stopper" resistance of .1 megohm prevents reduction of the anode load of V1, besides allowing slightly higher power output.

Suitable output valves for these circuits are the 2A3, 6A3, 6B4G, DO20 and 50, or a pair of 45's in parallel. Remember, the greater the output the more effective the "expansion" is and the less distortion is produced.



Circuit for use when a pentode valve is used in the first stage.

According to Ralph R. Beal, research Director of RCA, (America), full-scale commercial television within the range of the average pocketbook will become a reality after the war. He predicts home receiving sets with screens from 6 to 24 inches in width and indicates that colour telecasts also are a probability.

OPERATION OF OUTPUT VALVES

A simple explanation of the meanings of Class A, Class A1, Class AB, etc.

THERE have been many definitions of classes A, B and C, but many people have been confused, especially as under certain circumstances, some of the definitions overlap. We all know that class AB requires more grid bias voltage than class A, but why? What does the subscript 1 or 2 mean when talking about Class A1 or class AB2?

Valve Grid Curves

In all ordinary valves, the anode (plate) current is controlled by the grid voltage. When the grid is highly negative, i.e., when there is a large negative bias, the electrons can no longer flow in the valve and there is no anode current. As the grid is made less negative, anode current gradually appears, becoming very large when the grid is made appreciably positive. This is true for **all** the common receiving tubes, although the actual anode current differs from tube type to tube type, besides depending upon other conditions. The variation of anode current with grid voltage may be represented by a simple graph called the Eg- Ia curve (Eg equals potential difference between grid and cathode and is the resultant of grid bias and signal voltage; Ia is the anode current). The "curve" is curved at large negative grid voltage, then it becomes straight and, finally, at large anode currents, it bends over again becoming nearly horizontal. The word "dynamic" on the curve means that it is, for actual conditions, with a load in the anode circuit.

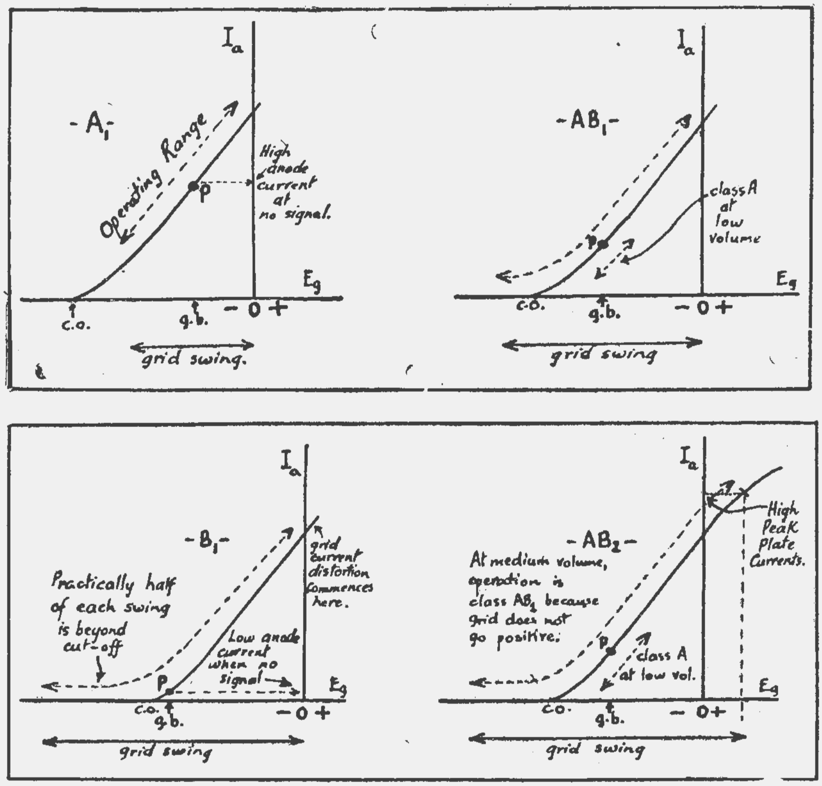
Operating Point

The grid voltage varies on each side of the grid bias by an amount equal to the signal voltage. The variation may be large or small. The grid bias may be highly negative, slightly negative, zero or positive, but whatever it is, there is a point on the curve corresponding to it. This point is called the Operating Point, and for ordinary amplification work it is put somewhere on the straight portion of the curve by choosing a suitable grid bias voltage.

Grid Swing

The applied signal "swings" the operating point to and fro on each side of the point chosen.

If the signal is small and the operating point was originally near the middle of the straight portion, then



Typical grid-plate curves of output valves to illustrate the different classes of operation.

the point is always on the straight portion, of the curve. This system gives least distortion and is called **Class A operation.** In practice, it does not matter if the beginnings of the curved part are used, so the practical definition of class A operation is as follows: "A valve is said to be working under class A conditions if the grid bias voltage and signal are such that the operating point does not appreciably leave the straight portion of the Eg-Ia curve." All valves connected as R.F., I.F., or A.F., voltage amplifiers in receivers are supposed to be working in class A. If only a single output valve is employed, then it, too, operates as a class A amplifier. Detector valves, on the other hand, must not, in fact, **cannot**, operate under class A conditions.

Curved Portions

In practice, quite a fair bit of the curve portion at the negative end is used. In fact, the grid may be swung almost to cut-off and if the distortion is low, it is still called class A operation. If the operating point is moved to the left by increasing the bias so that on large signals it swings past the negative curved portion, then a fair degree of distortion results. If the operating point is on the straight part, but **near** the curve, then class A operation is obtained at low volume, but at high volume when the signal is very large, the operating point not only travels over the curved portion, but also goes past the cut-off voltage. This operation is called class AB.

Class B

Now suppose the grid bias is increased still further so that the operating point is actually on the curved portion (at the negative end). On one half of the signal (the positive half) the operating point swings up on to the straight path and produces a large change in anode current. On the other half of the signal (the negative half) the operating point moves beyond cut-off and no anode current flows. The operating point is chosen so that anode current flows for just over half of each side and class B operation is defined as follows: "When anode current flows for only half of each cycle, or just over half of each cycle, the valve is said to be working under class B

(Continued on next page)

OUTPUT VALVES

(Continued)

DATA on Class A, B and AB Operation.

Tube	Anode Volts	Screen Volts	Bias Volts	Class	Anode Load.	Anode Curr.(ma)	Power output.	NOTES.
1F4	135	135	−4·5	A_1	16,000	8	·31	Single Tube.
1F4	135	135	−4·5	A_2	15,000	8	·51	Trans. Coup. 30 as driver.
1F4	180	180	−7·5	AB_2	20,000 C.T.	19	1·4	Trans. Coup. (2 Tubes) "
6A3	250	-	−45	A_1	5000 C.T.	120	7·5	(2 tubes) 380Ω bias res.
6A3	325	-	−68	AB_1	5000 C.T.	80	10	(") 850Ω " ".
6B5	325	-	−4·5	A_2	7200	42	6·7	Special Tube.
6B5	390	-	−14·5	AB_2	10,000 C.T.	88	20·2	2 tubes. 150Ω bias res.
6F6G	375	285	−26	AB_1	12,000 C.T.	60	13	" Fixed Bias.
6L6G	350	250	−18	A_1	8000 C.T.	108	22	" " ".
6L6G	360	270	−22·5	AB_2	3800 C.T.	88	47	" " "
6L6G	"	"	"	AB_1	"	"	18	" " "
6V6G	285	285	−19	AB_1	8000 C.T.	70	14	" " "
45	275	-	−56	A_1	9200 C.T.	72	4	" Bias Res = 775 Ω
45	275	-	varies	AB_1	4000 C.T.	67	6	" " = 850 Ω

N.B. Anode Current Shown is at zero signal. At full volume it is somewhat higher.

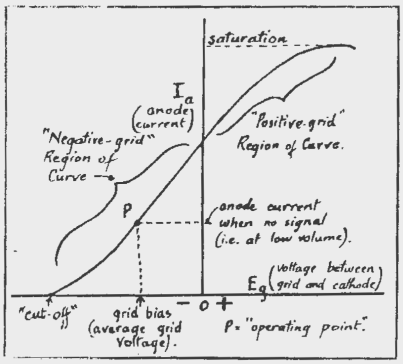
conditions." You will notice that the grid bias for class AB is greater than class A and that the grid bias for class B is greater still. This large grid bias may be awkward to obtain, so special valves (class B valves) have been made so that the grid bias for class B operation is practically zero. Any valve that is suitable for class A operation can be used in class AB or class B, but class B valves are not suitable for use in class A operation.

Push-Pull

When class AB or class B operation is used, there is large distortion if only a single valve is employed. To overcome this distortion, two valves are used and work with **opposite** signal voltages. If two valves are used in class B then one valve has anode current flowing whilst the other has its operating point swung beyond cut-off. In the output stage of a receiver, class AB or class B operation is never used with a single valve.

The Numbers

The letter or letters denoting what part of the valve curve is used, are often followed (and should always be followed) by a number 1 or 2 to indicate whether or not grid current is flowing at any time. Anode current flows at all times, except when the operating point is swung beyond cut-off. Grid current, on the other hand, flows only when the grid is



positive. If the signal voltage exceeds the grid bias voltage, then the grid will become positive at one end of the swing and because a positive body attracts electrons, grid current will flow at these times. To indicate that grid current flows, the figure 2 is used. Note:—In the case of class AB operation, the valves may be class AB1 for medium-sized signals, and class AB2 only on the peaks. This is a great advantage of class AB2 — at low volume the operation is class A1 (straight part of curve, very low distortion), at medium volume class AB1, and at full volume class AB2 (grid current flowing), the grid now being given a very large swing. Class AB2 operation enables large grid swings to be handled. Class B2 operation also enables large grid swings to be handled, but the operation is NOT class A at low volume and so "low-volume distortion" is more noticeable in a class B2 amplifier.

Summary

Class A1—uses straight part of curve, but not positive grid region.

Class A—usually means class A1.

Class A2—(not commonly used) uses entire straight portion of valve curve.

Class AB1—class A1 at low volume. On peaks valve is swung beyond the cut-off for a fraction (less than half) of each cycle. No grid current flows.

Class AB2—class A1 at low volume, class AB1 at medium volume. Grid current flows during the most positive parts of each grid voltage cycle.

Class B1—(also called Q.P.P., i.e., quiescent push-pull). Biassed almost to cut-off. No grid current. This system popular for battery sets in England.

Class B2—Biassed almost to cut-off (zero-bias for some tubes). Grid current flows during part or all of each cycles.

Class B—usually means Class B2, but in case of certain tubes may mean class AB2.

Class "A prime"—an early and misleading term for class AB2.

Table of Values for Various Tubes

This table is given to show how class of operation depends on grid bias, signal voltage and anode load.

STATIC CHARGES ON RECORDS

Disc recordists have long known that the coating of a blank develops a charge of static electricity during cutting, thereby causing dust particles to adhere very firmly to the surface and increasing the abrasive action of the play-back needle, with accompanying rise of hiss in the reproduction. This static charge is also troublesome in the cutting process as it makes the removed thread of coating material hard to control, as it tends to fly up against the cutting-head.

Recent tests by N.B.C. in America revealed that rubbing a direct play-back disc with felt created potentials as high as 12,000 volts, and merely removing a disc from its envelope set up charges of the order of 5,000 volts! New glass-base priority blanks, now being used in the U.S.A., have a fibre insert in the centre-holes to counteract the building up of a charge. Some recordists, before placing the disc on the turntable, pick it up by the edges and hold for a few moments to drain off the charge as much as possible!

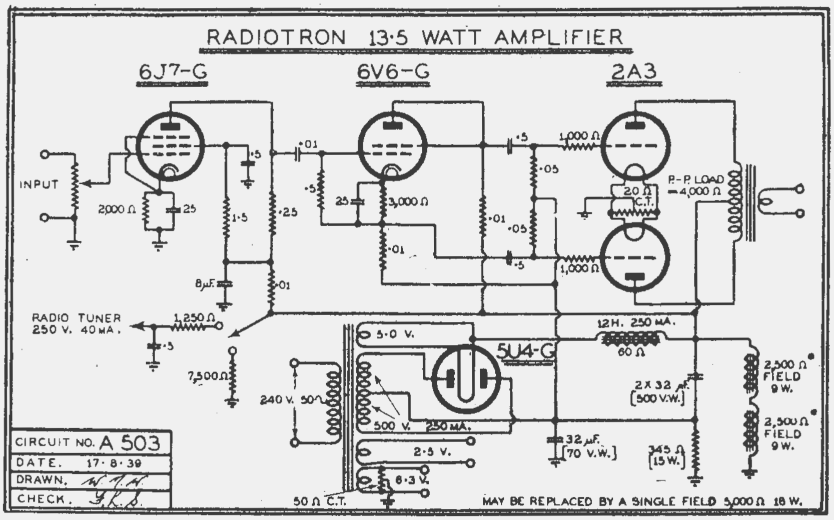
A GUIDE TO THE BACK NUMBERS OF 1942

IN THESE times of scarcity of paper we find it difficult to put as much editorial matter into each issue as we would like to do. Fortunately, however, we have always made a practice of storing away a good supply of back numbers, and this stock is now proving invaluable to our readers who want to turn up some article on theory, get an explanation of some radio subject about which they are not quite clear, or obtain a circuit to suit the particular components that happen to be on hand.

Back numbers are available at 1/- each post free, but a special offer is made for quantities. Any two issues will be posted for 1/6, three for 2/- and larger numbers at 7d. each. This offer holds good only for issues ordered at the one time and being posted to the same address.

All enquiries for back numbers should be addressed to "Australasian Radio World," 243 Elizabeth Street, Sydney, enclosing stamps or postal note to the value of issues ordered.

A guide to the contents of all issues between May, 1936, and December, 1941, were given in our issue of March, 1942. Here is a rough summary of the contents of the issues published during 1942.



Circuit of the Radiotron circuit A503, which was originally released in 1939. Since that time it has proved itself to be a particularly effective and handy circuit.

January, 1942.

The January, 1942, issue was strong in its appeal to country readers, containing the circuit of the "Countryman's Seven-valve Dual-Waver", a most powerful battery-operated receiver, details of a battery-operated Signal Tracer for country dealers and servicemen, and a long article on the general design of battery sets. In addition, a short article dealt with the construction of a simple three-valve battery circuit for portable use. Technical features included a full coverage of the cathode ray oscilloscope, an explanation of the features of the direct-coupled phase changer by Straede, and a five-way tone control arrangement to give inverse feedback, volume expansion or tone control at will. Another article in this issue which proved popular dealt with the renovating and repolishing of radio cabinets.

February, 1942.

The February, 1942, issue proved itself to be of particular interest to amplifier enthusiasts. Details were given of the circuit used by the winner of the Victorian Championship, as well as the design of the box baffle arrangement which undoubtedly helped the winner to achieve his success. Other items of interest about amplifiers included the circuit for a detector unit suitable for fitting to a good amplifier, a long technical article on the subject of effective speaker baffling and a constructional article covering an amplifier featuring push-pull 2A3 type valve with a scheme for using either fixed or automatic bias at will. The circuits for battery sets were also given, including the "Tried and Tested" one-valver.

March, 1942.

Principal technical feature of the March, 1942, issue was the "Little Companion" receiver, a dual-wave four-valve mantel model for which a cheap kit was available at that time. Of course, the kit is no longer available, but the circuit had its points of interest. For the amplifier men there was a suggested design for push-pull 6V6G by Straede, also an article on the importance of harmonics in reproduction. As mentioned above, also featured, was a guide to back numbers between May, 1936 and December, 1941.

April, 1942

Bristoe's design for an improved Signal Tracer (a.c. operated) was featured in this issue. Recognised as the leading authority on these instruments, Bristoe is the man who dealt with them for months in "Radio World," before other local technical journals were aware of their possibilities. Backed by plenty of practical experience, this signal tracer design still stands as the last word. Also in this issue is a circuit of a high-

(Continued on next page)

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BACK NUMBERS
(Continued)

fidelity amplifier to use 6A3 type triodes in push-pull. This circuit, of American origin, embodies resistance-coupling, with a self-balancing phase changer. We can thoroughly recommend this circuit.

May, 1942.

The whole subject of the correct procedure for the alignment of receivers is covered in the May, 1942, issue. Circuits featured are the "Little Companion with A.V.C.", and the "Triplex Single", a most unorthodox arrangement of a 1D8GT as single-valve set to operate in a similar manner to a three-stage receiver.

June, 1942

A circuit for a two-valve portable receiver for headphone reception appears in the June, 1942, issue, together with several articles of general technical interest. These include one on simple set testing without meters, a tone compensation circuit arrangement to correct scale distortion, how to deal with the problems of instability, and some notes on the construction and operation of meters.

July, 1942.

Interesting circuit suggestions are featured in the July, 1942, issue, also an article on what a radioman should know about screws and screw threads. Modern set building methods are discussed in a general article on this subject. Another item of interest is a circuit and lay-out plan for a simple wave-trap to improve the effective selectivity of any set which is being operated adjacent to a powerful transmitter and suffering from overlapping stations on that account.

August, 1942.

"Making the Most of a Milliameter" is the heading of an article by Bristoe in the August, 1942, issue, in which he describes the construction of five handy pieces of test equipment; A volt-ohmmeter, a volt-ohmmilliameter in sections, a universal (a.c. and d.c.) volt-ohm-milliammeter, a vacuum-tube voltmeter (both in a.c. and battery-operated style) and a modern valve tester. Other features include an article on the servicing of vibrator units and a newer version of the "Little Companion" circuit. This circuit features the idea of using a frequency converter to feed directly into the second detector with an audio stage of amplification, as against the original arrangement of frequency converter, intermediate amplifier and then feeding the audio output of the diode direct into the output stage.

RADIO STEP BY STEP

The series of articles entitled "Radio Step by Step" go together to form a complete course in the fundamentals of radio theory and are invaluable to those who wish to get a thorough grounding in technical radio. The series consists of sixteen articles, appearing in the sixteen issues from April, 1942, to August, 1943, inclusive, except the July, 1943, issue.

September, 1942

Designed to embody only those components available at the time, the "Victory Set" featured in the September, 1942, issue, was of simple tuned radio frequency type and ideally suitable for use as a basis for the rebuilding of many types of old receivers.

October, 1942

The idea of the "Victory" set is also carried out in the October, 1942, issue, but this time in the form of a mantel model of compact dimensions. Other items covered in this issue include a tone-gain control, some notes on the use of permag. speakers as microphones, and other interesting technical items.

November, 1942

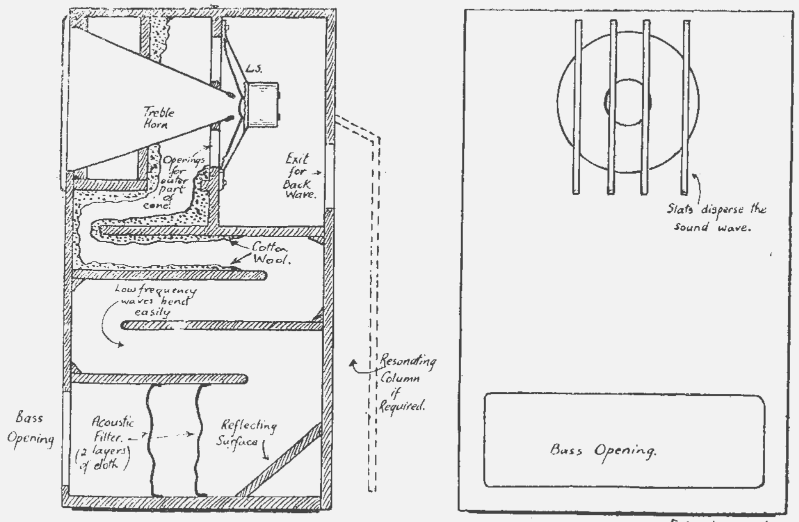
The first article of two by H. W. L. Hunt appears in the November, 1942, It deals with the amplifier portion of a super quality dual-wave receiver designed and built by this enthusiast. Other articles in this issue cover better detection circuits for the t.r.f. set, a handy feedback system, the weak links in quality reproduction, tolerances in set design, and a series of circuit suggestions by Straede.

December, 1942

The second article by Hunt, covering the tuner portion of his receiver, with its intermediate switching for fidelity, is given in the December, 1942, issue. Other items are: a dictionary of radio terms, further circuit suggestions by Straede, and a reflex arrangement to boost the range of simple battery sets.

A NEW DESIGN FOR A FOLDED HORN

The basic theory, together with constructional details, of a new folded horn in which only the front-wave is used.



FOLDED HORN WITH TWO ACOUSTIC CHANNELS.

THE earliest baffles used were square, or circular boards, from 2 to 10 feet square, the larger the board the better the bass response. These flat baffles suffered from two main defects: radiation from one side (the rear) of the diaphragm was lost, so the baffle itself meant a loss of power of 3 db. Also a regular-shaped baffle (e.g., square or circle) had a resonant frequency at which a pronounced drop in response occurred except very close to the baffle, in which region a pronounced rise occurred.

Other disadvantages were the bulk (some ingenious people got over this by using a wall or ceiling as a baffle) and the fact that at high frequencies a speaker diaphragm acts in two parts! The central part acts as a negative-baffle, allowing some of the air vibration to leak around to the rear of the central part. Luckily, this effect is slight, as most of the forward high-frequency radiation goes forward; but, unfortunately, as a beam.

Tendencies in Baffles

There have been four main ideas in baffle design. First the bass response has been boosted either by putting the rear wave out of phase and feeding it forward, or by the use of resonating tubes tuned to low frequencies (ever tried a chimney as a baffle?). Second, efficiency has been increased by fitting the speaker with a horn, either one piece or folded. Unfortunately a straight-out exponential horn is bulky, whereas a folded horn causes a loss of "highs", as these do not bend around corners easily. Third, high-note response has been increased by the fitting of a diffuser cone to the central part of the diaphragm (actually a short horn improving the efficiency of the highs). Fourth, cavity resonance has sometimes been used to increase efficiency around some particular frequency, either in the middle frequency, as in the case of speakers designed for voice reproduction, or in the bass resistor.

All these systems have defects — the Bass reflex speaker is apt to have a loss in bass response at some frequency because at that frequency, waves from front and rear are not in phase by the time they leave the speaker-and-baffle.

Now supposing some of these systems are combined in a new way. suppose we want plenty of efficiency to avoid overloading our output valves, plenty of really deep bass for "full" reproduction and plenty of well distributed highs for realism and presence.

Designing a Baffle

Let us start with the highs. We take a good quality speaker (e.g., Rola 10/42, Magnavox 380L, Amplion 12P-64, etc.,) as basis of our design. There must be plenty of magnet, or plenty of field excitation, as otherwise there won't be enough "highs" to start with (instead there would be a bad bass hump). In front of the central part of the cone we fit a short horn to boost and distribute the highs. This horn can be exponential or **it can be conical**, as a conical horn works quite well at high frequencies! Now we want this horn close to the cone so the cone must be well loaded to prevent excessive movement. (Good loading also reduces bass modulation).

This small horn could taper from about 3-inch diameter to about 10 or 12-inch diameter, and be about 10 or 12 inches long. It should be made of some material that **reflects** sound waves (otherwise it doesn't act as a horn), but must not vibrate or spurious frequencies will be produced. Bakelite coated with pitch on the outside is quite good, but out of reach for most experimenters. A metal cone coated on the outside with a good layer of wax is quite good. The front and rear edges of the cone could be covered with adhesive tape to damp out edge vibration.

Efficiency and Back Wave

We want efficiency and we do **not** want the back wave to reduce volume by cancellation. Let us apply a not commonly known fact about horns: When a horn is fitted to a dynamic speaker, the ratio of back-wave to front-wave decreases very rapidly as the efficiency and size of horn are increased. This is easy to see. If the horn is large (and efficient) and loads up the cone well, there will be very little actual cone movement and so very little back-wave will be produced.

All right, we'll fit a big horn to our speaker — to the front of it. But now there are objections! The short horn is in the way, the big horn is bulky, etc. Here is the solution — the big horn is to be a folded horn, fitted to the outer part of the cone! In other words, we use a two-channel acoustic amplifier — a high note horn and a low-note horn.

Rear of Speaker

Now what about the rear of the speaker? It can be left open, or better, a resonating column can be fitted here to boost the more audible range of the bass a bit. The rear of the speaker compartment could be line with felt or cotton wool to prevent reflections of the high-frequency waves. That would be bad, as some of the reflected waves would reinforce the diaphragm vibration, whilst others would hinder it, resulting in a peaky response. If a resonating column (folded, of course), is to be fitted, it should be about 8 or 10 feet long, i.e., effective length, and of fairly large cross-section, say a square

(Continued on next page)

foot, as otherwise it will act merely as a damped cavity resonator.

Folded Horn Length

Now for some details as to the folded horn for the medium and low notes. If the horn were straight, a length of 12 feet and an opening of about 150 sq. feet would be required to maintain the low frequency response right down, down, down, without resonance, but this size is impracticable, even if folded, so a shorter horn is used and a decrease in opening area gives a certain amount of resonance as compensation. Anyway, an irregularly shaped horn, as ours will be, has quite a gradual cut-off and a drop of 1 or 2 db. at 50 cycles per second cannot be detected by the ear. The interior of the folded horn must be lined with material to absorb the higher frequencies (the outer part of the cone must be damped as regards "highs") or two or three pieces of cloth may be loosely fastened across the air column as an acoustic filter.

Size of Complete Horn

The actual overall size of the finished job, depends, of course, on the size of the speaker started with and the frequency requirements and space available. Quite an effective baffle can be built into a cabinet 4 feet high, 2 feet 6 inches wide, and 1 foot 6 inches deep. This does not include a radio, although an amplifier or power pack can be left anywhere in the lower part of the folded horn, provided there are not parts that buzz.

Constructional Details

The horn MUST be free from buzzes. Do not rely too much on conventional carpentry — a large number of screws is better than tongue-and-groove, or whatever it is that carpenters fancy. Timber can be 3/8-inch ply, or thicker. We found 3/8-inch was quite thick enough as the various partitions give plenty of rigidity. Do not worry about the vibration of the centre of a panel. The vibrations that cause trouble are those that result in one part striking or rubbing against another. Painting the interior joins with pitch or old transformer compound is a good idea.

Warning

It is not generally known that the addition of a large horn to a speaker reduces its power handling capacity slightly. The dangers are that the voice coil might tear off the cone, which is "anchored" by a large volume of air and that the reduced diaphragm motion results in less ventilation and consequently more heating for the voice coil. The two speakers mentioned at the beginning of this article are each capable of taking the output from a 12-watt amplifier when fitted into this horn and each gives very good reproduction.

HIGH EFFICIENCY AERIAL FOR SHORT-WAVES

HERE is a short wave antenna that has helped me very much in my SWL work. I believe it is an original idea, for I have never seen or heard of one like it. It occurred to me when I was trying to figure out a way to have good directional antenna (all directions) without having to have a separate antenna for each direction. It has worked wonderfully well for the past six months, so I thought that others interested in the same field might like to try it.

Four Masts Needed

To begin with, it take four masts or other elevated objects to anchor the antenna to. At present I am using three 40 foot pipes and a 26 foot wooden pole fastened on the side of the house. All these are well braced and are on a lot 65 by 175 feet. Two of the masts are at the extreme ends of the length of the lot. (A and B). The other two are approximately in the centre or half-way between the north and south masts. The enamelled wire is of the seven strand type and can be lowered by pulleys on all masts except C to the east. By taking the leads on the west side of this rhombic first, we have the best and most important feeders. The two joints and, in fact, all splices are well soldered and in some instances also taped. The leads are of heavily insulated (bare wire should serve as well.—Editor) number 14 copper wire, spaced about every 12 inches by flat simple little porcelain insulators with the nails taken out. In this way you get two spreaders from one insulator. The leads are run through the nail holes and drop as far as possible straight down and then run to the window. These spreaders are held in place by binding twine, which is tied around each spreader and drawn tight at the bottom of the drop. The spreaders are allowed to slide on the wire and are held in place only by the twine. This proves much more effective if the feeders are allowed to swing freely. At the end of the lead-in, a D.P.D.T. switch is connected with the antenna leads from the receiver soldered to the centre taps on the switch. The antenna feeders are then soldered to one of the two pairs of outside jaws on the switch. Thus far you have one complete rhombic antenna with feeders to the west.

Now for the switch at the top of the east mast. (c). Another D.P.D.T. switch is screwed to the top of mast C, as indicated in the diagram. The antenna is "broken" and the loose ends are soldered onto the centre taps of the switch. An 800-ohm 1-watt resistor is soldered across the top taps. This is optional, but does help a lot in getting rid of QRM. Another pair of feeders is soldered to the lower taps and brought down to the switch at the receiver. Be sure that when you fix this second pair to the open taps on the inside switch, that you do not fix the north wires parallel on the switch, as shown in the drawing.

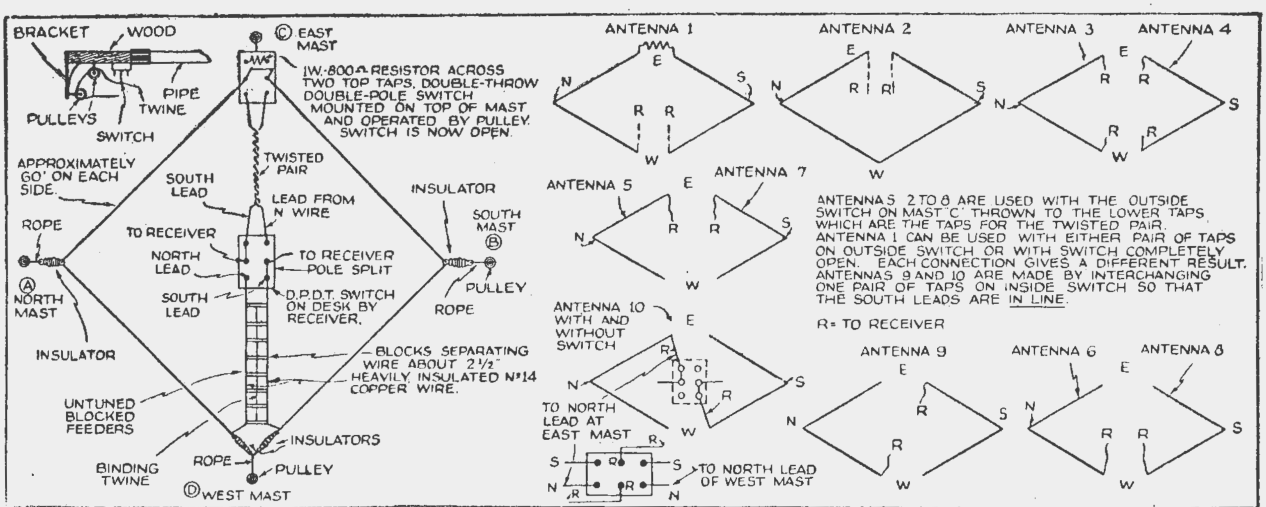
Directional Switches

In this way you have two end-fed V antennas. I have never seen an end-fed V yet, but these two work very well and seem rather **directional**. The outside switch on mast C is worked by a system of pulleys with a double length of twine dropping to the bottom of the mast. A bracket is placed on the top of the mast and the switch far enough below it so that there is sufficient leverage to work the blade of the switch both ways. By splitting the blades of the switch at the receiver and using the lineup I have just given, you have eight different antennas; 2 V's fed from the end; 4 straight wires, end-fed, which really are V's also; and 2 rhombics, each fed from a different direction. By interchanging one pair of wires on the inside switch, you have two other antennas.

—"Radio and Television," (U.S.A.

UNIT OF POWER

Wattage is the unit of power, and it is power which is required to drive the current through a resistance. The formula for calculating the power rating of a resistor (or in other words the wattage) is current squared times the resistance. Thus, 10 milliamps flawing through 10,000 ohms resistance would give .01 × .01 × 10,000 (current being expressed in amps.). The answer is 1 watt. Another way of ariving at the wattage is to calculate the voltage drop across the resistance (by multiplying that voltage by the current. Thus you will see that each resistance has to be considered alone, irrespective of whether it is in a battery or a mains set. You can use resistances with higher ratings — and this is desirable — but not with smaller ratings. If a 1-watt resistance is needed and you use a ½-watt component, it will probably be damaged or destroyed, due to the heat which would be generated.



Speaker Location For High-Powered Amplifiers

(Continued from the November Issue)

Camouflaging Loudspeakers.

In installations carried out in municipal buildings, such as town halls, assembly halls, etc., it is often made clear in the installation agreement and specification that the loudspeakers should in no way detract from the beauty of the internal decorative scheme or architecture. Especially is this the case where installations in churches and cathedrals are concerned.

When a building is already erected, and is very bare in its interior scheme there is little that can be done in the way of camouflage, but even so, there are ways and means if the co-operation of the architect can be obtained.

For example, false corners may be made in which to house the loudspeaker unit and, in some cases, even false ceilings over lecture platforms can be arranged so that the installation does not exhibit any unsightly equipment in the internal design of the hall.

When the actual loudspeaker unit is fitted into a false wall, corner piece, or ceiling, the camouflage material in front of the loudspeaker unit may be perforated with a number of tiny holes which are hardly visible, but which provide an exit for the sound.

Where there is a ventilation scheme in the room, it is often possible to make up imitation ventilator grilles to match those already in existence, and then to mount the loudspeaker unit behind the grille and insert the whole equipment in a cavity excavated in the wall or ceiling, or sometimes even in the floor. Churches often have heating ducts in the floor covered with a grille at the sides of the aisles.

Where there are separate ventilator grilles and it is not possible to fit any false ones, loudspeakers can be mounted behind the actual grille, using a small baffle board which allows a margin of 2 inches to 3 inches all round, so that the ventilation is not seriously impaired. The reproduction of the lower frequencies in such cases will probably be attenuated, but this may generally be overcome by tone correction in the amplifier so that the output from the equipment emphasises the bass.

As was mentioned in an earlier article in this series dealing with the wiring of flat installations, it is essential that the civil engineers concerned with the design of the ventilation system, and the architecture, are consulted before any work of the above-mentioned nature is carried out.

Not only is it courteous, but serious trouble made be prevented due to lack of knowledge, and the architect may often be in a position to advise on a better location for the loudspeakers and be able to design suitable grilles, false plaster decorations, etc., that will fit in with the scheme of the building, and yet give the acoustic results desired.

Covering Power.

With regard to the power and the number of loudspeakers required to cover any particular area, it is difficult to give exact figures as there are so many factors which cannot be predicted, and which must be studied.

A bare, empty hall will require far less power to fill it than will one which is panelled in softish wood or has a great amount of cloth material decorations such as curtains, upholstered seats, etc. The audience themselves also provide a considerable amount of damping upon the sound waves. The cinema projectionists knows this well, and has to control the output from his amplifier according to the size of the audience. A volume which is only pleasantly sufficient for a crowded house would be overwhelmingly painful in a half-filled auditorium.

Background Noise.

Another consideration is background noise. We have already dealt with this from the factory angle, but for domestic or entertainment installations some idea as to the background conditions should be obtained before deciding upon the power required for the amplifier, and the number of loudspeakers necessary to cover the job.

For example, take the case of restaurants. Higher class establishments will have a far less noisy atmosphere than the more popular type of refreshment place. Quite apart from the fact that in the first type of restaurant the rooms would be more softly furnished, probably with carpets, upholstered chairs, etc., but the staff would move more quietly, and would go about their work unobtrusively compared with the clatter and bustle of a city lunch-house.

However, as a guide, the following notes may be helpful in arriving at a first approximation of the power required, but in all cases it is wise to allow the amplifier to have about 50 per cent. reserve power to deal with unexpected eventualities such as noisy audiences, extra loudspeakers for overflow crowds, etc.

Straightforward P.A. installations for halls holding up to about 1,000 people can generally be served with a 10-watt amplifier where speech only is required, and a 20-watt amplifier if really good quality reproduction is desired or if the background noise is high, such as in some restaurants as we have just been discussing. Of course, musical interludes between speeches would be fairly satisfactory from a 10-watt equipment, but full-bodied reproduction of music at real quality to an appreciative audience would require double or treble the power required to give satisfactory speech reproduction with its limited range of frequencies.

To prevent too much echo from the rear wall of straightforward rectangular halls used for speeches or lectures, the loudspeakers should be positioned so as to feed diagonally across the hall into the far corners. If, on trial, feedback is troublesome, the rear wall should have curtains, rugs or other material draped over it to absorb the sound waves reaching the wall.

If the room is not rectangular, but has alcoves, balconies, etc., extra loudspeakers of the cabinet or baffle-board type may be required to boost up the sound in dead spots. One or two watts for each of these loudspeakers must be allowed when deciding upon the power of the amplifier required.

Loudspeakers in alcoves and private dining-rooms in hotels or restaurants should be fitted with their own volume control, so that the reproduction from the speaker may be reduced or completely turned off at the request of the patron. Everybody does not like music with their meals and the discerning "maitre d'hotel" will not wish to lose even one customer if it is possible to cater for his particular likes and dislikes by arranging a table in an alcove which is not supplied with music.

Outdoor Installations

For conventional P.A. jobs an 8 to 10-watt amplifier would suffice for speech reproduction, using two high-efficiency projector-type loudspeakers positioned as shown.

Note that the microphone is well behind the loudspeakers in order to reduce acoustic feedback or howling. The loudspeakers should be as high as possible, preferably on tripods and directed downwards towards the people at the rear half of the crowd.

Should the background noise be high (for example, heavy traffic, trains, etc., passing the area) a 20-watt amplifier may be necessary employing four 5-watt loudspeakers, while, if music is to be reproduced, a 40-watt amplifier should be used with four 10-watt loudspeakers of the directional baffle type.

Outdoor restaurants, tea-gardens, etc., do not require reproduction at such a high level as the music is generally required only as a background. On the other hand, if a larger number of cabinet or baffle-type loudspeakers are used to diffuse the sound, and as these are far less efficient (acoustic output for electrical watts input) than projector or directional baffle types, a high-powered amplifier may still be necessary, depending, of course, upon the number of loudspeakers being used.

Shortwave Review

CONDUCTED BY
L. J. KEAST

NOTES FROM MY DIARY—

I'M WISHING FOR A WHITE XMAS

Last month I said. "Here we are again." This month it is "Here it is again." Yes, Christmas is almost on us and as friend Bing croons, I guess we are all wishing for a white Xmas. I have not seen the programmes that have been arranged for the Fighting Forces, but I figure some great dishes are being cooked up for them by the Special Service Division of the War Department of the U.S.A., and the B.B.C. will also have the boys well in mind. Therefore, this Yuletide we can join in the boys' entertainment and all of us hope it will be their last away from home.

Let me take this opportunity of thanking all our readers who have helped to keep these pages up to date and wishing them the best Christmas circumstances permit and a happier New Year.

NOW OF AGE

On Monday, November 15, the BBC became 21 years of age. Beginning with a staff of four persons it now employs over 4.000 and from a broadcast of 4½ hours daily in English it now takes 33 listening hours daily for the Home and Forces programmes, while its Overseas Service in English and 46 other languages occupies 71 broadcasting hours.

Howard Marshall gave a fine talk on "Twenty One Years of Broadcasting" and was heard well in the North American Service on November 16 through GRH at 2.30 p.m.

WHERE HAVE YOU BEEN?

Our old friend, GSF 15.14 m.c., 19.82m., who for so long was one of the favourite transmitters in the sessions for Australia is back on the air again, but this time is a late comer. Directed to the Near and Middle East and taking in East Africa, he is on the air from 2.30 till 4.45 a.m. However, beamed to West Africa he remains on till 5.15. Glancing at the BBC list of Identification Words I notice GSF, F for Freedom. Maybe this accounts for his long absence, but he was so popular with us, I think we are justified in asking, "Where have you been?"

NEWS FOR THE CLANDESTINE PRESS

This is an interesting item given nightly at 9.45 over GSE 25.29m., GVV 25.58m. and a new ...— station on 25.42m. Incidentally, it will be a grand opportunity to test the selectivity of your set.

WHO MAKES THE WHEELS GO ROUND

Most of us are chiefly concerned with the programme material offered, some of us like to hear our favourite announcer, we become accustomed to "you have been listening to . . .the edition of the Radio News Reel, your narrator was Norman Claridge." But how few of us think of the engineers who make the broadcast not only possible, but after years of study, etc., make it audible in our locality at a fixed time.

Just before the war there were 1300 men, largely trained engineers, employed all over the country in the engineering division of the British Broadcasting Corporation alone. With the vast expansion of the Overseas and European services transmitter hours have increased nearly six-fold and today the engineering division numbers more than 3,000. Before me I have a list of 66 BBC transmitters, each with a call sign and only this week two more ...— transmitters have been noted. Some list, some engineers, and that's what makes the wheels go round.

DID YOU SAY MORSE?

Yes, this month has had more than its share of Morse; but hold your horses, maybe some of it was telegraphic information from friend Hugh Perkins in Malanda. One thing about Hugh, he is not selfish, and unlike a good many, he rushes news to Sydney about any new station long before he bothers to send for a verification. This shows a fine spirit and, incidentally, by giving others a chance to send a report around the same time, it helps the station receiving them, as they can see it was not just a fluke they were heard in such and such a place.

Mr. Perkins was the first to advise re VPD-2 on 25.25m. and then wired again when they were testing on 48.95m. Still a further telegram, this time to tell me Brazzaville was putting in a very good signal at 11 p.m. on approximately 19.3m.

SOME FAVOURITE AMERICAN PROGRAMMES

Charlie McCarthy

Sundays: KROJ, 9.30—10 pm.
KWIX 11.00—11.30 p.m.
Mondays: KROJ 4.30—5.00 p.m.
KWID 7.30—8.00 p.m.

Burns and Allen

Mondays: KROJ 7.30—8.00 p.m.
Thursdays: KROJ 2.30—3.00 p.m.
KWID 8.30—9.00 p.m.

Command Performance

Sundays: KWID 7.30—8.00 p.m.
Mondays: KROJ 1.15—1.45 p.m.

Fannie Brice and Frank Morgan

Tuesdays: KROJ and KWID 8.30—9.00 p.m.

ALL-WAVE ALL-WORLD DX CLUB

Application for Membership

The Secretary,
All-Wave All-World DX Club,
243 Elizabeth Street, Sydney.
Dear Sir,

I am very interested in dxing, and am keen to join your Club.

Name ....

Address ....
(Please print both plainly) ....

....

My set is a..

I enclose herewith the Life Membership fee of 2/– (Postal Notes or Money Order), for which I will receive, post free, a Membership Certificate showing my Official Club Number. NOTE—Club Badges are not available.

(Signed)..

(Readers who do not want to mutilate their copies can write out the details required.)

Shortwave Notes and Observations

AUSTRALIA

VLG-2, 9.54mc, 31.45m, from 11—11.45 pm is directed to U.S.A. and from 11.55 till 1 am to Asia. In the latter session Malay, Dutch, French and Thai is used (L.J.K.)

VLR, 9.58mc, 31.32m. Very good at 9 pm, but morse interferes (Harvey).

VLQ-.3, 9.66mc, 31.05m. Fair to good at 1 pm. (Harvey).

VLW-3, 11.83mc, 25.36m. Good in morning and afternoon, but whistle still persists (Harvey).

NEW ZEALAND

ZLT-7 Wellington 6.71mc, 44.68m, R6 at 8 pm, but awful morse interference (Perkins). And so say all of us (L.J.K.).

OCEANIA

FK8AA, Noumea, 6.20mc, 48.39m. Good at 8 pm (Harvey). R-7 at 7 pm (Perkins).

Fiji

VPD-2, Suva, 11.9 mc, 25.22m. Several have reported this station as having been heard of an evening, but that was during the testing period. Has now settled down to 9.30—11 am (L.J.K.).

VPD-2, Suva, 6.13mc, 48.94m. After exhaustive tests is now scheduled 4.55—9 pm, and a great signal. (L.J.K.)

AFRICA

Algeria

AFHQ, Algiers, 9.53mc, 31.45m. This new outlet for United Nations Radio gives news at 6 am (L.J.K.).

AFHQ, Algiers, 8.96mc, 33.48m. Fair to good at 8.15 am (Harvey). (Now gives news at 6 am.—L.J.K.)

Belgian Congo

OPM, Leopoldville, 11.67mc, 25.71 m. Good at closing at 4.30 pm (Harvey). (Have now moved to 30.66m—L.J.K.).

RNB, Leopoldville, 9.78mc, 30.77m. Excellent from 4 till 5.45 pm, and again from 2.45 till 3.30 am.—.LJ.K.

Ethiopia

Radio Adis Ababa, 9.62mc, 31.17m. Coming through nicely from 2.30 till 3.30 am. Relays BBC at 3 am — L.J.K.

French Equatorial Africa

FZI, Brazzaville, 11.97mc, 25.06m. Good at 4.45 pm (Harvey).

Portuguese East Africa

CR7BE, Lourenco Marques, 9.88 mc., 30.38m. An old timer back again but on a slightly different frequency. On the air from 5 till 7.30 am with news at 6.50 am. Was heard last year on 9843kc. 30.48m.—L.J.K.

CHINA

XGOY, Chungking, 15.20mc. 19.73m Fair to good at 9.15 pm (Harvey). (Think has now closed.—L.J.K.)

XGOY, 11.90mc, 25.21m. Fair at 9 pm (Harvey, Perkins).
(Signal is invariably strong, but modulation is poor.—L.J.K.)

GREAT BRITAIN

See special list of Pacific and General Overseas transmitter, as quite a number of changes took place on November 21.

A session worth hearing is the

news for the Clandestine Press, given over GSE, 25.29; GVV 25.58 and a ...— on 25.42m. at 9.45 pm — L.J.K.

INDIA

VUD-4, 9.59 mc, 31.28m. Fair at 5.10 pm in Hindustani (Harvey).

VUD-, Delhi, 11.87mc, 25.27m. Opens at 8.45 pm with "This is All India Radio calling Indians overseas from Delhi. This programme can be heard on 25.27, 25.45 and 41.15m."— L.J.K.

Here are a few new call signs:—

GVV, 11.93mc 25.15m.
GVW 11.70mc, 25.64m.
GRJ 7.31mc, 41.01m.

and, in case the 13 metre Band does "come good" some day, here are some not already listed:—

GVT, 21.75mc, 13.79m.
GVS, 21.71mc, 13.82m.
GVR, 21.675mc, 13.84m.
GST, 21.55mc, 13.92m.
GSJ, 21.53mc, 13.93m.

MISCELLANEOUS

HVJ, Vatican City, 11.74mc, 25.55 m. P.O.W. very fine at 6 pm (Harvey).

CSW-7, Lisbon, 9.73mc, 30.82m. Very good at 7 am, (Maguire, Harvey). (Now closes at 9.30 am, but signal weakens after 8.30—L.J.K.)

TAQ, Ankara, 15.19mc, 19.74m. Poor to fair at 8.30 pm (Harvey).

TAP, Ankara, 9.46mc, 31.70m. On Fridays at 7.15 am. gives special session for listeners in Great Britain.

XEWW, Mexico, 9.50mc, 31.58m. Splendid signal most afternoons till well after 5 o'clock—L.J.K.

XEQQ, Mexico, 9.68mc, 30.99m. Good at 7.45 am (Ferguson).

HER-3, Berne, 11.71mc, 25.61m. Fair of a morning around 7 o'clock, but delightful on Tuesdays and Saturdays from 6.30 pm.—L.J.K.

HER-, Berne, 6.34mc, 47.28m. "The Day at Home and Abroad" at 7.53 am. At 8 am "This is Switzerland Calling South Africa—you will now hear our news bulletin in German and French."—L.J.K.

NEW STATIONS

VUD-2 Delhi 11.87 mc, 25.27m.: First heard on November 16. Will be a welcome addition to the All India Radio transmitters and from opening at 8.45 pm till long after 11 o'clock maintains an R-9 Q-5 signal. News is read at 8.46 and we are reminded that it can also be heard on 25.45m. and 41.15m

RNB, Leopoldville, 9785 kc, 30.66m.: This should prove a popular outlet for our Belgian Congo friends and from opening at 4 pm till closing at 5.45 signal is very fine. During the afternoons only, foreign languages are heard, French being in use more often than others.

....They open again at 2.25 am with a march and from 2.27 till 2.30 notes on the Kissantzi are played. See Short Wave Notes for further particulars.

AFQ Algiers, 9535 kc, 31.45m.: This is a new outlet for The United Nations Radio. I am not sure of actual schedule but think it is from 3 till 9 am. News is read at 6 o'clock.

—, Moscow 13.42mc, 22.35m.: Still another to be added to the already long list of Moscow transmitters. Heard at 11.45 pm with great signal.

KMI, 'Frisco, 17.09mc 17.5m,: Broadcasts programmes for The United Network from the studios in the Fairmount Hotel, San Francisco from 2 till 5 am.

VPD-2 Suva 11.9mc 25.22m: This was briefly mentioned in last month's issue. Seems to have settled down now with an announced schedule as follows: 7.30—8.15 am; 11 am —1 pm.

VPD-2 Suva, 6.13mc, 48.94m: After testing for a few nights announced schedule would be 4.55—9 pm. Great signal of a night and rebroadcast a number of American shows.

——, Moscow 10.23mc, 29.33m.: This may not actually be a new one, but it is heard from 5 till 6.50 pm in a fine musical programme and again at 10 till midnight in a varied programme.

....— London 11.80mc, 25.42m.: Seems to be another outlet for the BBC, whose transmitters have already reached 66. This one can be heard at 9.45 pm when news for the Clandestine Press is given. Signal is only fair and is badly heterodyned.

FZI, Brazzaville, 15.56mc, 19.28m.: First to report this one was Hugh Perkins of Malanda who heard it at 11.10 pm on November 18. Roy Matthews of Perth is tuning it in as early at 10.15.

SOUTH AMERICA

Ecuador

HCJB, Quito, 12.46mc, 24.08m.: Opens at 11 pm with "Good Morning Everbody, this is 'The Voice of the Andes', Station HCJB. We are on the air every morning except Monday at 5 am P.W.T. 11 pm Sydney). Here is our 'Back to the Bible' session." Good signal but better on 30.12m.—L.J.K.

U.S.A.

San Francisco

KROJ, 17.76mc, 16.89m. Good between noon and 1 pm (Ferguson, Perkins).

KKR, 15.46mc, 19.4m. Heard around 9 am (Perkins).

KWU, 15.35mc, 19.53m. Good in morning at 7 o'clock. (Harvey) R-5-6 at 9.15 am. (Perkins).

KWID, 15.29mc, 19.62m. R4 around lunch-time (Perkins).

KROJ, 15.19mc, 19.75m. R4 at 9.30 am (Perkins).

KGEI, 11.79mc, 25.43m. Fair at 8 am (Ferguson).

KWV, 10.84mc, 27.68m. Very good at 5.15 pm. (Ferguson, Harvey, Maguire).

(Now re-opens at 8 pm, closing at 10 pm—L.J.K.)

KES-3, 10.62mc, 28.25m. Fair to good at 5 pm. (Harvey, Perkins, Ferguson).

KWIX, 9.57mc, 31.35m. Excellent till Khabarovsk comes on the air. (Perkins, Harvey, Ferguson).

KWID, 9.57mc 31.35m. "The Daddy of 'em all (All reporters).

KRCA, 9.49mc, 31.61m. Good about 5 pm (Harvey). R-4-5 at 7.15 pm (Perkins).

KGEI 7.25mc, 41.38m. R-6 at 6.30 pm (Perkins). Very good at 9.45 pm (Harvey).

KWID, 7.23mc, 41.49m. Fair to good at 9.45 pm (Harvey, Perkins).

U.S.A.

Miscellaneous

WRUA, Boston, 11.14mc, 26.92m. R3 at 7.16 am (Perkins).

Now closes at 7.30 am—L.J.K.

WWO, Cincinatti, 7.57mc, 39.6m. Closes with good signal at 5.30 pm—L.J.K.

NEW YORK

WNBI, 15.15mc, 19.81m. Good at 11 pm (Ferguson).

(Continued on page 26)

Allied and Neutral Countries Short-Wave Schedules

These schedules which have been compiled from listeners' reports, my own observations, and the acknowledged help of "Globe Circler" and "Universalite" are believed to be correct at time of going to press, but are subject to change without notice. Readers will show a grateful consideration for others if they will notify me of any alterations. Please send reports to: L. J. Keast, 23 Honiton Ave. W., Carlingford. Urgent reports, 'phone Epping 2511.

Loggings are shown under "Short Wave Notes and Observations." Symbols: N—New stations; S—Change of Schedule; F—Change of frequency.

NOTE: S indicates change of schedule other than those affected by change of time system.

Call Sign	Location	Mc.		M.	Time: East. Australian Daylight
GRZ	London	21.64		13.86	10—12.15 am.
GSH	London	21.47		13.97	9.30—2.15 am
OPL	Leopoldville	20.04		14.97	9.55—11.15 pm
—,	L'poldville	19.20		15.63	3.45—4.30 am; 5.30—5.45 am; 10.15—10.30 pm.
HBH	Berne	18.48		16.23	Tues & Sat 12.45 am—2.15 am
GVO	London	18.08		16.59	2—3.15 am
GRQ	London	18.02		16.64	Midnight—2.15 am.
GRP	London	17.87		16.79	9 pm—2.15 am
EIRE	Athlone	17.84		16.82	11—12.30 am; 4.30—5 am; News 3.45 a m
WCDA	New York	17.83		16.83	12 am—5.30 am.
WCRC	New York	17.83		16.83	8.15—10.15 am
GSV	London	17.81	S	16.84	Not in use.
WLWO	Cincinnati	17.80		16.85	8.30—9.45 am; 12.15—6.30 am
GSG	London	17.79	S	16.86	9—9.30 pm; 2.15—3.45 am
WRCA	New York	17.78		16.87	12—3.45 am
OPL	Leopoldville	17.77		16.88	9.55—11.15 pm; 5.30—7.30 am
KROJ	'Frisco	17.76		16.89	Noon—1 pm; News at noon.
WRUW	Boston	17.75		16.90	2—4.15 am
GVQ	London	17.73		16.92	6—8 pm; 12.30—2.30 am
LRA-5	B'nos Aires	17.72		16.93	Sats. 7.45—7.30 am
—,	Brazzaville	17.71		16.94	7.30—8 am
GRA,	London	17.71		16.94	7 pm—3.45 am; News 7 pm
KMI	'Frisco	17.09	N	17.5	2—5 am
WCW	New York	15.85		18.93	4 am—8 am
—,	Moscow	15.75		19.05	10.40 pm —12.30 am
FZI	Brazzaville	15.56	N	19.28	Reported heard 10.15—11.15 pm
KKR	Bolinas	15.46	N	19.4	News and commentary 1—1.30 pm
GRD	London	15.45	S	1942	2.30—3.45 am.
GWE,	London	15.43	S	19.44	
GWD	London	15.42	S	19.46	8.30—8.45 pm; 9—9.30 pm; 2.15—2.45 am.
GRE	London	15.39		19.50	6.45—8 pm; 11.15—2 am; 2.30—5 am.
KWU	'Frisco	15.35		19.53	Daily except Thurs. 7.30—9.15 am (Mon. 8—9 am) Daily except Mon. & Thurs. 10.45—12.30 pm.
—	Masocw	15.35	N	19.54	9.15—11.20 pm. (English from 10.40)
WRUW/L	Boston	15.35		19.54	9 pm—4.15 am; 3.30—4.30 am
WGEA	Schenectady	15,33		19.57	8.30—9.45 am
KGEI	'Frisco	15.53		19.57	Not in use
WGEO	Schenectady	15.33	S	19.57	10.15 pm—6.30 am
VLI-3	Sydney	15.32		19.58	8.30 pm—Midnight
GSP	London	15.31	S	19.60	4.35—6.15 pm
KWID	'Frisco	15.29		19.62	4.30—Noon; 4—5.45 pm
VUD-3	Delhi	15.29	S	19.62	2.30—8.30 pm; News 2.30 and 6. 9.30—11.15 pm.
WCBX	New York	15.27		19.64	19 pm—7.45 am; 8—10.45 am
GSI	London	15.26		19.66	5—8 pm; 9.45 pm —2.15 am; 2.30—7.45 am
WLWK	Cincinnati	15.25		19.67	8.30—11.15 am; 11.30 pm—8.15 am.
VLG-6	Melbourne	15.23		19.69	11.45 am—12.20 pm; 1.40—1.50 pm (Sun. 1.15—1.50)
—	Moscow	15.22		19.70	8.15—8.40 am; 9.47—10.30 am; 12.15—12.40 pm; 10.40—11.20 pm
WBOS	Boston	15.21		19.72	11.15 pm—2 am; 2.15 am—3.45 pm
XGOY	Chungking	15.20		19.73	See 25.31.
TAQ	Ankara	15.19		19.75	8.30—10 pm; 12.30 am—1.45 am
KROJ,	'Frisco	15.19	S	19.75	7—11.45 am
WKRX	New York	15.19		19.75	6.30—8 am
XGOY ..	Chungking	15.18		19.76	Wed. only, 11—11.45 am

Call Sign	Location	Mc.		M.	Time: East. Australian Daylight
GSO	London	15.18		19.76	9.45—10 pm; 11.15—12.15 am; 2.30—2.45 am; 4.30—5 am
TGWA	Guatemala	15.17		19.78	4.45—5.55 am (Mon. till 9.15 am)
VLG-7	Melbourne	15.16		19.79	6—8.10 am (Sun. 6.45—8 am)
SBT	Stockholm	15.15		19.80	2—5.15 am. News 2.01 am
WNBI	New York	15.15		19.81	11 pm—8 am.
GSF	London	15.14		19.82	2.30—5.15 am
KGEI	'Frisco	15.13		19.83	4.15—5.15 am
HVJ	Vatican City	15.12		19.84	Irregular in afternoons
—	Moscow	15.11		19.85	8.15—8.40 am; 9.48—10.30 am; 12.15—12.40 pm; 2.15—2.40 pm; 10.30—11.20 pm
HVJ	Vatican City	15.09		19.87	See 19.84m.
GWC,	London	15.06	S	19.91	See 10mc.
WWV	Washington	15.00	N	20.00	4.45—8.45 pm.
—	Moscow	13.42	N	22.35	Around 11.45 pm
WKRD	New York	12.96		23.13	11 pm—10.15 am
CNR	Rabat	12.83		23.38	10.30—11 pm
HCJB	Quito	12.45		24.11	7—8 am; 10.55 pm—midnight
—	Moscow	12.26		24.47	2 pm to 3 am
TFJ	Reykjavik	12.23		24.54	4.15—4.30 pm
—	Moscow	12.19		24.61	8.45—10.23 am; 11—11.50 am
—	Moscow	12.17 ..		24.65	7—9 am; 3.40—4.45 pm; 5.45—6 pm; 8.30—9.50 pm; 12—12.15 pm; 1.30—1.45 am; 2.15—2.45 am
R. France	Algiers	12.12		24.75	3.30—5.30 am; 6—8.30 am; 8.45—9.15 am
ZNR	Aden	12.11		24.77	3.13—4.30 am
GRF	London	12.09		24.80	9 pm—3.45 am
GRV	London	12.04	S	24.92	News at 8 pm; America calls Europe 8.15 pm
FZI	Brazzaville	11.97	S	25.06	5.45—8.30 am; 2—3 pm;5—5.15 pm; 12.30—1.15 am
GVY	London	11.95		25.09	9 pm—.45 am; News 19 pm, midnight and 2 am.
GVX	London	11.93		25.15	8 pm—1.30 am; 2.30—6 am; (Eng 8.15—8.45 pm; 12—12.30 am.
XGOY	Chungking	11.90	S	25.21	9—10.30 pm; 2.30—3.30 am.
VLG-9	Melbourne	11.90		25.21	Not in use
CXAIO	Montevideo	11.90		25.21	10.5 am—1.10 pm
WRCA	N.Y.	11.89		25.22	7—11.45 pm; 4—7.45 am; 8 am—2.30 pm
VPD-2	Suva	11.90	N	25.22	9.30—11 am
WKTM	New York	11.89		25.23	9.—11 am.
VLR-3	Melbourne	11.88	S	25.25	2—5.30 pm (Sun). 1—5.30 pm)
VLI-2	Sydney	11.87		25.27	5.55—6.25 pm
WBOS	Boston	11.87	S	25.27	9.15—11 pm; 6—8.15 am; 8.30 am—3 pm
VUD-,	Delhi	11.87	N	25.27	8.45—11.30 pm; News 8.46
HER-5	Berne	11.86		25.28	11.55—12.30 am
GSE	London	11.86	S	25.29	9.45 pm—2.15 am; 2.30—6 am
WGEA	Schenectady	11.84		25.33	11 pm—8.15 am
VLG-4	Melbourne	11.84	S	25.34	Noon—1.45 pm; 7.25—8.25 pm 8.30—9 pm; 9.15—10.45 pm
VLW-3	Perth	11.83	S	25.36	9.30 am—12.45 pm; 2.30—9.15 pm; (Sun. 9.45 am—9.15 pm)
—	Moscow	11.83		25.36	3—3.45 pm; 4—5 pm; 10—10.30 pm; 12—12.4 am; 1.30—4.45 am.
WCRC	N.Y.	11.83	S	25.36	6.15—7.15 am
WCDA	N.Y.	11.83		25.36	No schedule
GSN	London	11.82		25.38	7—8.45 pm; 9—11 pm
XEBR	Hermosillo	11.82		25.38	12—4 pm
COGF	Matanzas	11.80		25.41	3.30—6 am
KGEI	'Frisco	11.79	S	25.43	Noon—3.45 pm
WRUL	Boston	11.79		25.45	4.30—9 am; 9.15—10.25 am; 10.30—5 pm
VUD-6	Delhi	11.79		25.45	8.45 pm—1 am; News 8.45
GVU	London	11.78	S	25.47	8.30—8.45 pm
HP5G	Panama	11.78		25.47	12.15 pm—1.30 am; 3.45—7 am
VLR-8	Melbourne	11.76		25.51	6—10 am (Sun. 6.45 am—12.45 pm)
GSD	London	11.75	S	25.53	12.15—3 pm; 6.45—8.45 pm; 9 pm—2.30 am; 8.30 am;—12.45 pm
—,	Moscow	11.75		25.53	10.30—10.55 am.
HVJ	Vatican City	11.74		25.55	Mon. & Thurs: Calls Eng. 5 pm, Thurs & Sat calls Aust 6 pm.
COCY	Havana	11.73		25.56	12. pm—5.15 pm.
GVV,	London	11.73	S	25.58	9.45 pm—2.15 am; 2.30—7.30 am

Call Sign	Location	Mc.	M.	Time: East. Australian Daylight
WRUL,	Boston	11.73	25.58	10.15 am; 3—4 pm
HER-5	Berne	11.71	25.61	Daily: 5—8.45 am; Tues & Sat. 6.30—8 pm
YSM,	San Salvador	11.71	25.62	5—6 am.
VLG-3	Melbourne	11.71	S 25.62	4.55—5.40 pm; 5.55—6.25 pm; 6.30—6.50 pm.
WLWO	Cincinnati	11.71	S 25.62	6.45—8.15 am; 9.30 pm—midnight; News 10 and 11 pm.
CXA-19	M'tevideo	11.70	25.63	10—11 pm; 8 am—2 pm
SBP	Motala	11.70	S 25.63	2—5.15 am; 8.20—8.40 am; 12 am—1 pm opens again at 10.05 pm
CBFY	Montreal	11.70	25.63	10.30 am—2.30 pm
GVW	London	11.70	25.64	2.30—7 am
HP5A	Panama City	11.70	25.64	12—pm—4 am; 12.10 pm—4 pm
CE1170	Santiago	11.70	25.64	11pm—1 am
GRG	London	11.68	S 25.68	8.15 am—3.45 pm; 2.30—4.30 am.
—,	L'poldville	11.67	25.71	6.15—6.30 am; 3—4 pm; 7.30—7.45
COK	Havana	11.62	25.83	3 am—2 pm (Mon. 4—10 am)
WRUA	Boston	11.14	S 26.92	5—7.30 am, News at 7
CSW6	Lisbon	11.04	S 27.17	8.45—9.30 am.
KWV	San F'cisco	10.84	S 27.68	5—7.45 pm; 8—10 pm
VQ7LO	Nairobi	10.73	27.96	1.45—6 am
KES-3	Bolinas	10.62	S 28.25	4—9.15 pm
VLN-8	Sydney	10.52	28.51	Idle at present.
—	Moscow	10.44	28.72	7 pm—2.45 am (often news at 10.40 pm)
—	Moscow	10.23	N 29.33	5.15—6.50 pm; 10 pm—midnight
SUV	Cairo	10.05	29.84	5.30—6 am; 9.45—10.30 am
WWV	Washington	10.00	N 30.00	National Bureau of Standards frequency check, in speech on hour and half hour.
—	Brazzaville	9.98	S 30.06	5—6.20 am; 8—8.30 am 8.30 9.30 pm; 12.45 pm—1.15 am
HCJB	Quito	9958	S 30.12	7—8 am; 10.55 pm—1 am
WRX	New York	9905	30.29	9 am—3 pm; 3.15—8 pm
WKRD	New York	9897	30.31	7.45—9.30 pm; 6—8 am.
WKRX	New York	9897	30.31	9—11.45 am.
KROJ,	'Frsco	9.89	S 30.31	2—6.45 pm; 7—midnight; 12.15—3 am
—	Moscow	9.88	30.34	Irregular, but often heard around 9.30 pm
CR7BE	L. Marques	9.88	F 30.38	5—7.30 am; News 6.50
EAQ	Madrid	9860	S 30.43	5—6 am; News 5.15
—	Moscow	9860	30.43	9—10.15 pm
COCM	Havana	9833	30.51	10.45 pm—4 pm
GRH	London	9825	S 30.53	4.45—8.45 pm; 1.45—2.15 am; 6—8 am; 8.30 am—3.45 pm
RNB	L'poldville	9.78	N 30.66	4—5.45 pm; 2.55—3.30 am
—	Moscow	9770	30.71	11—11.30 am.
WKLJ	New York	9750	S 30.77	6.30—9 pm; 9—12 am
T14NRH	Heredia	9740	30.80	11—12 pm (Wed, Fri, & Sun. 2.30—4.30 pm).
CSW-7	Lisbon	9735	S 30.82	6—9.30 am
XGOA	Chungking	9720	30.86	6—7 am; 10 pm—2 am; News 1 am
OAX4K	Lima	9715	30.88	9.30 am—3.20 pm
WRUW	Boston	9.70	30.93	5.45—10 am; 3—4 pm
FIQA	Tananarive	9700	30.93	1.30—2 am.
GRX	London	9690	S 30.96	News 8 pm; America calls Europe 8.15 pm.
TGWA	Guatemala	9685	30.96	12.50 pm—3.45 pm (Mon. 11 am—3.45 pm)
LRA-1	B'nos Aires	9688	30.96	2.30—5 am; 6.30—7.30 am; 7 am—1 pm
VLG-8	Melbourne	9.68	30.99	Idle at present.
XEQQ	Mexico City	9680	30.99	1 am—5.45 pm
VLW-5	Perth	9.68	S 30.99	9.30 pm—2.30 am
WNBI	New York	9.67	31.02	8.15—5 pm
VLQ-3	Brisbane	9.66	31.05	11.45 am—5.15 pm. (Sun. 11 am—5.15 pm).
LRX	B'nos Aires	9.66	31.06	9.30—10.; 11.30 pm —2.10 pm (Sundays 4 pm)
HVJ	Vatican City	9.66	31.06	3—5.30 am
WGEO	Schenectady	9.65	31.08	Not in use at present.
WCBX	New York	9.65	31.09	2.45—5 pm.
COX	Havana	9.64	31.12	3.50—3 pm
XGOY	Chungking	9.64	S 31.10	10.35 pm—2.40 am; News 1 and 2 am
LRI	B'nos Aires	9.64	31.12	8.57—11 pm; 4.30—5.30 am; 6 am—2 pm
GVZ	London	9.64	31.12	7.45—9.45 am; 4.30—8 pm
—	Addis Ababa	9.62	31.17	2.40—3.30 am
VLI	Sydney	9.61	31.12	Not in use at present.
ZRL	Capetown	9.60	31.22	6.15 pm—1.30 am
HP5J	Panama City	9.60	31.23	11 pm—5.30 am; 12.30 am—2.30 pm; Sun. 12 pm—2 pm. Mon.
CE960	Santiago	9.60	31.24	10 am—3 pm.
GRY	London	9.60	31.25	7.15—8.45 am; 4.45—5.45 pm
—	Athlone	9.59	31.27	8.05—8.25 am; News 8.10 am
VUD-4	Delhi	9.59	31.28	9.30—12.35 am; 1.15—2 am; 3.30—5.30 am; News 11 pm 1.50 am and 5 am
WLWO	Cincinnati	9.59	31.30	10 am—3 pm
WLWK	Cincinnati	9.59	31.30	Idle
VLR	Melbourne	9.58	31.32	6.30—11.30 pm. daily
VLI-10	Sydney	9.58	31.32	Idle at present.
VLG	Melbourne	9.58	31.32	1.15—1.45 am (Eng. for India) 2—2.45 am (for Nth America
GSC	London	9.58	S 31.32	4.45—5.45 pm; 8.15 am—3.45 pm
KWIX	'Frisco	9.57	31.35	11 am—3.45 pm; 4—5.45 pm; 10.30 pm—1 am.
KWID	'Frisco	9.57	S 31.35	6—9.15 pm; opens again 12.45 am
—	Khabarovsk	9.56	S 31.37	6.30—8.12 am; 8.40—9.45 am; 1—2.12 pm; 2.45—3.40 pm; 7—10.30 pm; 11.30 pm—1 am.
OAX4T	Lima	9.56	31.37	Midnight—1 pm
XETT	Mexico	9.55	31.39	Continuous
GWB	London	9.55	S 31.41	6.30—8 am; 8.15—8.30 pm; 2.30—5.30 am.
WGEA	Schenectady	9.55	31.41	Not in use at present.
—	Moscow	9.54	31.43	10.40—11.20 pm; 1.15—1.30 am
VLG-2	Melbourne	9.54	S 31.45	Noon—1 pm; 3.30—4.40 pm; 11 pm—1 am; 2—2.45 am
AFHQ	Algiers	9.53	N 31.46	1.45—2 am; 3—9.30 am; News 6 am
SBU	Stockholm	9.53	31.47	8.20—8.35 am; 12 am—1 pm, News 8.20 and 12 am.
HER-4	Berne	9.53	31.47	See 25.61 metres.
WGEO	Schenectady	9.53	31.48	6.45—8.15 am; 8.30 am—10.30
ZRG	Joh'burg	9.52	31.50	6.30 pm—1.30 am
COCQ	Havana	9.51	31.53	11 am—2 pm; 9.20—12 pm
GSB	London	9.51	S 31.55	8.45 am—12.45 pm; 3—6 am
PRL-7	R de Janeiro	9.50	31.57	9 am—2 pm
XEWW	Mexico City	9.50	31.58	12.58—6.45 pm.
GWF	London	9.49	31.61	6.30 pm—1.30 am; 2.30—9.45 am
KRCA	'Frisco	9.49	31.61	4 pm—4 am
WCBX	New York	9.49	31.61	10.50 am—2.30 pm
—	Moscow	9.48	31.65	5—6 pm; 9.30 pm—1.45 am; 2.45—3.15 am.
TAP	Ankara	9.46	31.70	2—6.45 am; News 4 am.
GRU	London	9.45	S 31.75	11.30 pm—2.30 am; 4—7.30 am
COCH	Havana	9.43	31.80	9.45 am—4.15 pm
—	Moscow	9.43	31.81	8—8.25 am; 3.15—3.45 pm; 4.30—5 pm.
GRI	London	9.41	31.86	3.45—9.30 am; 6—8.45 pm
FGA	Dakar	9.41	31.88	4—5.15 am
—	Moscow	9.39	31.95	10.30—12 pm; 2.30—3 am; 11 am—2 pm.
COBC	Havana	9.37	32.00	12 pm—4.15 pm.
OAX4J	Lima	9.34	32.12	10 am—5 pm; 12 pm—1 am; 4—7 am
LRS	B'nos Aires	9.32	32.19	9 am—1 pm; 11—12 pm; 5—5.30 am
COCX	Havana	9.27	32.26	11.45—4 pm.
HC2ET	Guayaquil	9.19	32.64	11.30 pm—4.30 pm
CNIR1	Rabat	9.08	33.03	5—9.50 am; 5.30—5.50 pm; 10.30—12 pm.
—	Brazzaville	9.04	N 33.19	12.45—1 am; 5—6.15 am; 8—8.30 am; 8.30 pm—9.30 pm
COBZ	Havana	9.03	33.23	11.45 pm—3 pm
—	Kuibyshev	8.99	33.37	6.50—7 am.
AFHQ	Algiers	8.96	S 33.48	3—9.30 am; News 5.15 and 6
—	Moscow	8.94	N 33.54	Around 9.45 pm
KES-2	'Frisco	8.93	33.58	9.15 pm—4 am
—	Dakar	8.83	33.95	6.15—7.45 am; 6.30—6.50 pm; 11.15—12 pm.
COCQ	Havana	8.83	33.98	9.20 pm—3.15 pm
COCO	Havana	8.70	34.48	8.30 pm—4.30 pm
COJK	Camaguey	8.66	34.62	3.30—4.30 am; 7.30—10 am; 12—12.30 pm:
WOO4	New York	8.66	34.64	11 am—5 pm; 5.15—8 pm.
—	Kuibyshev	8.05	37.27	2—2.30 am; 3—5.15 am; 8.15 9.45 am
CNRI	Rabat	8.03	37.34	5—10.45 am; 4—6 pm
FXE	Beirut	8.02	37.41	Midnight—8 am.
YSD	San Salvador	7.89	38.00	11 am—2.30 pm
SUX	Cairo	7.86	38.15	4.30—5.30 am; 6.15—8.45 am
WKRD	New York	7.82	38.36	10.30—12.15 pm
WKRX	New York	7.82	38.36	8—11 pm.
WRUL	Boston	7.80	38.44	1.30—5 pm; 7—9 pm
WLWO	Cincinnati	7.57	S 39.6	3.30—5.30 pm
WDJ	New York	7.56	39.66	10.15 am—7 pm
KWY	'Frisco	7.56	S 39.66	11.30 pm—1.30 am
WKTS	New York	7.57	39.6	11 am—1 pm
—	Moscow	7.56	39.68	2—7.30 am; 9—10 am; 12.10—12.30 pm.
SU—	Cairo	7.50	40.00	2.30—4 am
YN2FT	Granada	7.49	40.05	11 am—2 pm
HER—	Berne	7.39	40.56	2.15—2.47 am

Call Sign	Location	Mc.	M.	Time: East. Australian Daylight
GRJ	London	7.31	41.01	6.30—9.45 am; 3.30—7.30 pm
—	Moscow	7.30	41.10	3—10.30 am; 11—12 am; 2—4.45 pm; 5.30—6 pm
VUD-2	Delhi	7.29 S	41.15	8.45 pm—12.25 am; News 8.45 pm; Special news for 15 minutes at 5 am.
VLI-9	Sydney	7.28 S	41.21	2—2.45 am (for Nth America)
VUM-2	Madras	7.26	41.32	7—7.40 pm; 10.45—12.30 pm; 1.45—1.50 pm. News 11 pm and 1.45 am.
GSU	London	7.26	41.32	5.30—11.30 am; 4.45—7.30 pm 10.35 pm—1 am; 5—7.30 am
KGEI	'Frisco	7.25	41.38	2 pm—3.45 am
VUB-2	Bombay	7.24	41.44	5.15—6.10 pm; 10.25—11.45 pm. News 6, 10.25 & 11 pm
VLQ	Brisbane	7.24	41.44	6—10 am.
KWID	'Frisco	7.23	41.49	9.30—4.05 am
GSW	London	7.23 S	41.49	6.15—9.45 am; 4.45—6.15 pm
VLI-4	Sydney	7.22 S	41.55	12.35—1.45 am
VUC-2	Calcutta	7.21	41.61	Schedule unknown; News at M/n
VLQ-2	Brisbane	7.21	41.58	5.30—11.30 pm
—	Moscow	7.21	41.61	8.50—10.30 am
—	Madrid	7.20	41.63	7—10 am
YSY	San Salvador	7.20	41.65	11.30 am—3 pm
GRK	London	7.18	41.75	
XGOY	Chungking		41.80	9 pm—4 am; 5.30—8 am
—	Moscow	7.17	41.80	6.20—7.30 am; 8.15—10.55 am 11—11.30 pm; 2—5.30 am
GRT	London	7.15 S	41.96	1.45—3 pm
EAJ-9	Malaga	7.14	42.00	7—10.05 am
—	Ovideo	7.13	42.05	6—8.30 am
GRM	London	7.12 S	42.13	11.45 am—3.45 pm; 4.45—7.30 pm
EA9AA	Melilla	7.09	42.31	Heard around 8 am
GRS	London	7.06 S	42.46	5—9.45 am; 12.45—3 pm; 3.30—9.45 am.
EAJ24	Cordoba	7.04	42.61	7.40—8 am
EAJ-3	Valencia	7.03	42.65	7—11 am
—	Ponto Delgada	7.02	42.74	6—7 am
WGEA	Schenectady	7.00	42.86	11 am—3 pm
FO8,AA	Papeete	6.98	42.95	Wed & Sat. 2.57—3.45 pm
—	Moscow	6.98	42.98	3 am—10.23 am; 11—11.30 am
YNOW	Managua	6.87	43.67	11 am—3.30 pm
KEL	Bolinas	6.86	43.7	8—8.25 pm
ZLT-7	Wellington	6.71	44.68	9 pm in news session only
TGWB	G'temala	6.54	45.87	10.30 am—4 pm
WKTM	New York	6.38	47.01	6.15—8 pm
	Berne	6.34 N	47.28	5—8.45 am; News 7.53
SUP-2	Cairo	6.32	47.47	5—8 am
FK8AA	Noumea	6.20	48.39	6.15—6.27 pm; 8—9 pm
GRN	London	6.19	48.43	6.45—7.30 am; 1—3.45 pm
VUD-2	Delhi	6.19	48.47	10.30—11.15 pm; M/n—2.35 am News 11 pm; 12.45 am; Special 15 mins at 5 am
XECC	Puebla	6.19	48.47	From 3—5 pm
WGEO	Schenectady	6.19 S	48.47	3.15—6.15 pm
LRM	Mendoza	6.18	48.51	9.30—2 pm
GRO	London	6.18	48.54	6—11.45 am; 3.40—8.45 pm
WCBX	New York	6.17	48.62	6.18—8 pm; News 7.18 pm
—	Antananarivo	6.16	48.62	2—3 am
HER-3	Berne	6.16	48.66	See 47.28 metres
HJCD	Bogota	6.16	48.70	Around 3 pm
CBRX	Vancouver	6.16	48.70	12.30 am—5.30 pm
EQB	Teheran	6.15	48.74	3—6 am; News 3.45 and 6.15 am
GRW	London	6.15 S	48.78	3—6.15 pm; 4—7.30 am.
WBOS	Boston	6.14	48.86	7.—9 pm
XGOY	Chungking	6.13 N	48.92	10.35 pm—2.30 am; News 1 and 2 am.
VPD-2	Suva	6.13 N	48.94	4.55—9 pm
GWA	London	6.12	48.98	7 am—1 pam; 2.45—7.30 pm
HP5H	Panama City	6.12	48.99	10 am—3 pm
XGOY ..	Chunking	6.12	49.02	10.35 pm—3.30 am
XEUZ	Mexico	6.12	49.02	Around 3—4 pm
WKTS	New York	6.12	49.02	5—7 pm
GSL	London	6.11 S	49.10	4.45—6.45 pm; 1.45—2.15 am
CBFW	Montreal	6.09	49.25	10.30 pm—2.30 pm
ZNS-2	Nasau	6.09	49.25	12—12.15 pm; 4.45—5.15 am
VQ7LO,	Nairobi	6.08	49.32	3—6 am; News 3.15 am.
WLWK	Cincinnati	6.08	49.34	11.30 am—3 pm; 3.15—7.30 pm
CKFX	Vancouver	6.08	49.34	12.30 pm—5.30 pm
CFRX	Toronto	6.07	49.42	10 pm—4.30 pm
—	Moscow		49.42	7.30—8.30 pm
GRR	London	6.07	49.42	4.45 am—1 pm; 2.45—6.45 pm
SBO	Stockholm	6.06	49.46	Try around 8.30 am
WCDA	New York	6.06	49.50	10.30 am—5 pm
GSA	London	6.05 S	49.59	6—8 am; 2.45—7.30 pm; 2.30—4.30 am; News 6.30 pm
XETW	Tampico	6.04	49.66	11 pm—5 pm
WRUW	Boston	6.04	49.66	3.15—7 pm
HP5B	Panama City	6.03	49.73	10 am—2 pm; 2.30 am—5 am
—	Moscow	6.03	49.73	10.40—11.19 pm
CJCX	Sydney (Nova Scotia)	6.01	49.92	10 pm—5.30 am; 9 am—2 pm
VUD-3	Delhi	6.01	49.92	11.25—12.a5 pm
GRB	London	6.01	49.92	9.45—11.45 am; 2.45—7.30 pm
ZRH	Joh'burg	6.00	49.95	2.—8 am
CFCX	Montreal	6.00	49.96	11 pm—5 am; 9 am—3 pm
ZOY	Accra	6.00	49.96	9.30—10.15 pm; 3.15—6.15 am News 6 am
XEBT	Mexico City	6.00	50.00	2 am—4.30 pm
WKRD	New York	5.98	50.12	3.45—7.30 pm
VONH	St. John's	5.97	50.25	11.30 pm—5.30 am; 8—1235 pm; News 8.30 am
HVJ	Vatican City	5.96	50.26	5.30—7.45 am
ZRD	Durban	5.94	50.47	10.30—11.10 pm; 2—8 am
—	Khabarovsk	5.93	50.54	9 pm—1 am
—	Moscow	5.89	50.90	8 pm—7 am
—	Lisbon	5.85	51.19	4.45—8 am
VUB-2	Bombay	4.88	61.48	12—12.15 pm; 1 am 1.15 am; News Midnight
VUC-2	Calcutta	4.84	61.98	11—11.10 pm; midnight—12.10 pm; 1 am—2 am.
WWV	Washington	5.00 N	60.00	See 30 metres
VUC—	Colombo	4.90 N	61.2	10.30 pm—3.20 am. News midnight and 2 am.

B.B.C. PACIFIC SERVICE

AS FROM 21/11/43

E.A.D.S.T.: 4.45—8.45 p.m.

Australia—

GRH, 9.825mc, 30.53m, Period throughout.

GSL, 6.11mc, 49.10m, 4.45—6.45 pm.

GRM, 7.12mc, 42.13m, 4.45—7.30 pm.

GSD, 11.75mc, 25.53m., 6.45—8.45 pm.

GWC, 15.07mc, 19.91m, 7.00—8.45 pm.

New Zealand and Pacific Area

GRH, 9.825mc, 30.53m, Throughout.

GSU, 7.26mc, 41.32m, 4.45—7.30 pm.

GRM, 7.12mc, 42.13m, 4.45—7.30 pm.

GWC, 15.07mc, 19.91m, 7.45—8.45 pm.

GSN, 11.82mc, 25.38m, 7.00—8.45 pm.

B.B.C. GENERAL OVERSEAS SERVICE

AS FROM 21/11/43

E.A.D.S.T.: 3—615 pm; 9—2.30 am.

GSW, 7230, 41.49, 4.45—6.15 pm.

GSN, 11,820, 25.38, 3.00—6.15 pm.

GRW, 6150, 48.78, 3.00—6.15 pm.

GSP, 15,310, 19.60, 4.35—6.15 pm.

GSN, 11,820, 25.38, 9.00—11 pm.

GVZ, 9.640, 31.12, 9.00—2.15 a.m.

GSV, 7,260, 41.32, 10.35—1.00 a.m.

GRP, 17,870, 61.7, 9.00—11.15 p.m.

GRP, 17,870, 16.79, 9.00—2.15 am.

GWC, 15.070, 19.91, 9.00—12.45 am.

GRG, 11,680, 25.68, 11.00—2.30 pm.

GRU, 9.455, 31.75, 11.30—2.30 am.

GSA, 6050, 49.59, 1.00—2.30 am.

GRH,9825, 30.53, 1.45—2.15 am.

GSL, 6110, 49.10, 1.45—2.15 am.

Regret space does not permit of 2.30—10 am. schedules.

SPEEDY QUERY SERVICE

Conducted under the personal supervision of A. G. HULL

S.T. (Kerang) asks: Where can you buy scraps of silicon steel for making into power chokes (see recent issue of A.R.W.)?

A.—Most of the smaller manufacturers of power transformer, battery chargers, etc., will supply you with "cut-offs", but you will probably be amazed ot the price! Good quality silicon steel costs about £50 per ton and even in the form of oddments, it is still quite expensive! If you write to the technical editor, enclosing a stamped addressed envelope, he will inform you of a place where oddments can be bought in lots of half a hundredweight.

●

C.I.F. (Fremantle) asks: What is a cathode ray?

A.—A cathode ray is a rapidly moving stream of electrons pulled by electrostatic attraction from a negatively charged body. The streams of electrons in an ordinary radio valve are actually cathode rays since they are emitted from a "cathode." Early cathode ray tubes had cold cathodes — merely metal plates or rods and the voltage between cathode and anode had to be extremely high (hundreds of thousands of volts) in order to get an appreciable flow of electrons. Those electrons that did move, however, acquired very high velocities (the velocity of electron flow depends on the voltage), speeds up to thousands of miles per **second** being attained.

●

H.M.C. (Bacchus Marsh) asks if ordinary midget condensers can be employed in a short-wave set.

A.—As you do not state whot you propose using the condensers for, we cannot advise you. Ordinary midget variable condensers are definitely not satisfactory, as reaction condensers on account of their not "staying put" and also due to backlash, or slack, in the single bearing. The same features render them unsuitable for use as tuning condensers.

For short-wave work, we advise the use of either an H-gang condenser from which half the plates have been removed, or else high-quolity midget condensess with efficient insulation and rigidly mounted bearings.

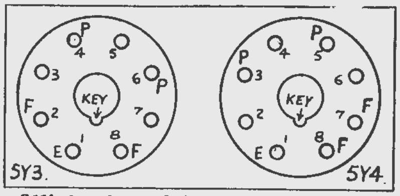
WANTED

Will any reader possessing o template or details for correct alignment of an "Astatic Tru-tan" crystal pick-up, communicate with me. I will pay postoge and return instructions if required.

J. RAMSAY,
Pokeno, New Zealand

F.S. (Darwin) asks: What are the differences between a 5Y3G and a 5Y4G?

A.—These tubes are practically identical from an electrical viewpoint — in foct, they very often ARE identical and are merely octal equivalents of the 80. The bases are octals, but connections are different. In the case of the 5Y3G, the more commonly used valve, the second and eighth pins are for the filament, while while Nos. 4 and 6 are for the two anodes. Pin No. 1 is usually present, but is



BASE CONNECTIONS OF OCTAL TYPES = 80

either not connected to anything, or is connected to a rather half-hearted internal shield.

All pins are present on the 5Y4G, the filoment being connected to No. 7 and 8, while the anodes are connected to Nos. 3 and 5. Pin No. 1 is again a shield. The other pins have no connections.

In numbering octal base socket pins, the procedure is to look at the bottom of the tube, or bottom of socket and count in a clockwise direction from one side of the keyway around to the other. That is, the keyway goes between pins Nos. 1 and 8.

●

L.S.R. (West Maitland) osks if metol tubes are better than glass.

A.—It seems to be largely a matter of opinion. Some valve makers swear the metal tubes are better, others swear the opposite. It seems to depend on what they make! Metal tubes are more compoct and provide better shielding, but you can see what's going on in a glass tube. Some of the early metal tubes suffered a bit from gas—either the metal envelope had occluded gas or else gas leaked through the metal when it became hot. A lorge manufacturer of American sets advertised that the sets had octal sockets so that they could be used with "glass tubes or the still-inferior metal tubes!"

●

A.S.F. (Frankston) asks: How can A.V.C. (automatic volume control) and A.V.E. (automatic Volume expansion) be employed simultaneously in o receiver?

A.—The A.V.C. and A.V.E. act in different parts of the receiver and have totally different functions. The A.V.C. acts in the R.F. or (I.F.) section and keeps the **average** signal strength of the signol constant (**before** detection). This is to eliminate fading and also to keep the volume approximately the same when tuning from one station to another. A delay of from one-twentieth to holf a second is incorporated in the A.V.C. action so that it cannot affect the ups and downs of volume in speech or music.

The A.V.E. has the opposite effect. It does not disturb the average volume level, but it decreases the volume on soft notes and increases it on loud notes so that the loud-to-soft power ratio is increased, thereby increasing the emphasis, the rhythm and expression.

CRYSTALS IN VALVE ENVELOPES

With a great song and dance it has been announced in America that somebody there has thought up that extremely novel idea of putting crystals into valve envelopes, so that they can be kept free from moisture and atmospheric pressure changes. The scheme is not so novel as they imagine, however, crystals being mounted in valve envelopes in this manner by our local Amalgamated Wireless Valve Company about six years ago. A crystal of this type was specified for the Amateur's Communication-type receiver described in our columns in 1937.

SHORTWAVE NOTES AND OBSERVATIONS

(Continued from page 22)

WNBI, 9.67mc, 31.02m. Very good at 4.50 pm (Perkins, Harvey, Maguire).

WGEO, 9.53mc, 31.48m. Excellent around 1.30 pm (Perkins).

WGEO, 6.19mc, 48.47m. When closing at 6.15 pm said, "WGEO will return to the air in fours hours on 15.33mc, 19.5m.—L.J.K.

U.S.S.

——, 10.44mc, 28.72m. Excellent at 5.30 pm with chimes and Russian. (Harvey).

—, 10.23mc, 29.33m This now outlet is splendid at 5.15 and again at 10 pm.—L.J.K.

If you are making a list of U.S.S.R. transmitters this may help. I tuned to the following on the night Stalin's speech was broadcast. 24.45, 28.72, 30.34, 30.43, 31.36, 31.43, 31.65, 33.54 33.54, 33.67, 38.68, 50.38, 50.54,58.90 and 59.17m. All were audible but 28.72 and 30.43 were the best at 12.40 am—L.J.K.

WEST INDIES

Cuba

COCH, Havan, 9.43mc, 31.80m. Fair during morning (Harvey).

electronic briefs: television

To produce a moving picture it becomes necessary to break down the action into a series of still pictures. Each still scene is flashed on the screen individually but done so rapidly that the human eye sees a smooth action. If the motion picture projector is slowed down the action becomes jerky. Each still picture is called a frame and the conventional movie projector flashes between 24 and 30 frames per second on the screen. Television is based upon the same principle but the problems involved are much more complex.

Television, using the same basis for creating picture action as the movies, breaks down the picture or scene to be broadcast into a series of still pictures called frames. But each frame must also be broken down into approximately 200,000 tiny segments, each segment being broadcast separately and reassembled at the receiving end so rapidly that 30 frames can be flashed on the screen every second. Thus some 6,000,000 separate signals must be transmitted per second. Furthermore each of these signals starts as light, is converted into an electrical impulse, broadcast and then reconverted to light again. To make television talk, a conventional sound transmitter must be coordinated and synchronized with the picture broadcast.

As with all things in the field of electronics, vacuum valves are what make television possible. Remember; Eimac valves enjoy the enviable distinction of being first choice among leading electronic engineers throughout the world.

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Printed by the Bridge Printery, 117 Reservoir St., Sydney, N.S.W., for the proprietor of the "Australasian Radio World," 117 Reservoir St., Sydney.