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MARCH 18, 1925

VOL. II

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"Gloucester House," 97 Clarence Street, Melbourne. 97 Clarence Street, Sydney. Australasian Chambers, Wellington, N.Z.
Silk Purses and Sows' Ears

"Of cannot make a silk purse out of a sow's ear—nor can you make effective Wireless apparatus out of inferior material. Every enthusiast, as our American cousins so succinctly say, should "paste that inside his hat" and refresh his memory of the fact as often as needs be, for, judging by the number of letters Radio receives on this matter it is a reminder that is frequently forgotten or ignored.

Cheap material in ninety-nine cases out of a hundred means cheap results. In the hundredth case success is not secured through the fortunate possession of a "tuppeny-ha'penny" accessory which operates more efficiently than the original cost of it warrants but in spite of it.

The Wireless field is one that is peculiarly situated in regard to immense output of material. This Science or form of entertainment, as the case may be, is so popular that enormous production follows as a natural consequence upon which is super-imposed the consequent ability of the makers to turn out goods at much lower cost than would be the case if the demand were less, or the public had become sufficiently educated by the College of Hard Experience to realise that all that glitters is not gold, or, for that matter, all that is black is not bakelite.

From the foregoing it should not be gathered that we carry a lance only for the "part" which, to be worthy of the name, or our confidence, must make an appreciable gap in our bank-balance. By no means. The more expensive of two articles is not at all necessarily the better. Not necessarily, but nowadays, by reason of that strong competition which exists in every commercial direction and compels the manufacturer to produce as fine an article as possible at as low a price as practicable and still lay before the public a product of his factory equal to, if not superior, to his competitors', most probably.

To turn out high-grade apparatus costs money but the manufacturer who does so is in the end threefold repaid. He establishes confidence in the public mind and secures a reputation for first-class goods and the man who has obtained these cannot afford to lose them—they are his bread and butter.

The conclusions to be drawn from the above are obvious: purchase your apparatus or accessories from a reputable firm or maker and pay as much for them as you can afford—it will be found to be cheaper, not only in the end, but in the beginning.

So much for the financial aspect of the matter. Now, to deal with it from the point of view of efficiency.

Having adhered to one's hat the golden maxim concerning swine and silk, it is just as important to add, "A chain is as strong as its weakest link"—in other words, a receiver, or a transmitter, for that matter, is as efficient as its most inefficient accessory.

To install a first-class valve for which has been paid a first-class price and then, through an ill-advised sense of economies, to add a third-rate type of transformer is suicidal; the virtues of the former are immediately neutralised in operation by the defects of the latter.

Furthermore, it should be remembered that certain receivers are designed to give certain results. For an instance, it is almost foolishly extravagant to go to the expense of buying, or the trouble of building, a five-valve set to receive signals with telephones, even if the experimenter wants to listen to American broadcast stations, that has already been done time and time again on one tube. For loud-speakers the case is, of course, different. Then the receiver must be given a fair chance to perform the work required of it by the use of at least three valves. Values are manufactured for different purposes and they cannot be expected to give best results if used for other purposes; each type has its special characteristics and each is best when used as intended by its maker.

Be fair with the apparatus. Buy the best and most reputable; do not expect one valve to do the work of four, nor loud-speaker results on telephone signal strength and all will be well.

As an analogy, a receiving set can be likened unto a motor-connection. Overcrowd it (which on too much plate and filament current), set it to climb a steep hill (expect it to reach out for distances for which it was never designed), in fact, treat it not with that care and attention which is the right and necessity of any other scientific instrument and only one thing can be expected—TROUBLE, in large, capital letters.
The Experimenter’s Short Wave Low Loss Tuner

A QUICK-CHANGE Set for Amateur and Radiocast Wavelengths, Using Coils whose Construction is Described.

By Carlos S. Mundel.

REPRINTED BY COURTESY OF "RADIO," SAN FRANCISCO.

RECEIVER especially well adapted to waves below 100 metres can easily be made from the circuit diagram of Fig. 1. This is a Hartley oscillator with antenna circuit loosely coupled and fixed in tune, so as to minimize radiation. Its special feature is the provision made for easy and rapid coil changes, thus giving great flexibility in covering all wavelengths.

This quick change is accomplished by means of small battery clips, whereby different coils may be attached at X, Y, Z, Q, and R. Best results are assured with a 2 in. separation of coils S and K. Complicated coupling arrangements are obviated by using variable condenser C, to control the feedback. A simple panel arrangement for tuner and detector is shown in Fig. 2. Complicated coupling arrangements are obviated by using variable condenser C, to control the feedback.

The apparatus is as follows:
1. 7 x 12 x ¾ in. panel.
2. 2 good low-loss variable condensers.
3. 1 socket.
4. 1 rheostat.
5. 1 tube.
6. 1 grid leak plus grid condenser.
7. 1 lb. No. 18 enamelled wire.
8. ½ lb. No. 28 d.c.c. wire.
9. Plus necessary ‘phones and batteries.

The coils may be chosen from the four kinds described below. Look over your facilities and pick out those which are best suited to your available material.

Coil 1 (Fig. 3a) is wound on an ordinary spiderweb form. Thread the wire in and out over each arm (see figure), or as an optional method, over two arms and under two arms. Assuming an inside diameter of 2½ in., wire 24 turns of the No. 18 enamelled, stop and make a bared twist for connection Y, then add 16 turns to constitute the plate coil.

Coil 2 (Fig. 3b) is wound on a 3 in. bakelite cylinder arranged for low-loss by glueing eight strips of bakelite (or better yet, hard rubber) lengthwise around the circumference at equal distances. The object of this arrangement is to keep as much of the winding in air as possible. Six strips may be used in place of eight, if desired. Number of turns: 20 for XY, bared twist, and then 14 for YZ.

Coil 3 (Fig. 3c) is a “diamond weave.” On a disc of 3 in. dowel or window pole ½ in. wide make 15 equally spaced marks (lay your watch on the face of the disc and mark off every four minutes). Drive 14 ⅝ in. nails

Fig. 1.—Circuit diagram for Short-wave Tuner.

Fig. 2.—Suggested Panel Layout.

Fig. 3a.—Coil 1.

Fig. 3b.—Coil 2.

Fig. 3c.—Coil 3.
erect and operate powerful stations in the N.Z. Broadcasting Company and come into force on April 1, which accomplished fact. This company will take over the existing public broadcasting stations, increase the power, and otherwise improve the existing service, so as to adequately cater for the requirements until such times as the new stations can be erected.

The writer of the letter quoted above wishes to avoid personal publicity but has left full particulars with the United Distributors, Ltd., 72 Clarence Street, who are the manufacturers of this set.

The new rules and regulations governing amateur radio and broadcasting in N.Z. have been gazetted and come into force on April 1, which date should also see the formation of new stations. This company will then be able to make it exactly like them. For coils 1 and 3 inductance L should match exactly. Clips at points on this circle. Drill holes at these points and insert

Coil L is of five turns No. 18 enameled. For coils 2 and 3 it may be made circular, though it is best to use clips at points on this circle. Drill holes at these points and insert turn (honeycomb coil). Audio filament, three-quarter glow. No condenser in at all.

The terminals are:— The following coils were used at the four-valve Unitized Home Assembly:— The following coils were used at the four-valve Unitized Home Assembly:

KDKA ON A UNITED HOME ASSEMBLY SET.

WITH many noted achievements already to its credit, the United four-valve Home Assembly set gained a further striking success recently, when a Northbridge experimenter succeeded in tuning in KDKA on good strength.

The signals received were of good 'phone strength, being about equivalent to the usual signal strength of EPC on a crystal set. Several stations were present at my house at the time and we verify the results obtained. I was rather surprised myself at such splendid results and it occurred to me that perhaps I was receiving broadcasters’ harmonics, but after KDKA gave their correct alignment I continued to listen for a quarter of an hour without altering the tuning at all, but absolutely nothing could be heard. I then tuned the set to 2BL, who came in on full 300-spoken power. This absolutely put it beyond all doubt that KDKA had been received direct.

The set was operating on an aerial 70 ft. long over all and 14 ft. high.

The signals received were of good 'phone strength, being about equivalent to the usual signal strength of EPC on a crystal set. Several stations were present at my house at the time and we verify the results obtained. I was rather surprised myself at such splendid results.

Northbridge.
RADIO

March 18, 1925

Radio Evolution

BEING Excerpts from a Paper presented recently at the Pan-American Conference on Standardisation in Lima, Peru.

DR. ALFRED N. GOLDSMITH.

Practical radio communication is now more than a quarter of a century old, and may fairly be said to have passed out of its infancy and into its period of early maturity. Radio engineering is rapidly becoming a specialised and exact division of electrical engineering. Commercially, the radio field has reached such proportions that the radio industry takes its place, at least in certain countries, among the major manufacturing and sales industries of these countries. It is fitting, therefore, to consider the trend of radio communication during the last twenty-five years and to study the evolution of the art during that time.

TECHNICAL EVOLUTION.

A.—Spark Coil Transmitter and Coherer Receiver.

The first stage in radio communication may be termed the epoch of highly damped wave transmission and reception, and relatively non-selective receiving methods using potential operated detecting devices. The typical transmitter during this early period of the art was the spark coil, which produced a relatively frequent succession of highly damped wave trains in the antenna system. The radiation covered a very wide range of frequencies in its spectrum and was therefore sure to produce marked interference in all receiving sets. The receiving sets were not electrically selective to any considerable extent, and the typical detector was the coherer.

B.—Rotary Spark Transmitter, and Crystal and Electrolytic Detectors.

The second epoch may be called that of the moderate decrement transmitter and the proportional-response detector. During this time spark transmitters, frequently of the rotary gap type, were employed. These gave a more frequent succession of moderately damped wave trains, though still covering a wide range of frequencies in the emission and not permitting truly selective signalling. The receiving set was only moderately selective, it being hardly worth while to increase the selectivity of receiving sets to any considerable extent when using such transmitters. On the other hand, a great improvement was made in the detector system. Crystal or electrolytic detectors were employed. Such detectors were better suited to use with reception by ear than the coherer, and accordingly the speed of operation was greatly increased.
March 18, 1925.

C. Quenched Spark Transmitter and Three-Electrode Vacuum Tube Receivers.

The third epoch in radio communication may be termed that of the low decrement transmitter and the highly sensitive receiver. The transmitter most typical of this epoch is the quenched spark transmitter, which produces a large number of regularly spaced wave trains of low decrement each second. This method of transmission is well adapted to the production of a musical tone in the receivers, and thus permits a considerable degree of psychological discrimination of the signal as against incidental atmospheric disturbances of reception.

The receiving set was either of the crystal detector variety or employed the three-electrode vacuum tube. Audio-frequency amplification also came into vogue. The new tube receivers soon showed the possibility of building receivers of relatively low decrement and high selectivity, and of great sensitiveness. As a result it became possible to choose the desired signal, with at least the partial exclusion of others, and it also became feasible to signal over long distances, particularly during the favourable hours of the day and the best times of the year.

D. Long-Distance Communication Attained.

It became clear at this stage of the evolution of radio communication, that the scope and usefulness of the art were rapidly increasing. Whereas in the first epoch, radio was used almost entirely for communication between ship and shore stations (and for occasional military purposes), its use for overland communication increased somewhat during the second epoch; and during the third epoch it even began to be employed for the trans-oceanic and trans-continental services. Fairly powerful spark transmitters enabled long-distance communication of a hitherto unattainable degree of reliability. As a result of this increase in the use of radio, the congestion of traffic in the ether became very noticeable and engineers bent their best efforts to the production of a transmitting and receiving system which should enable the use of a narrower band of frequencies for each separate transmission.

We thus come to the fourth epoch in radio development, namely, that of the continuous wave telegraph transmitter and the highly selective receiver based upon heterodyne reception. The transmitters in this case were either arc oscillators or radio frequency alternators. In contradistinction to all earlier types, they produced continuous wave trains.

E. The Oscillating Receiver.

The receiving set was generally slightly different frequency produced by a local oscillator.

F. Radio Telephony: Super-Receiver.

We now come to the fifth epoch in radio communication, namely, that in

(Continued on page 872.)
The Inductance of Bends and Loops

By E. C. Philipp.

Here is an impression among a great many people who ought to know better that the inductance of a loop wire is greater than the inductance of that same piece of wire straightened out. This is not so; in fact, the inductance is actually greater when the wire is straightened out. It does not matter how crooked is the path taken by a conductor, as long as one loop does not lie over another one; its inductance cannot be greater and is actually less than the same conductor stretched out in a straight line.

For instance, take a piece of wire one foot long; this has a certain inductance. Now bend it into a circle and the impedance will be found to be slightly less.

This can be arrived at by the following reasoning. Consider two pieces of wire 1ft. and 2ft. long, respectively; bend these into circles and the diameter of the second loop will be just double that of the shorter one.

The circumference of B is twice that of A and therefore its area is four times that of A and its flux density is only one-half as great, therefore it will actually contain twice the flux.

Since there are the same number of elements of da and db as there are db and db, the same relation holds good for whole circles or partial circles (bends) of whatever shape so long as A and B are both bent similarly.

In other words, the flux for a given current, or the inductance, varies directly with the linear dimensions (length) of similarly shaped coils and bends.

If for similar loops the inductance is proportional to the length of wire it must be the same per foot of wire in each case. Now, if one loop be made very large, then a small section of it, say, a few feet in length, is approximately a straight line, and its inductance can be considered as equal to that of a straight line.

Hence the inductance of a foot of wire is the same whether it is straight or a part of a larger circle, or a straight line.

Now this last sentence has to be modified to take into account the fact that when currents are flowing in opposite directions in parallel the inductance of both wires is partially neutralized depending upon how near together they are. Take three pieces of wire, each a foot long and bend them into the following shapes:

It is obvious that this neutralizing effect is greatest in the case of c but nevertheless it does exist to some extent and its effect is to make the inductance of all three pieces of wire less than that of the wire straightened out.

We therefore reach the conclusion that the inductance of all bends and loops is actually less than the same length of wire straightened.

Where one loop lies over another the inductance is general increased as the square of the number of turns:

If $H = \text{Magnetomotive force (product of the amperes and number of turns per unit length)}$

$B = \text{Flux density (number of lines of force produced per unit area)}$

the stored energy is proportional to $H \times B$

If a coil has the number of turns doubled the value of H for the same current is doubled and the magnetic reluctance in air remains the same, so B is doubled and therefore $H \times B$ is quadrupled. It is the coefficient of self-induction which is a measure of $H \times B$ being correspondingly quadrupled.

1YA AUCKLAND.

Since resuming broadcasting, 1YA has been doing excellent service. Some important improvements are being effected at this station. A contract has been let for the erection of new aerial poles at Scott’s Hall, Symonds Streets, where the station is situated, and it is anticipated that an aerial having a clearance of the building of 60 feet will soon be available for the higher-powered transmissions, which it is proposed to give.

The present input power at 1YA is 140 watts, but the plant is designed for a 500 watt input and a substantial increase over the power at present in use is promised. 1YA will be one of the stations taken over by the New Zealand Broadcasting Company when that body commences operations.

Your aerial should be high, but does not have to be level.

The primary of your loose coupler is always connected between the aerial and ground.

Do not wait until your valves will not work before charging your battery; give the battery a regular charge.
Experimenters Heard in Paris

A VICTORIAN reader has kindly forwarded us the cutting below from the San Francisco Chronicle of January 18. No doubt it will prove of some interest to the experimenters concerned —

WORLD'S RECORD BEATEN BY FRENCH RADIO ACE.

PARIS, Jan. 17—J. L. Menars, E3, who has been forging ahead steadily with record after record for distance reception, announces an achievement which may well prove historic for French radio. He has heard, he tells us, seven radio stations from New Zealand—a total distance of over 12,200 miles. He lists the stations logged as follows:

Oct. 10, 6 p.m.: E2AC, E4AG, E3BD.
Oct. 14: E1BG.

This remarkable reception was obtained on his usual three-valve set, after having a few minor adjustments and modifications. It is, according to M. Menars, the longest distance ever recorded between amateur stations. He also announces that he is now transmitting, using only ten watts input, and that so far he has had reports from Finland (FIN) and the British Isles (G3) of successful reception. He hopes to have some reports also from England on these transmissions. He is working on 100 metres or near it most of the time, as he says this is "the only interesting wave-length left." M. Menars can be reached by mail at Le Blancat, Gans (Basses-Pyrénées), France.
OW that the Wireless Institute possesses a precision wavemeter for calibrating purposes, every experimental station—especially transmitting stations—should be equipped with an accurate oscillating wavemeter.

The many advantages possessed by an oscillating wavemeter over the usual wavemeter employing a buzzer make it well worth while to go to the extra trouble and expense of making one. True, for tuning a transmitting set the simplest form of wavemeter gives every satisfaction. This employs an oscillatory circuit, with a small flashlamp in series. See Fig. 1.

In use, this kind of wavemeter is placed in close proximity to the transmitting set, and the condenser varied until the lamp glows. The wavelength is then read on the condenser scale. I always have a wavemeter of this description keeping check on my transmitter, for the glowing of the lamp shows that the set is in stable operation and that the key is working correctly. This meter is not much use for anything else, though.

Much the same thing could, of course, be done with the oscillating wavemeter by listening for the beat note, but then it would be necessary to keep the wavemeter telephone on the lead, which is out of the question when using your receiving set.

However, the oscillating wavemeter has many uses. It allows you to hear the quality of the note or signal emitted from your transmitter, and to so adjust your set as to get this as pure as possible. It can stand near your receiving set and be ready for immediate use either to measure the wavelength of incoming signals or to function as a separate heterodyne and thus allow you to stop your receiving set from oscillating, and so prevent interference by radiation.

The circuit is a very simple one, and is shown in Fig. 2. A UV199 valve is used, the filament being lit through a 30 ohm. rheostat from a 4½ volt ever-ready flashlight battery No. 126. The "B" battery is made up of five smaller 4½ volt flashlight batteries, giving a total of 20 volts.

To cover the full range of wavelengths, five coils are required. These are all plug-in type, the first three being 12, 20, and 50 turns spider webs, and the remaining two ordinary honeycomb coils of 100 and 200 turns respectively. Somewhere (the exact position is not critical) about half-way down each coil, bare one wire and solder on a short piece of flexible wire. This is for the filament tapping, as shown in Fig. 2, and connects to a terminal on the panel.

A single closed circuit jack is required in the plate circuit to allow a pair of telephones to be plugged in. As these will be required when the set is calibrated, they should preferably be left in circuit. If not, remember that for accurate measurements the same pair of telephones used in the calibration must be inserted.

The condenser has a maximum capacity of .0005 m.f. It should be a good condenser and have some kind of vernier for fine adjustments. This must not be a vernier plate, but some form of gear reducer, so that the dial may be rotated very slowly.

A mica blocking condenser of .001 m.f. capacity is shunted across the telephones and "B" battery. A filament switch is also necessary, as it is better not to depend on the rheostat for switching off the filament. The rheostat when once adjusted should not be altered, as this might cause a slight change in wavelength.

A fixed resistance of the correct value may therefore be used. The photograph shows the complete instrument with the smallest coil plugged in. It is contained in a small cabinet, 10 x 6 x 6 inches, and may be used in any position, as the batteries inside are firmly clamped down. The panel is of ½ in. bakelite, 5½ x 6 inches. The filament switch...
can be seen just in front of the coil plug.

Fig. 3 gives an idea of the internal lay-out, but this arrangement can be varied to suit the maker, while Fig. 4 shows the lay-out of the panel.

When the set is completed and found to oscillate with all coils, it must be calibrated from a standard wavemeter. To test whether oscillation has commenced, tap the grid terminal of the valve holder with the finger and if a double click is heard—one when the finger touches, and another when the finger leaves the terminal—then the set is oscillating.

The method of measuring the wavelength of a received signal is quite simple. When the signal is tuned in, switch on the valve of the wavemeter (which should be within three or four feet of the receiving set), then turn the condenser dial setting on the wavemeter to a chirp is heard in the headphones.

The wavelength can then be read from Fig. 3 gives an idea of the internal lay-out, but this arrangement can be varied to suit the maker, while Fig. 4 shows the lay-out of the panel.

THINK OF THE SAVING!

REPAIRS

Do not throw away those damaged accessories. We specialise in all kinds of repair work. Headphones and Loud Speakers Re-wound, Condensers Adjusted, etc. Bring that nasty job to us.

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If you are not getting the results with your set that you should, consult us. We have re-wired and adjusted hundreds of sets of all makes.

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Engaving gives that professional touch to an otherwise amateurish set. It looks ever so much neater, and will provoke the admiration of your friends. We have an up-to-date plant. The cost is small. It is worth while.

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TO THE LEFT OF KING STREET FROM GEORGE STREET.
Three Popular Valves

Their Characteristics

**TYPE R5V.**
A "GENERAL PURPOSE" bright emitting valve which may be used with satisfaction in any part of the receiving set. Anode volts, about 45. Grid return lead being connected to positive or negative filament lead, according to whether the valve is functioning as a detector or amplifier. For best results as low frequency amplifier use about 120 volts on anode and three or four volts negative grid bias (normal working conditions) the

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<td>Fil. volts.</td>
<td>5; fil. current: 0.70</td>
</tr>
<tr>
<td>Anode volts.</td>
<td>30-120; impedance: 30,000 ohms; amplification factor: 9</td>
</tr>
<tr>
<td>Overall length</td>
<td>115 m/m.</td>
</tr>
<tr>
<td>Max. diam. of bulb</td>
<td>45 m/m.</td>
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Anode current obtained is about six milliamps. As transmitter it can be allowed to dissipate 10 watts at an anode voltage not exceeding 500 volts. Fil. volts: 4.5; fil. current: 0.5 amps; anode volts: 60-400; impedance: 6,000 ohms; amplification factor: 6; overall length: 135 m/m.; max. diam. of bulb: 55 m/m.

**TYPE LS5.**
A low frequency amplifying valve designed for loud-speaker work. The straightness of the grid voltage-plate current characteristic enables the valve to give distortionless amplification. This valve serves the same purpose as the LS2 and is multivalve low frequency amplifier. The LS3, however, works with a plate voltage of the same order as the ordinary R type, thus making a separate high tension battery unnecessary.

**TYPE LS2.**
Designed as power amplifier; extremely useful also as low-power transmitter with moderate anode voltage. Probably the best valve yet de-
and is suitable therefore in the final stage of amplifiers using R type valves in the initial stages.

Fil. volt.: 6; Fil. term. volt.: 4.0; fil. amps.: 0.65; anode volts: 70-100;

Filament: Overall length: 110 m/m; Diam. of bulb: 54 m/m; Socket type: "R".

TWO-WAY COMMUNICATION.
RADIO 63/1, the station operated by Mr. W. M. Dawson, of Ashburton, has established two-way communication with 6AWT, San Francisco, on a wave-length of 88 metres, using a five-watt valve at normal input, about fourteen watts. Mr. Dawson was recently allotted a special wave band of 38-42 metres by the N.Z. Government.

5MC RECEIVED IN N.Z.

The latest Australian broadcasting station to get over to N.Z. is 5MC, on a wave-length of 273 metres. Mr. T. H. Blain, of Rangiora, near Christchurch, reports hearing this station at 11.45 p.m., when the transmission was very clear. The signals were held until 12.30 a.m., N.Z. time, when the transmission was fading slightly. It is stated by Mr. Blain that most of the announcements were made by a lady in a very clear voice. Other stations heard were—1YB, 4YA, 3AI, 2FC, 2BL, 3LO, and 6WF.

The set used was a three-valve receiver using detector and two stages of audio. This is the same set that has been responsible for a very fine record in the hands of Mr. Blain, with the exception that smaller coils were used. The coils used in the reception were—Primary eight turns of No. 16 D.C.C., secondary 10 turns of No. 22 D.C.C., and tickler 15 turns of No. 22 D.C.C. The valve used as detector was a UV200 with 17 volts on the plate, and for the two audio-frequency stages, two type UV201a valves were used with 79 volts on the plates. The aerial is of average size.

Back Numbers of "Radio"

The following interesting articles appeared in previous issues of "RADIO." Copies may be had on application to this office.

- Oscillating Crystal Receiver; Aerial Mast for £8/12/-; Microphonic Noises in your Set; Swinging Aerials; Honeycomb Coils; How to Make and Use Them—Shielding—No. 43.
- Three-Valve Receiver; 3 LO—No. 44.
- An Efficient Long-Distance Receiver; Receiver Noises—How to Diagnose and Cure them; A 60-600 Metre Tuner; Four First-rate Circuits; How to Make an Audibility Meter; A Loose-Coupled Short-Wave Set—No. 45.
- Crystal-Valve Circuits; Low Loss Tunes; One-Tube Circuits; Low Loss Inductance Coils; An All-Wave Tuner—No. 46.
- A Super-Five Valve Receiver—No. 47.
- A Novel Switching Arrangement for Detector Amplifiers; The Super-sonic Heterodyne Receiver (Theory)—No. 49.
- A Portable Set that receives England; Round's Round Ground (complete directions for constructing a ground connection that will materially improve DX reception); The Super-sonic Heterodyne Receiver (constructional details); Transmission of Photographs by Radio—No. 50.
- Adding a Valve to Your Crystal Set; Reducing the Capacity of Condensers; A Single Valve Transmitter for Telegraphy—No. 51.
Valve Data

FTR you have had your radio set for some time, even though it is a ready-made one, you want to know why this or that control must be turned to a certain place and later on it must be moved farther around or on certain wavelengths the rheostat must be moved one way or another and the potentiometer the same. If you do not know these things, you are like the man who drives a car and does not know what to do when the engine stops.

This article will give you some information on the valve circuit and its controls. Figure 1 is that of a valve circuit and consists of the input or grid coil, IN; variable condenser, VC; grid condenser, GC; grid leak, GL; grid, plate and filament, G, P, F; telephones, T; rheostat, R; A and B batteries.

This gives us three circuits. Grid and plate and filament. The grid or input circuit is the valve gets its radio energy from. It consists of the input coil (grid coil), grid condenser, grid leak, variable condenser, grid of the valve and the return to the filament. This is a very important part of your circuit and its controls.

The next circuit is the plate circuit and consists of the plate of the valve and the return to the filament. The grid or input circuit and any losses in it mean a leak, variable condenser, grid of the coil (grid coil), grid condenser, grid leak, variable condenser, grid of the valve and the return to the filament. This is a very important part of your circuit and its controls.

The third circuit is the filament and consists of the filament of the valve, the rheostat and the A battery for lighting the filament.

We also have a C battery but this is used in the audio frequency amplifying circuit to prevent distortion when high plate voltages are used. It also reduces the plate current thereby prolonging the life of these batteries. The C battery is always connected in the secondary of the audio frequency amplifier grid return lead, which is the secondary transformer.

The negative of this battery connects to the transformer and the positive of the battery goes to the negative filament, not to the positive. This gives us three circuits. Grid and plate and filament. The grid or input circuit is the valve gets its radio energy from. It consists of the input coil (grid coil), grid condenser, grid leak, variable condenser, grid of the valve and the return to the filament. This is a very important part of your circuit and its controls.

The negative B battery is most always connected to the positive of the battery for better rectification may be obtained. The negative filament is connected to the negative filament, not to the positive. This gives us three circuits. Grid and plate and filament. The grid or input circuit is the valve gets its radio energy from. It consists of the input coil (grid coil), grid condenser, grid leak, variable condenser, grid of the valve and the return to the filament. This is a very important part of your circuit and its controls.

Now we will cover filament lighting. The detector should always be on a separate rheostat and in most cases a vernier rheostat is best. Radio frequency valves may either be on a separate rheostat or connected in parallel on one rheostat. The same holds true of audio frequency rheostats, they may be one, two or three valves, or you may have separate rheostats for each. In the case of audio frequency valves, the filament current is not at all critical and one rheostat will do for all three of them.

Radio frequency amplification is more critical than audio and while one rheostat will do for one, two or even three valves, it is better practice to have separate rheostats because each valve, even of the same make, varies. The detector should not be on the same rheostat with other valves, even though some manufacturers insist in doing so. When this is done
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"RADIO"

you either must burn the detector valve bright to get results and this makes the audio frequency valves burn too brightly, or you reduce the brilliancy of the detector valve to save the audio frequency valves with a consequent loss of signal strength.

Figure 2 shows how five valves may be connected up with three rheostats. This is the usual practice with neutrodyne sets. The type of rheostats you use depend on the valves you are going to use with the set. The type of valves should be decided upon before buying the parts for your set. If you are using a soft valve as detector, you will require a four to six ohm vernier rheostat. The vernier is necessary if you are to get best results. If you are using the 201A type for radio and audio frequency amplification and use two valves on one rheostat as shown in the drawing, a ten-ohm rheostat will do for either the radio or audio frequency valves, while if separate rheostats are used, 25-ohm rheostats will be required.

Only the filament circuits are shown in the drawing. The grid and plate of each valve are shown but not the connecting circuits as we are only dealing with the filament here. In placing more than one valve on a rheostat, it is only necessary to take loads from the filament of one valve to that of the next. The main thing to keep in mind is to have the rheostat in series with the filament of one valve and all the other valves in parallel to that valve. Do not make the mistake of placing the rheostat in series with all valves, as that would defeat your purpose due to the resistance of the filament of the valves. Even though the valves would light, the series connection is not advisable because if one filament burned out, all the valves would go out.

No matter whether you use dry cells or storage batteries for filament lighting the voltage will be the same. One radio fan wrote in and said he had been told to use a 30 ohm rheostat if dry cells were used with a TV109, but to use a 60-ohm rheostat if a storage battery was used. What his informant probably meant was, if you use cells, three of them will give you 4½ volts, but if you use a six-volt storage battery, the 30-ohm rheostat would not do so.

**Fig. 2.**

**RECENT CHANGES IN LOUD SPEAKER DESIGN.**

It is not a generally known fact that loud-speakers have been in use for a considerably longer period than the years during which broadcasting has been in vogue. These instruments replaced the ordinary telephone receiver in situations where it is convenient to hear the conversation without actually going over to the telephone, e.g., in ships, engine rooms, works, etc. These loud-speakers were of the straight funnel type. With the advent of radio-telephony a further use for the loud-speaking telephone materialised. Much experimental work has, and is still being done to improve loud-speaking reception. Most commercial instruments are of the "trumpet" type, and many of them made by reputed firms will give excellent reproduction. The Sterling Telephone and Electric Co. has broken entirely away from conventional design in the "Primax" loud-speaker. In this instrument the horn is replaced by a large pleated diaphragm made of parchment material, a substitution which results in purity of tone, whilst giving great volume. The standard instrument stands about 17 inches high, the metal work being of polished aluminium, whilst a recent model is executed throughout in a fine bronze finish. This loud-speaker is also made in a statuette model. The bronze figure, symbolic of triumph, holds in its upraised hand the "Primax," its ensemble effect being very pleasing. The total height of this instrument is 42in. Made under Lumieres patent, the "Primax" is licensed for sale in Great Britain and Ireland, the British Dominions, Colonies, and possessions, but excluding always the Americas and the West Indies.

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AUSTRALIAN AT MOSUL SENDS MESSAGE TO KERANG.
Mr. MYLES O'BRIEN has received a wireless message from his son, Captain O'Brien, who is now stationed with the Air Force at Mosul, Mesopotamia, states The Age. The message was picked up by Mr. Howden, of Box Hill, the well-known experimenter, via 2GQ and 4AN.

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March 18, 1925.
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"RADIO"
Brisbane’s New Broadcasting Station

In discussing broadcasting in Queensland some few days ago, the General Manager of the Queensland Radio Service, Mr. J. W. Robinson, said that steps were being taken by the State Government to establish broadcasting on a large scale in Queensland.

"In other parts of Australia," Mr. Robinson said, "private concerns have been allowed to obtain the licenses and carry out broadcasting services. In Queensland, however, the State Government has decided that wireless broadcasting has such a great future that it really should be a public utility controlled by the State. The Government has therefore taken out the only 'A' grade license allowable to Queensland, and intends to carry out broadcasting on up-to-date lines. A tender from Amalgamated Wireless (Asia.) Limited, for the construction of a five kilowatt modern broadcasting station similar to those at 2FC and 3LO has been accepted. In conclusion, Mr. Robinson said, "Our concern in the future will be the supply of full and authoritative information to the man on the land, Special arrangements have been made with the Council of Agriculture for the supply of full and authoritative market reports daily and special sessions will be set aside during which interesting and important agricultural lectures will be delivered by wireless of country dwellers."

In conclusion, Mr. Robinson pointed out that the whole system adopted in Queensland was quite new to Australia, and he felt sure that it would very successful.

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Tales of the Wireless Service
The Lighter Side of the Life

By H. Tuson.

If asked how a ship's operator is able to pick out messages sent to his particular ship, the average "man in the street" would, no doubt, reply that the attention of the operator is called by an automatic signalling or recording device. Others, a little more informed, would reply that operators on each ship call other ships within range, or the nearest land station, every quarter or half an hour. Such is not the case. On ships carrying one operator he is on duty 8 hours out of the 24, and in broken shifts covering a period between 15 and 16 hours, generally between 9 a.m. and 1 a.m. the following morning. On ships carrying three operators a continuous watch is kept, each man doing 4 hours on duty and 8 hours off—a similar to the deck and engineering crews.

I will now endeavour to recall a few of my many humorous experiences while an operator on various passenger ships.

On one occasion we were just pulling out of our berth at Sydney bound for New Zealand. I was standing outside the wireless cabin when a lady passenger approached me and asked, "Do we have to pass through the heads?" I gravely informed her it was necessary for every vessel leaving Sydney to pass through the famous heads, at the same time visualised the ship taking a short cut somewhere across Watson's Bay. I had no sooner got over this attack when the bugle sounded for luncheon.

On taking my seat in the dining saloon a passenger shot at me the question, "What time are we going to arrive at Wellington?" To show the idiocy of such a question I might mention it takes the average passenger ship given fine weather, four days between Sydney and this port. Should rough weather be encountered, which is not uncommon crossing the Tasman, this time could easily be extended to four and a half and sometimes five days, which actually happened on one trip. However, as I was under the impression he was trying to "put one over" me, my answer (Continued on page 873.)
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Some Notes on the Efficiency of Short Wave Receivers

SUCCESSFUL interception of broadcasting station KDKA (Pittsburgh, U.S.A.) on a wave-length of 63 metres immediately attracted the attention of every radio experimenter in Australia and N.Z. Prior to this, however, many experimenters were engaged in exchanging telegraphic signals on low power and short wave-lengths over very considerable distances.

The various transmitter circuits employed have not yet become subject to criticism but different types of receivers have been widely published. The one every enthusiast now aspires to possess is the so-called "Low-Loss" receiver.

The object of these notes is to attempt to explain how the efficiency of receivers is governed principally by the way in which advantage is taken of the phenomena of resonance. How the deleterious effects of ohmic resistance and other losses may be compensated for by the proper use of regeneration is well known.

In order to clearly analyse the phenomena of resonance as applied to radio work it is necessary to deal briefly with the elementary arithmetic of alternating currents. The characteristic difference between direct and alternating currents is that the latter vary in amplitude and direction in a periodic manner, whilst the flow of the former is unidirectional and usually of constant amplitude. Alternating currents reverse their direction a certain number of times per second and pass through a complete cycle of changes in amplitude per second. The number of complete alternations, or cycles of changes per second, is known as the periodicity, or frequency, of the current. Alternating currents do not always keep step with the alternating Electromotive Force impressed upon the circuit, for if the circuit possesses inductance, the current will lag, or, if there is capacity, the current will lead in phase. If however, the circuit contains resistance only, the current will vary in step, or in phase, with the voltage and its magnitude may be found by Ohm's Law:

\[ I = \frac{E}{R} \]

Where \( I \) = Current in amperes, \( E \) = Applied volts, and \( R \) = Resistance in ohms.

The resistance of a condenser is:

\[ R = \frac{1}{X} \]

where \( X \) = reactance in ohms.

\[ X = \frac{1}{\pi f C} \]

where \( \pi = 3.1416 \), \( f \) = the frequency of applied voltage, and \( C \) = Capacity of condenser in farads.

From the above it will be seen that the higher the frequency the lower the resistance for any given capacity. As an example, the resistance of a condenser of 2 mfd. for an applied frequency of 1,000 cycles (audio frequency) is equal to

\[ R = \frac{1}{\pi \times 1000 \times 2} = 78 \text{ ohms.} \]

If, however, the frequency is increased to 100,000 cycles (30,000 metres) the resistance would be .78 ohms. The current in a condenser leads the voltage across it by 90 degrees as shown by curve C, Fig. 1.

On the other hand, the resistance of an inductance is equal to 2\piL, where \( L \) is its inductance in henries and the current through it lags 90 degrees behind the voltage across it as shown by curve L, Fig. 1. At a frequency of 1,000 cycles the resistance of inductance of .2 henries would be: \[ 2 \times 3.1416 \times 1,000 \times .000002 = 125.60 \text{ ohms.} \] Increasing the frequency to 100,000 cycles increases the resistance to 12560 ohms.

It will thus be seen why 20 self-capacity of a valve, or even the capacity between the connecting wires of a very low wave receiver, is to be avoided, because these capacities, although very small and non-effective at long wave-lengths, offer a relatively low resistance to the extremely high frequencies of the short waves, thus providing side tracks for the energy which otherwise would be usefully employed. The reason for selecting inductance coils of different values for choking currents of different frequencies will also be understood.

The choke L, across which it is desired to set up high potential variations from the low frequency rectified impulses, should have a high resistance at speech frequencies and there-

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By Geo. Apperley.
March 18, 1925.

fore is usually provided with an iron core and possesses considerable inductance. The coupling coil L1 being of low inductance offers a low reactance to the low frequency component of the plate current variation. The condenser C2 would have a capacity of about 2 mfd, so that it would offer a relatively low reactance to the low frequency energy. The radio frequency component of the plate current variations would, on the other hand, be considerably hindered by the coil L2, but the small capacity between the windings as represented by C3 provides a path of much lower reactance. An external condenser is very often employed to by-pass the radio frequency component across such devices and a value of .001 mfd. offers a relatively low reactance at such frequencies. The condenser C4 is provided across the high tension battery for the same purpose.

It is a practical impossibility to construct a circuit possessing either capacity or inductance or both without resistance. Our condenser circuit must therefore necessarily possess a certain resistance which may be very small. Now the current flowing is at every instant equal in each part of the circuit. The fall of potential across the resistance is, of course, equal to the product of the resistance and current because, as stated previously, the latter is in phase with the voltage across the resistance. The voltage across the condenser does not, however, rise and fall in phase with the current in the circuit, the current leading the condenser voltage by 90 degrees. It is thus evident that the impressed voltage in such a circuit is made up of two distinct components which are more easily explained by a vector diagram, Fig. 3. Let the horizontal line OR represent the direction of the current and the point R marked to scale, so that OR represents the voltage across the resistance. This voltage is, of course, in phase with the current. The condenser voltage is 90 degrees out of phase and is therefore drawn in magnitude and direction by OC drawn at right angles to OR. The impressed voltage in the circuit is therefore the resultant of OR and OC and may be represented in magnitude and direction by the line CR, the angle & being known as the angle of lead of the current with respect to the applied voltage.

It is thus evident that the impressed voltage in such a circuit is made up of two distinct components which are more easily explained by a vector diagram, Fig. 3. Let the horizontal line OR represent the direction of the current and the point R marked to scale, so that OR represents the voltage across the resistance. This voltage is, of course, in phase with the current. The condenser voltage is 90 degrees out of phase and is therefore drawn in magnitude and direction by OC drawn at right angles to OR. The impressed voltage in the circuit is therefore the resultant of OR and OC and may be represented in magnitude and direction by the line CR, the angle & being known as the angle of lead of the current with respect to the applied voltage. OR may also represent the ohmic resistance of the circuit and OC the revereal resistor of the condenser, so that the vectorial sum of OR and OC is equal to the total impedance of the combination expressed as

\[ Z = \sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2} \]

Therefore, the algebraic statement of Ohm's Law for such a circuit is:

\[ I = \frac{E}{\sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2}} \]

Where \( Z \) = Impedance in ohms and \( E \) = Impressed volts.

It is clear, therefore, that the strength of current in the circuit is affected by both the ohmic resistance of the circuit and the reactance of the condenser, and for this reason the former should as far as possible be avoided, particularly in a circuit not employing regeneration. The plates of the condenser should possess very high conductivity and there should be very high insulation between the two sets. Whatever resistance is present can be for some loss of energy.

(Continued on page 875.)
TAKING advantage of the opportunities afforded to soldiers of the Dominions after the signing of the armistice for travelling in the United Kingdom and on the Continent of Europe, the writer availed himself of the chance of attending many British and Continental opera houses, and, like many other of his comrades, cultivated an appreciation of good music. In fact, every day of sightseeing, whether a run out to Versailles or a trip to the battlefields of Waterloo, invariably ended up with an evening at the opera.

Strange to relate, after listening to a wonderful rendition of song or chorus by artists at the pinnacle of their fame, I found the sensation left by the musical vibrations were somewhat rudely shattered by the vociferous applause accorded to them. The feeling created by the singer, being, as it were, destroyed by the baser vibrations of the shouting and clapping. The ideal conditions under which to hear an opera, would be, in my humble opinion, to let the impression created by the voice vibrations remain in the memory undisturbed.

However, with the advent of Radio broadcasting the ideal has been achieved, and the delicate renderings of good music, with its sweet vibrations are permitted to impress the sensitive listener-in, without having his train of thought disturbed by the usual applause which goes hand in hand with public opera performances. This entirely new feature is something that can be favourably attributed to "Broadcasting," and of which little mention has been made so far.

The listener-in is deeply impressed, he will surely write to his favourite artist, expressing his appreciation, and I feel sure this new form of applause will come to be as much appreciated as that of the orthodox kind.

Radio Evolution
(Continued from page 855.)

which we are living. It may be characterised as the age of continuous wave telegraphy and telephony. While radio telephony had been known long before in an experimental way, it is only during recent times that it has become widely employed and notably for broadcasting purposes. The transmitters used during this era for broadcasting, and in some cases for telegraphy, are continuous wave transmitters generally employing powerful vacuum tube oscillators in place of the earlier arc or alternator. The receiver is highly selective and depends, in the best instances, for its selectivity on a succession of tuned electrical circuits either operating at radio-frequency, or as in the super-heterodyne system, in part operating at a converted or intermediate frequency. Great sensitiveness is obtainable in these receivers, which employ a considerable number of the modern three-electrode vacuum tubes.

During this era, radio communication has become a household necessity in some countries through the advent of broadcasting. The application of radio telephony to marine communication and trans-ocean communication between individuals, is at hand, but, contrary to some earlier speculation, the radio telephony service of maximum public value has so far turned out to be broadcasting. Indeed, by its very nature, radio telephony is especially well adapted to covering large areas and addressing its message to great bodies of listeners.

(To be continued.)
March 18, 1925.

"RADIO"

Tales of the Wireless Service
(Continued from page 867.)

was equally idiotic. During the trip another passenger asked me how many times around the promenade deck constituted a mile. I told him what I thought was a fair thing, and on meeting him the next day he informed me, according to the number I had given him, he had walked over 40 miles. I found out afterward my figure should have been multiplied by five.

I made a number of trips on a ship trading between Melbourne and New Zealand. Invariably while we were going up the Yarra comparisons would be made between Sydney and Melbourne. There were generally a number of Sydney people on board, with the result that a lively discussion would take place. I was often called to give my opinion and, knowing the Sydney supporters were outnumbered, gave my decision in favour of that city.

A few trips afterwards I found Sydney had a majority, and promptly supported Melbourne. Unfortunately one of the passengers who had joined in the discussion and had travelled with us a few trips previously bowed me out by telling the others I had on that occasion voted for Sydney.

One of my most amusing experiences was when a passenger handed me a message which he signed "Turnipseed." On looking at the back of the form, where the sender writes his signature, I found it was the same, whereupon I politely asked him if it was his correct signature. He replied, "Yes, bo; funny, ain't it?" and joined me in the laugh.

When I repeated this word to the land station operator to avoid mistakes, he queried it. On finding he had not been mistaken, he asked if it was any relation to hayseed. It was rather a coincidence that this passenger travelled with a friend by the name of Beans, the two names coupled together being a standing joke among the rest of the passengers.

Turnipseed and Beans would tell many amusing and annoying experiences caused by their strange names. Before visiting a certain city they sent a telegram to one of the hotels, reserving a room. On arriving the next day they asked to be shown to their room, but soon found no room had been engaged. On being told they had sent a telegram the previous day, the Enquiry Clerk thought for a few seconds then suddenly said, "Oh, yes, I remember now. I received a telegram signed 'Turnipseed and Beans,' but thinking someone was playing a joke, tore it up."

On being shown how messages are sent and received, many passengers would be quite disappointed and invariably remark, "Oh! Is that wireless? I thought you spoke to each other like they do on the telephone." One was under the impression the transmitting key was for sending the familiar "engaged" signal.

Passengers have many times asked me if I did not find life at sea monotonous. As regards passenger ships, I have not found it any more monotonous than the average city man.

(Continued overleaf.)

"RADION" Panels and Parts meet every requirement of the radio set builder

There are many reasons why you should build your radio receiving set with Radion panels and parts.

First: Radion has proven beyond a doubt to be the supreme insulation. It is made exclusively for radio work and excels any other material in the four main characteristics required for wireless, namely, low angle phase difference, low dielectric constant, high resistivity and the low absorption of moisture.

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"RADIO" when communicating with Australia.
Tales of the Wireless Service
(Continued from previous page.)

who generally travels by the same train or ferry the same time every morning and evening, and sees the same old faces every day year in and year out. (1 Ed. Radio.) On board ship one meets different passengers every trip. If this is not sufficient, the usual routine could be upset during heavy weather by being awakened during the night and finding yourself on the deck with your brand new suitcase floating in water, and chasing a few accumulators which have come adrift, in which case it is often necessary to strap oneself to the bunk before turning in again. On many occasions I have found it necessary to lash the chair to the operating table before attempting to work, to prevent being thrown a double somersault with your head finally colliding with the bulkhead on the opposite side of the cabin.

Taking the "ups" with the "downs," it's a great life—if you don't weaken!

---

STAFF CHANGES.

Mr. H. P. Coffey, Officer-in-Charge, Thursday Island Radio, has been transferred to Brisbane Radio on completion of his term of tropical service.

Mr. J. H. Leverett, Hobart Radio, has been transferred to King Island Radio, as Officer-in-Charge.

Mr. P. J. Gowlett, Radiotelegraphist, King Island Radio, has been transferred to Brisbane Radio.

Mr. C. J. Lennon, Radiotelegraphist, Townsville Radio, has been transferred to Adelaide Radio on completion of term of tropical service.

Mr. E. J. O'Donnell, Radiotelegraphist, Adelaide Radio, has been transferred to Townsville.

Mr. W. C. H. Hodges, Radiotelegraphist, Sydney Radio, has been transferred to Cooktown.

Mr. G. H. Smith, Radiotelegraphist, Cooktown Radio, has been transferred to Brisbane Radio on completion of tropical service.

---

CLIX PRODUCTS.

WE have received from Messrs. Auto-veyors, Ltd., of 84 Victoria Street, Westminster, S.W.1, an interesting booklet which describes in detail the many wireless accessories which they manufacture.

A guarantee of 27 years' practical radio experience stands behind their claims of accuracy of principle; correctness of design; good workmanship and finish; and British manufacture of all their components and accessories.

Messrs. Auto-veyors, Ltd., are makers of the well-known "Clix" products, which they claim to have 150 uses.

Abstracts from many English wireless magazines show the great popularity and success of "Clix."

This firm also manufactures Kongax, the combination pin and fork clip; the Variable Bridge Condenser; the "Filtron" Variable Potentiometer Grid Leak; Static R.S. Ter., which ensures perfect safety to all telephone and telegraph receiving apparatus, whether in operation or not.

HOW often you charge your battery depends on how much you use your set and the capacity of the battery.

A VALVE is fragile, so do not handle it as you would an ordinary incandescent lamp.
MODERN PRINTING

KeePPing in touch with all that is new and good in type faces and modern printing machinery makes us think we can satisfy your printing wants.

The modern printing is equal to the product of the current and resistance, the voltage being in step with the current. As before, this is regarded as the power component of the impressed voltage. The back, or reactive, voltage of the inductance leads the current in the circuit by 90 degrees and may therefore be represented in magnitude and direction by L. As in the case of the condenser circuit this is called the reactive component of the impressed voltage and is required to overcome the back, or reactive, voltage of the inductance. The vectorial sum of the two is represented by L. R and is equal to the impressed voltage in the circuit.

The current flowing will therefore be:

\[ I = \frac{V}{\sqrt{R^2 + (L+L)^2}} \]

The angle \( \theta \) is known as the angle of lag of the current behind the impressed voltage. From the foregoing we can understand why it is desirable to employ a choke coil possessing minimum resistance if it is required to choke back an alternating current without sacrificing energy.

Although the proper design of circuits containing resistance and either capacity or inductance requires careful consideration of the foregoing fundamentals, radio experimenters are more concerned generally with circuits comprised of the three properties and this brings us to the phenomenon accompanying certain conditions which is known as resonance or synchony.

Let us assume that the inductance from our last circuit is included in the capacity resistance, combination of Fig. 3. We may now combine the vector diagrams of Figs. 3 and 4 to obtain Fig. 5a.

As before, the line O T represents the direction of the current and the point R to scale, so that O R is equal to the magnitude and direction of the impressed voltage. The vectorial sum of the two is represented by L. R and is equal to the impressed voltage in the circuit.

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and the current would therefore be equal to the quotient obtained by dividing this quantity into the impressed voltage. Returning to Fig. 5A, we find the reactive voltages due to the inductance and the capacity are opposite and exactly equal, i.e.,

\[ \frac{1}{2\pi fC} = 2\pi fL \]

so that the current will be a maximum and be determined solely by the resistance and the applied voltage and may therefore be expressed as

\[ I = \frac{E}{R} \]

When this conditions exists it is known as resonance, the natural frequency of the circuit being equal to the frequency of the applied voltage.

When \( 2\pi fL = \frac{1}{2\pi fC} \), we may write

\[ f = \frac{1}{2\pi \sqrt{LC}} \]

from which we notice that the resonance frequency is proportional to the square root of the product of \( L \) and \( C \) and provided this product remains unchanged, \( L \) and \( C \) may have any values.

Since the current flowing in a resonance circuit is limited by the ohmic resistance which absorbs a certain amount of power, it is desirable to wind the inductances and connect the elements with conductors possessing high conductivity. This is one reason why short-wave receiving coils (Continued on next page.)

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MAKE YOUR OWN BROADCAST RECEIVING SET in a few hours of your spare time, with a screwdriver, pliers and soldering iron, and spend a thoroughly enjoyable evening putting together one of these famous sets. No experience, special tools or drilling required. Only the best quality parts are supplied, including Bakelite panel, drilled and engraved. The accessories include Dry Cell Valves, Batteries, Headphones, Soldering Iron, Screws, Solder, and instructions for building and operating, which are so clear that you cannot go wrong.

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articles and features dealing with all classes of receiving sets; tips worth their weight in
gold to the experimenter who makes his own parts; and a hundred and one other helpful
hints is retailed at the extremely low price of

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office at a similar price.

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are usually wound with heavy wire or tape, and due precautions taken to keep the insulation between turns and between the two sets of condenser plates as high as possible. But since the loss of power in a resonant circuit due to resistance can be compensated for by the proper use of regeneration from valves, this matter is generally not serious. There are, however, other factors which must receive very careful consideration. The thermionic valve, when used as an amplifier or detector, depends for its action upon the potentials impressed by the signal between its grid and filament. If no current flows between the grid and filament, the voltage between them at any instant will be equal to the impressed voltage. If, however, owing to some indifferent adjustment, a current is permitted to flow, the voltage difference between them will not agree at every instant with the impressed voltage, because there must be a loss of pressure to enable the current to overcome the resistance of the circuit. The valve is therefore a device actuated purely by potential variations and absorbs no energy from the exciting circuit.

Fig. 6 represents a receiving aerial circuit with a valve coupled across the inductance L, as might be used in the P1 receiver. The action of the valve is therefore governed by the voltages set up across the terminals of the inductance L by the signals. Let us assume for resonance with a signalling wave of 300 metres (1,000,000 cycles) $C = 0.0005 \text{ mfds.}$ and $L = 50.7 \text{ microhenries}$ and that the resistance of the circuit is two ohms. For the sake of simplicity we will disregard the resistance capacity and inductance of the aerial itself and assume the current is uniform throughout the inductance and capacity circuit. The latter condition is almost true in practice. Further suppose the voltage set up in this circuit by the signal is .001 volts, then the current flowing through L and C will be

\[
\alpha \cdot \frac{E}{R + \frac{1}{\omega^2 L C}} = \frac{V}{2R + \frac{1}{\omega^2 L C}} = \frac{0.001}{2 \times 0.0005} = 0.005 \text{ amps.}
\]

From Fig. 5A we find the reactive E.M.F. $V$ across $L = \frac{1}{\omega L}$

\[
V = 0.005 \times 318.5 = 1592.5 \text{ volts.}
\]

This voltage is, of course, applied to the grid-filament of the valve.

If now we halve the capacity $C$, and use another inductance of twice

(Continued on next page.)
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for the Home Constructor—

Specially designed, and made throughout with particular care. In every case the finished product is subject to rigid inspection, thereby guaranteeing perfect working and satisfactory results to all users of Ormond's Components—they are British made.

The quality is high—the price is low.

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Ormond Engineering Co.

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KING'S CROSS, LONDON, ENGLAND.
the value, but of slightly larger wire, so that the resistance of the circuit remains unaltered, the current will be the same as before, but the reactive E.M.F. across L will now be \( V = 0.005 \times 1,020 \approx 318 \text{ volts approx.} \) it will thus be seen that it is an advantage to proportion the inductance and capacity in a circuit in such a way as to obtain the maximum value of \( L \) with a variable \( C \) sufficient to cover the desired range of frequencies for tuning purposes. This explains the reason for having a number of separate coils to cover the desired wave-range, thus enabling a relatively low value of variable \( C \) to be used.

Another important point is the selectivity of the circuit compared with the ratio of inductance to capacity. Suppose in the first case quoted above we apply the same voltage but at a frequency of 1,020,000 cycles (296 metres approx.). The current then would be \( 0.00081 \) amperes, or for a change of four metres wave-length, the reduction would be \( 0.000419 \) amperes. If now we halve the capacity and double the inductance, as in the second case, the current flowing in the circuit from an impressed frequency of 1,020,000 cycles will be \( 0.0004 \) amperes, the reduction from resonant current being \( 0.00046 \) amperes. Thus we find for a given resistance the selectivity of the circuit is greater when the ratio of capacity to inductance is made smaller.

With the various types of coils at the disposal of the experimenter all the foregoing facts are quickly ascertained by practical results. There is, however, another factor which plays a very important part is short-wave reception, and that is the distributed capacity of the inductance itself. For the reception of the longer waves the square root of the product of \( L \) and \( C \) is relatively large and to conveniently cover the desired tuning range without sacrificing efficiency the variable condenser may be correspondingly large. Every inductance winding necessarily has capacity between its turns and in effect this distributed capacity acts as if the coil is shunted by a small condenser.

The result is to reduce the range of wave-lengths which may be covered with a given tuning condenser. This is shown by curves A and B, Fig. 7. A represents the tuning curve of an inductance and capacity, the former possessing a minimum distributed capacity whilst curve B represents the tuning curve of an inductance having appreciable self capacity. From this it will be seen that the coil B covers a smaller wave range than coil A, the effect of the distributed capacity being more apparent when the value of tuning condenser is small.

Although distributed capacity in receiver tuning inductances is to be generally avoided, the necessity of so doing is more marked in short-wave receivers than otherwise, because to obtain an efficient proportioning of inductance to capacity it is a very easy matter to allow the distributed capacity of the coil to approximate that of the maximum capacity of the very small condenser used. For this reason short-wave coils are usually wound with as great a spacing between turns as space will allow, commensurate with the flux density which is required for coupling to other coils for regenerative purposes. The size of conductor used is generally large in order to keep down the high frequency resistance, although flat tape on account of the area presented between turns will tend to defeat the object of spacing of the spirals.

Want to hear more stations?

Old Man Ohm says it's easy if you know how to vary the resistance smoothly and continuously in your radio set.

The Marshall-stat can be used with any tube or combination of tubes, and working parts are entirely enclosed in nickel-plated chamber.

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16 years' experience

Both drawing well!

Grandpa's best friend is his pipe. The deep, rich colour of the polished bowl betrays the fact that it seldom rests in the rack. But the Brandes Headphones are giving it a close race just now. Why, we actually found him with the old briar but half filled, a derelict shred of tobacco on the rim, the headphones clamped to his head, and a rapt expression on his face, he was oblivious of the uncomplaining pipe. Obviously, the strong, mellow reception occasioned by the "Matched Tone" feature held his earnest attention. Now they are both in full blast.

ASK YOUR DEALER FOR BRANDES.

Trade Enquiries Invited

Matched Tone
TRADE MARK
Radio Headphones

 Mention "Radio" when corresponding with Advertisers.
ET us to-night run over the whole idea of wireless waves and see how they reach our aerials, carrying on their backs the music from the broadcast station, and activate our telephones which enable us, with the help of our ears, to enjoy the programmes. The humble crystal set provides the purest possible means of reception so let us see from start to finish just what happens.

A disturbance is caused in the ether at the transmitting station, and in consequence a wave travels out from its aerial in all directions. As I explained when talking to you about wave-length these waves have to overcome a certain amount of resistance on their outward journey and therefore become weaker and weaker as they get farther away from their source. When they reach your receiving aerial a strain is created between it and the earth beneath. This, in turn, causes currents to flow from your aerial to earth, and vice versa, through your receiver circuits.

These currents are oscillating, or running backwards and forwards at the rate of nearly a million times per second, and so we require something in the circuit to convert them into audible frequencies in the neighbourhood of hundreds per second instead of millions, so that the diaphragm of our telephones may respond and create air waves which travel to the little diaphragm of our ears causing it to vibrate and thus to bear these vibrations which a moment ago were electrical oscillations, as intelligible sounds.

To make possible this conversion, we insert a piece of crystal in the circuit. You will remember I explained in one of our previous talks how this little chap works, how it allows currents to pass in one direction and not in another, and that when you find a "good point," what you really do is to find a spot on the crystal's surface which offers very little resistance to currents in one direction and a very high one to those in the opposite direction.

There is one thing more, however, we must do and that is "tune-in." Most of you know how to do this, but let us see what happens "inside" when we turn the condenser dial or move the slider along.

If we take two balls and suspend them by means of two pieces of string and set them swinging, in order to make them swing in time with each other the two strings must be exactly the same length. Now the wave sent out from the broadcast station is very similar to one of these balls and the amount of inductance and capacity determine the wave-length which is equivalent to the rate of swing of the balls, so that in order that our receiver may have the same rate of swing or wave-length, it must have exactly the same amount of inductance and capacity as the transmitter. Then our set will be "in tune."

Our aerial has both inductance and capacity. The inductance can be varied by altering its length and the capacity by...
ILLAWARRA RADIO CLUB.

It may not be generally known that the Illawarra Radio Club (which is the pioneer wireless society of the Illawarra District) has for the past ten years been carrying on good work on behalf of wireless experimenters in that district. The club was inaugurated in 1912 with the object of encouraging the scientific study of wireless by amateurs and to establish a medium of information, instruction and advice on wireless matters for those interested.

Since the club's inception, regular fortnightly meetings have been held at the clubrooms, 75 Montgomery Street, Kurnool, where instructive lectures, demonstrations, etc., are given. The club is also affiliated with a State-wide organisation of amateur enthusiasts of an experimental turn of mind doing so, for as any club member knows, it is a keen experimenter, exhibited his partially-completed "low-loss" set, which was very much admired by members.

There is a large number of radio enthusiasts of an experimental turn of mind in the district who should be supporting the club, and are missing much by not doing so, for as any club member knows, membership of an active body is of great help to the experimenter.

The club is always glad to welcome new members or to have prospective members or persons interested visit its meetings and a cordial invitation is extended to any such persons to come along to any of the next few meetings, which will be held at club-room (as above) on March 18, 24, and alternate Tuesdays thereafter.

The secretary (Mr. W. D. Graham, 44 Cameron Street, Rockdale) would be glad to hear from any persons interested or desirous of joining, and any information concerning the club's activities will be supplied on application.

WIRELESS SOCIETY OF NEWCASTLE.

INTEREST in the Wireless Society of Newcastle is still unabated. At the Society's room, Y.M.C.A. Building, Newcastle, on Wednesday night, February 18, the President (Mr. L. T. Swain) delivered an interesting and appreciated lecture on inductances, dealing with each class of inductance, including those of the "low loss" kind. Mr. G. Steward, a member of the Society and a very keen experimenter, exhibited his partially-completed "low-loss" set, which was very much admired by members.

A Hertfordshire amateur carried out the request through the local police. -- The Sun.

WIRELESS AMATEURS HELP WAR OFFICE.

COMMENTING upon the British Government's new Wireless Bill, The London Daily Mail says that it is calculated to restrict amateur operations, although amateurs are frequently very valuable.

In support of its contention, the paper quotes an instance in which an amateur proved helpful. A wireless operator in Malta, it says, recently failed to attract the attention of the high-powered official stations. It desired that an important communication regarding the military situation in Mesopotamia should be sent through, and the transmitter finally attempted to do so on short wave lengths, which are relegated to amateurs. He asked: "Will a British amateur take this message for the War Office?"

A Hartfordshire amateur carried out the request through the local police. -- The Sun.

A3BT.

A British amateur writing from Great Shelford, Cambridge, England, states that early on December 23, 1924, he was successful in receiving signals from A3BT (strength 53 to 54) on three tubes (detector and two L.P.) when the Australian was calling GOOD and held him for twelve minutes until his signals faded.

As the British experimenter desired to communicate with A3BT, we would be glad if the latter would supply us with his name and address, when we will put him in touch with the Cambridge amateur.

The society's transmitter (wave-length 2200) is again in operation. In order to keep pace with the times, it is intended to install a new transmitter on the "low-loss" principle to operate on low waves, when it is expected that the society's good record for DX work will be continued.

Persons who are genuinely interested in wireless and who desire to join the society are requested to communicate with the Hon. Secretary (Mr. H. Childs), 18 Ripley Street, Moseley.

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RADIO

March 18, 1925.
Queries Answered

R. W. (Parthamis). Q.: How can interference from Pennant Hills be eliminated using a loose couple set? A.: Use a .001 mf. condenser for tuning the secondary, both variable, a series-parallel switch is also an advantage. These should enable you to cut down this interference without a wave trap.


J. E. (Bridge Creek). Q.: Using the PI three-valve receiver (Radio, No. 49), what is cause of difficulty in obtaining satisfac-
tory results from 2BL, distances 128 miles, although excellent results were obtained when in different locality?

A.: You omitted to mention sizes of coils used which are evidently too large to allow tuning on the lower wave-lengths. For amateur stations 25 or 30, the input secondary of the transformer should be connected to the negative of the filament instead of the positive as shown.


A.: You omitted to mention sizes of coils used which are evidently too large to allow tuning on the lower wave-lengths. For amateur stations 25 or 30, the input secondary of the transformer should be connected to the negative of the filament instead of the positive as shown.

R. W. (Strathfield). Q.: Are connections of series-parallel switch correct (diagram submitted)? A.: No. The plates are not required; no connections shown is "two-valve broadcast receiver". Radio, No. 39. Q.: Is .001 mf. aerial too low? A.: Yes; for the stations you desire to receive one of 100 ft. preferably single wire will be sufficient, but for amateur working on the lower wave-lengths this should not be lower than about 60 ft. Q.: Is it possible to receive on both a crystal and valve set using the same aerial? A.: Not if both sets are used at the same time. Q.: Is the 2F106 circuit satisfactory? A.: Yes. Q.: Would aluminium well bush be suitable for a plate? A.: No; use Bakelite or standard bakelite.

J. E. (South Kensington). Q.: When using the PI with a stage of audio and an 11 plate condenser across the plate, what is cause of "broad" tuning? A.: The condenser used is not large enough. Q.: For amateur circuits only, is .005 mf. variable (12 plates); try also a .001 mf. variable aerial tuning condenser with a series-parallel switch. Q.: Would it be necessary to use a three-valve circuit? A.: No, please supply same, using detector and two audios. A.: Use the three-valve receiver, page 84, Radio, No. 13, Q.: Would call out and fill with fresh acid. Unless you have a hydrometer, take the battery to a service station.
March 18, 1925.

"The Wireless Age"
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ing Review and most popular
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355 Clarence St., Sydney.

"To Advertisers!"
an AP double filament valve was satisfactory with two 6LO's as amplifiers. A: Use preferably, 6LO's throughout. Q.: Why does receiver refuse to oscillate on low wave-length? A: Using condenser and switch recommended you should have no difficulty; if unamplified, it will be necessary to reduce the length of your aerial. Without full particulars regarding the apparatus you are using we are unable to state why you are unable to pick up low distance stations.

J. R. C. (Queanbeyan). Q.: Using the PI and two stages of audio with potentiometer and grid line battery, should satisfactory loud-speaker results be received from 2BL, and 2FSB? A: Yes; see advertisements in this paper. Q.: Are you using high erase apparatus and a good aerial? If so, it often depends upon the locality, many places being "dead" as far as stations are concerned. Q.: Will the receiver require any modification to receive American and N.Z. stations? A: We presume you refer to broadcast stations, in which case you will probably get better results using the "Low Loss Toner," Radio, No. 46.

J. W. N. (Urania). Q.: Advise cause of "whistling" using four-valve receiver (3 B.P. detector and two audio) circuit submitted. A: Omited to state ratio of second transformer which is probably of trouble. Use a grid leak on the detector valve and a filter condenser with the moving arm connected to earth, which will enable you to determine, Q.: What cause of aerial battery having up. Q.: Poor aerial connection or plant, often due to shakiness of the aerial after it has been removed and replaced by distant earth. If the aerial has also been attached and become hard it can sometimes be released by completely filling the coil in the top with distilled water and leaving it inverted in a basin so that the water fills as it becomes detached.

R. H. S. (Lincoln Margate). Q.: Using four-valve receiver, difficulty in receiving 2BR? A: Omitted to state which coils which should be primary 15, tuned coils 15, and resonant on a 15, 5V, fixed condenser should be across the phones. Q: Adding another valve, would you advise audo or radio frequency? A: Per loud-speaker receiver from the neglect mentioned the PI with two stages of audio should be satisfactory; three stages of audio are not recommended. Present receiver should give satisfactory results for all purposes. To add a further stage of radio, use circuit of five-valve receiver, Radio, No. 47.


P. R. N. (Nobbs Park). Q.: Using the PI, three-valve, receiver described previously, what causes of "whistling" when receiver is touched? Q: Use lower radio transformer in the second stage, preferably, No. 31 to 1. You will probably find an improvement using a UV201A as detector and UV201A's as amplifiers or three UV201A's for a working loud-speakr. You have automatically overdriven circuit, published no connection being shown between the A and B batteries. Try mounting the valves on cushion as mentioned in "Microphonie Nukes," Radio, No. 43.

C. E. D. (Dunsborough). Q.: Using valve receiver circuit submitted, would you recommend adding a stage of radio for reception of 2BR, EAR and WFP? A: Should you have difficulty in picking up those stations in your present receiver, use the long-distance receiver, Radio, No. 46. Q.: What are coils necessary for receiving these stations? A: 2BL and EAR, primary, 150; secondary, 75; and reaction, 50; for WFP, 150, 100 and 100 respectively. Q.: What is cause of filament of Marconi "T" valve suddenly refusing to light, although filament does not appear to be broken? A: If you have been using the valve for any length of time the filament has evidently become exhausted, or there may be a faulty connection in the valve socket. Care should always be taken that correct filament and plate voltages are used as specified by the makers. Q.: Has a counterpoise any advantage over the water pipe system of coupling? A: This is only used for transmission purposes or when induction from lighting mains is experienced. Q.: Would you advise one stage audio, or three valued receiver? A: Yes. A: No infrequent use of phones will be an improvement.

A. W. F. (Townsville). Q: Is it possible to use a "Fruit" spark coil as an LIC transmitter. If so, please supply circuit and particulars. A: Yes; see article on apart-colp valve transmitter, Radio, No. 45.

J. W. J. (Albion). Q.: Using the five-valve receiver, Radio, No. 4, what type of valve would you recommend? A: As you have already installed six slim rhodium tubes you should use Marconis' "Vik." UTO plausible may be used; you will, however, require fixed resistances of 100 ohm in series with your present rhodiums.

F. P. (Horn Hill). Q.: Recommend circuit of a two-valve tetrode receiver capable of receiving distant stations. A: Use the two-valve tetrode receiver, Radio, No. 44, which is not satisfactory, and a stage of audio. Q.: What is the exact time here for "Fruit" KG5? A: It is doubtful whether you would be able to pick up this station, as it would be daylight with you when this station is transmitting.

F. H. (Hawkes Bay). Q.: What type of "call emitter" valves would you recommend for adding to my present two-valve receiver? A: Either UV109, Marconis DFR, TVS "Spen," or WH2 would give satisfactory results. Which ever you decide to employ, care should be taken to use the correct filaments and plate voltages specified.

S. E. L. (Blair Strathmore). Q.: Using the five-valve receiver, Radio, No. 47, advise how to eliminate interference from SLO. A: Unless you have had previous experience with valve receivers use the three-valve receiver described on page 687, No. 48. You will find this very satisfactory. Although two 6L6's are specified the A and B batteries may be used. The tanks may be eliminated here as will be the 1000 ohm resistors. A standard type of "null emitter" valves may be used; see advertisement in this paper.

W. F. F. (Taranaki). Q.: Using a "Tulloch" valve, what should be the resistance of the filament rheostat? A: Between 50 and 100 ohms. It should be noted that in full operation the filament shows red (not a brilliant white), any additional current over that specified does not improve the efficiency but reduces the life of the valve. A special socket should be used.

K. F. (Trumbull). Q: Give particulars for constructing a loop aerial for use with a five-valve receiver for reception of Australian broadcasting stations. A: See "Experimental Loop Aerials," Radio, No. 15, and "Loop aerials and Direction Finding," Radio, No. 34. Q.: Advise cause of trouble experienced with PI receiver, Radio, No. 46. A: Suggest your valve is faulty. Replace with another, if this does not overcome your troubles, then refer to your grid leak or accumulator. Q.: Should aerial be connected to montion of stationary plate? A: To avoid head capacity effects, connect in fixed plates of condenser.

W. H. W. (Chairmond). Q: Would a three-valve regenerative receiver be better than the PI A. No. 45, a three-valve coil circuit any advantage over a two-coil circuit? A: The former is more sensitive; there would be, however, a slight decrease of signal strength when receiving long-distance stations. Q: Is the "null" coil so efficient as a straight-through three-valve receiver? A: No; the former generally necessitates longer resonant connections which decreases the efficiency. Q: Can radio and audio frequency be added to the PI or three-valve receiver? A: Yes; see three-valve receiver, Radio, No. 44. A two-valve receiver employing one stage radio (linear anode) and detector was published in Radio, No. 45, a stage or audio may be added, if desired.


G. P. (Blackheath). Q: How "Least Loss Tuners," Radio, No. 46, Fig. 2; what is number of tanks required for the second? A: 14.

C. W. (Willoughby). Q.: Give wiring diagram for adding a second stage of audio amplification in a crystal receiver. A: Connect the primary of the transformer in place of the present "phone" terminals with secondary connections, as in the first stages. Why not use a two-valve crystal reflex circuit, such as Fig. 9, Radio, No. 46, page 607? A: Second transformer will not then function.
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R. L. (Brisbane). Q.: Using the 3L valve, three-valve receiver (two audio), can you explain cause of unsatisfactory results and noises experienced on touching any part of the set? (Particulars of apparatus submitted.) A.: You have evidently overlooked error in circuit published, as connection being shown between the A and B batteries; connect the negative of the former to the positive of the latter. Use a lower ratio transformer for the second stage. Try mounting the valves on sponge, as described in "Microphonic Noises." Radio, No. 48.

A. G. D. (Jackson). Q.: Using three-valve receiver (detector and two audio) what is cause of unsatisfactory signals from 2FC (particulars of apparatus submitted)? A.: As you suggest, a higher ratio transformer for the first stage will be an improvement. Also using wrong-size cells for this station. Which should be primary, 150; reaction, 100. Q.: Should circuit be capable of receiving 2FC (particulars of apparatus submitted)? A.: As you suggest, a higher ratio transformer for the first stage will be an improvement. You are also using wrong-size coils for this station which should be primary, 150; reaction, 100. Q.: Should circuit be capable of receiving 2FC (particulars of apparatus submitted)? A.: As you suggest, a higher ratio transformer for the first stage will be an improvement.


R. L. (Brisbane). Q.: Is it possible to use an extra stage of radio amplification in a single valve reflex circuit? A.: No. A valve may be used as both a radio and audio frequency amplifier, see Fig. 4, page 315, Radio, No. 39.

K. B. S. ( Guildingham). Q.: Can secondaries of audio transformers be used as choke coils in a two stage amplifier? Is this method advisable? A.: There are no secondaries of audio transformers. However, recommended, as it is practically impossible to cut in choke coils in a two stage amplifier.

R. L. (South Perth). Q.: Is there an extra stage of radio amplification in a single valve reflex circuit? A.: No. A valve may be used as both a radio and audio frequency amplifier, see Fig. 4, page 315, Radio, No. 39.

R. M. Evans, Local Manager for Victoria. Q.: Using three-valve receiver, page 434, Radio, No. 46, would using two Jefferson 4:1 transformers affect reception of distant stations? A.: Use either a 1:1 or 6:1 for the first stage, 4:1 or 8:1 would be satisfactory for the second stage. Q.: What size cells should be used for reception of Melbourne, 122 and 6WF? A.: For ELO: primary, 150; secondary, 266; and reaction, 300. For TEL, same as for ELO. For EWF, same as TEL. Q.: Should four dry cells be used for 3LF valves? A.: Three dry cells will be sufficient. Q.: What is cause of "cracking" noises experienced when receiving 3LF? A.: Evidently using too high plate voltage. For the valves mentioned, use 16-22 for the detector, and 40-46 for the amplifiers.

W. L. (Newtown). Q.: Using loose coupling and one stage amplifier, Radio, No. 27, what is cause of continuous "hiss" in "phone? A.: Connect negative of A battery to earth. Q.: After making up the P1 receiver, Radio, No. 38, the same trouble was experienced but stopped when grid leak and condenser was touched. Why? A.: Grid leak or condenser at earth. Q. Could a three-volt 30 amp accumulator be used for filaments of these valves? A.: No. Q.: Can two Cossor valves as amplifiers be satisfactory? A.: Yes. Q.: Would the "Low Loss Tunes," Radio, No. 46, with two stages of audio, give as good results as the 60-490 metre tuner? A.: This depends upon the wave-lengths over which you desire to receive; both are designed for different wave-length ranges.

E. R. (Bexley). Q.: Would Edison 3U1 valve be satisfactory for the P1, three-valve, receiver, Radio, No. 46? A.: These are not recommended as amplifiers. Q.: Could a three-valt 30 amp accumulator be used for filaments of these valves? A.: No. Q.: Can two Cossor valves as amplifiers be satisfactory? A.: Yes. Q.: Would the "Low Loss Tunes," Radio, No. 46, with two stages of audio, give as good results as the 60-490 metre tuner? A.: This depends upon the wave-lengths over which you desire to receive; both are designed for different wave-length ranges.

R. L. (South Perth). Q.: Is it possible to use an extra stage of radio amplification in a single valve reflex circuit? A.: No. A valve may be used as both a radio and audio frequency amplifier, see Fig. 4, page 315, Radio, No. 39.
March 18, 1925.

"RADIO"

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