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IN AUSTRALIA & NEW ZEALAND

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

VOL. II MARCH 18, 1925 No. 52

BUILD THIS PORTABLE OSCILLATING WAVEME

RADIO
IN AUSTRALIA & NEW ZEALAND
Incorporating "Sea, Land and Air"

[Edited by N. H. THOMPSON.]

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Published by

THE WIRELESS PRESS

Gloucester House, 44 Market Street, Melbourne.
97 CLARENCE ST., SYDNEY.
Australasia Chambers, Wellington, N.Z.

PRICE, 6d. per Copy.

Subscription Rate: 10/ per annum (26 issues) throughout Australia and New Zealand; Foreign Rate, 12/6 (26 issues).

Obtainable from all Booksellers and News Agents, also the N.S.W. Bookstall Co., Ltd.—all branches.

Wholesale Distributing Agents:
GORDON & GOTCH (AUSTRALASIA), LTD.,
Sydney, Melbourne, Adelaide, Brisbane, Launceston, Perth, Auckland, Wellington, Christchurch, and Dunedin, N.Z.

Canada and U.S.A.:
The Wireless Press Inc.,
326 Broadway,
New York City.

Great Britain:
The Wireless Press Ltd.,
12-13 Henrietta St.,
London, W.C.2.

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Silk Purses and Sows' Ears

"YOU 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 outcome 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 economics, 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. Valves 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-omnibus. Overcrowd it (switch 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 Amateurs and Radiocast Wavelengths, Using Coils whose Construction is Described.

By Carlos S. Mundt.

REPRINTED BY COURTESY OF "RADIO," SAN FRANCISCO.

A 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 especial feature is the provision made for easy and rapid coil changes, thus giving great flexibility in covering all wavelengths.

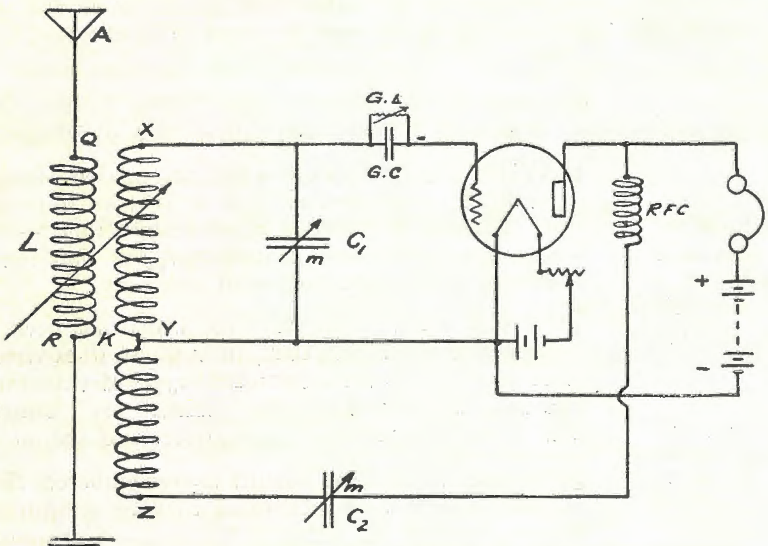


Fig. 1.—Circuit diagram for Short-wave Tuner.

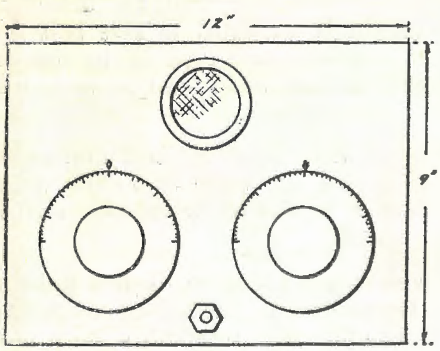


Fig. 2.—Suggested Panel Layout.

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 secured with a 2in. separation of coils L and K. Complicated coupling arrangements are obviated by using variable condenser C_2 to control the feed-back.

A simple panel arrangement for tuner and detector is shown in Fig. 2. This may be modified for adding one stage of audio frequency by mounting one rheostat above the left-hand dial and one above the right-hand dial.

The apparatus is as follows:

1 7 x 12 x ⅛in. panel.
2 good low-loss variable condensers.
1 socket.
1 rheostat.
1 tube.
1 grid leak plus grid condenser.
1 lb. No. 18 enamelled wire.
⅛ lb. No. 28 d.c.c. wire.
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 2½in., 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.

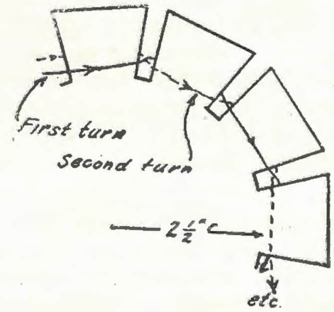


Fig. 3a.—Coil 1.

Coil 2 (Fig. 3b) is wound on a 3in. 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.

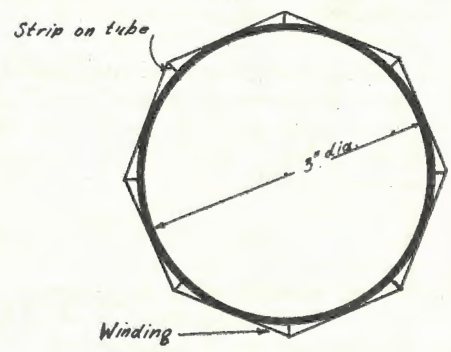


Fig. 3b.—Coil 2.

Coil 3 (Fig. 3c), is a "diamond weave." On a disc of 3in. dowel or window pole ½in. wide make 15 equally spaced marks (lay your watch on the face of the disc and mark off every four minutes). Drive 14 2in. nails normal to the surface, and about $\frac{3}{8}$in. away drive in a similar line (see figure). Wind over one nail, cross and under next, or, as option you may wind over two, cross and under two, thus making the "duolateral." When finished, tie with thread, pull out nails and clip coil off form, which may be used again. Turns as before.

Coil 4 (Fig. 3d) is the so-called "basket weave." On a flat board about $\frac{1}{2}$in. thick, draw a 3in. circle. Lay out by protracter or watch 15 equally spaced points on this circle. Drill $\frac{1}{4}$in. holes at these points and insert 2in. lengths of dowel in each. Wind in and out or, as option, over two and under two. Tie with thread, remove dowels with a twisting motion and coil is made. Number of turns as for Coil 2.

Coil L is of five turns No. 18 enamelled. For coils 2 and 4 it may be made circular, though it is best to make it exactly like them. For coils 1 and 3 inductance L should match exactly. Clips at Q and R provide for changes.

Choke CH is made of 100 turns No. 28 d.c.c. "jumble wound" on a 2in. tube.

In this set the exact number of turns for a given wave-length range will depend on certain constants within the set and on the size of your condensers with their maximum and minimum capacity values. The number of turns given here are on the basis of an 11-plate (.00025 mfd.) condenser and for waves not over 200 metres. For 23-plate (.005 mfd.) proper changes may be made by a little experimenting. For broadcast waves the values of turns must be considerably increased. Because of the clip arrangement at X, Y, Z, several coils may be made up for trial.

It is well to vary the turns in the YZ portion of coil K for a given number in XY. Distribute a few twist connections for experimenting, and after the proper value is found the excess turns may be clipped off and removed.

A variable grid leak is a positive necessity, as unusual howling may be experienced with a fixed leak of wrong value.

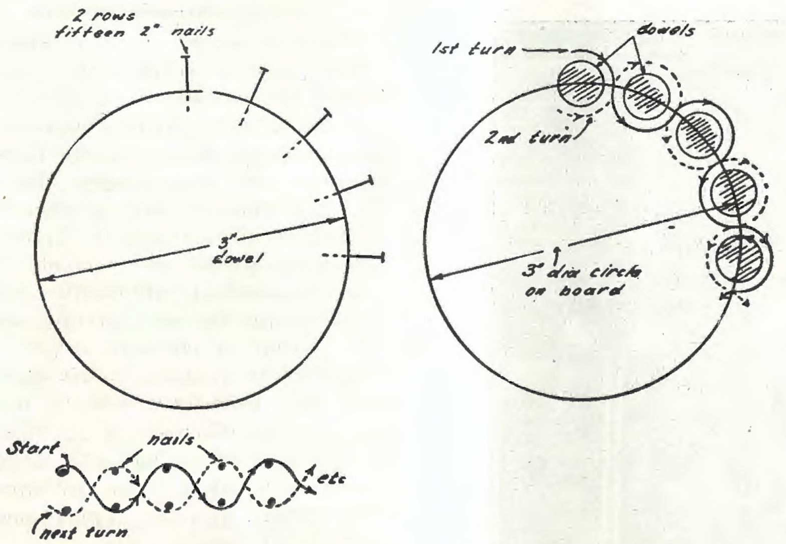


Fig. 3.—Constructional details for various types of coils.

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 letter addressed to the United Distributors Ltd., says:—

"You will no doubt be pleased to hear that I have twice succeeded in logging KDKA on the Model 'T' four-valve United Home Assembly set which I purchased recently.

"The signals received were of good 'phone strength, being about equivalent to the usual signal strength of 2FC on a crystal set. Several visitors were present at my house at the time and can verify the results obtained. I was rather surprised myself at such splendid results and it occurred to me that perhaps I was receiving Broadcasters' harmonic, but after KDKA gave their closing-down sign 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 loud-speaker strength. 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.

"For the benefit of others using the same Model Set, I forward the following particulars:—The following coils were used No. 1, 18 turn (low loss); No. 2, 35 turn (honeycomb coil); No. 3, 35 turn (honeycomb coil). Audio filament, three-quarter glow. No condenser in at all.

"I tuned on the aerial condenser first and for finer adjustment used the secondary condenser and the audio filaments.

"The final setting was:—Both condensers right out, tickler coil at an angle of 45 degrees, audio filaments three-quarter glow. It was extremely gratifying to me to get these results and I forward them to you in the hopes that they will be of assistance to other listeners-in.

"My set is located at Harden Street, Northbridge."

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. Verification and further particulars can be had direct from them.

NEW ZEALAND BROADCASTING COMPANY.

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 the N.Z. Broadcasting Company an accomplished fact. This company will erect and operate powerful stations in the four chief stations. It will have a capital of £50,000 and will build stations of 1,000 watts' input at Auckland, Wellington, Christchurch and Dunedin. The N.Z.B.C. will first take over the existing public broadcasting stations, increase the power, and otherwise improve the existing service, so as to adequately cater for requirements until such times as the new stations can be erected. The annual fee to be paid by license holders, as from April 1, will probably be about 30/- (the exact amount not yet having been fixed).

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.

Mr. A. S. Cochrane, the "Hello Man" of 2FC, Farmer's Broadcasting Station, Sydney. Mr. Cochrane is rapidly becoming one of the best-known men in Australia, for he speaks to thousands of people every night. Every evening during the "Children's Hour" he tells stories and replies as best he can to many questions his little hearers put to him. Mr. Cochrane's talks to the children have become a feature of Australian broadcasting.

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 infrequent 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.

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

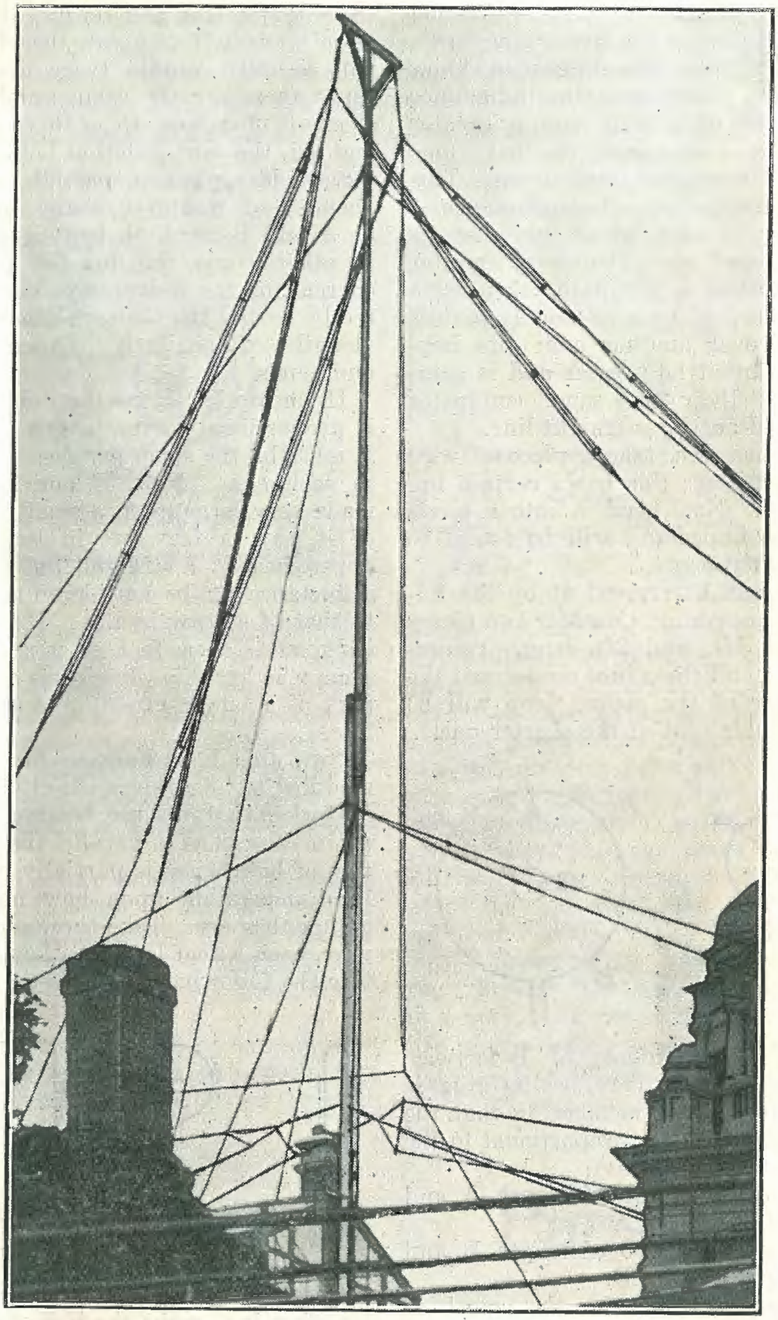
The third epoch in radio communication may be termed that of the low decrement transmitter and the highly sensitive receiver. The transmitter most typical of this epoch is the quenched spark transmitter, which produces a large number of regularly spaced wave trains of low decrement each second. This 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 c[illegible]tinuous wave trains.



The aerial of 7ZL, Hobart's new broadcasting station. It is erected on the roof of "The Mercury."

E.—The Oscillating Receiver.

The receiving set was generally based upon the production of a beat or difference frequency, between the currents produced by the incoming wave and radio-frequency currents of slightly different frequency produced by a local oscillator.

F.—Radio Telephony: Super-Reception.

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

(*Continued on page* 872.)

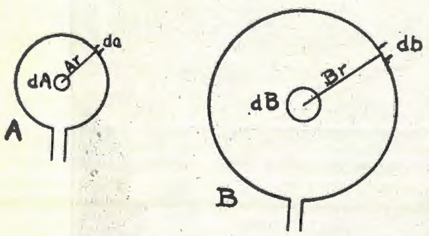
The Inductance of Bends and Loops

By R. C. Philipp.

THERE 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 impdance 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 impedance. 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 A (remembering that the area of a circle is proportional to the square of the radius).

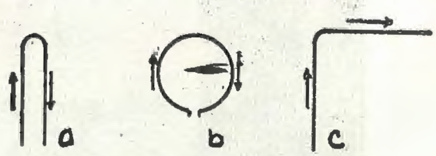
Let da be 1/100 of length A and dA 1/100 of area A.

Let db be 1/100 of length B and dB 1/100 of area B.

Because db is twice the length of da, the magnetic effect at any point the same distance from both due to current flowing in the loops will be twice as great. Now magnetic effect varies inversely as the square of the distance. Since Br is twice Ar, the magnetic effect of a given current in db on dB will be *one-half* that of a similar current in da on dA, i.e., $\frac{1}{4} \times 2 = \frac{1}{2}$. But the area of dB is four times that of dA 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 dA 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 this wire forms a circle, 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 induction 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 a and least in the case of c, but nevertheless it does exist in c 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 impedance of all bends and loops is actually less than the same length of wire straightened.

Where one loop lies over another the inductance in general increases as the square of the number of turns:

If H = Magneto motive force (product of the amperes and number of turns per unit length).

B = Flux density (number of lines of force produced per unit area)

the stored energy is proportion to H x 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 x B is quadrupled. L or the coefficient of self induction which is a measure of H B is 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 Scot'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.

Detector Connections

REGARDLESS of the fact that printed instructions are contained with each standard valve, the radio public seem to be uncertain as to how a soft, hard or amplifier valve is connected in the various circuits.

The first thing to keep in mind is this. The rheostat controlling the filament current is always connected in the negative A battery lead and the negative of the B battery is connected to the positive of the A battery. The negative of the B battery may also be connected to the negative A battery with a slight loss in plate potential.

In the drawings, Fig. 1 shows how an amplifier is connected. This is audio frequency and shows the grid return connected to the negative A battery and not to the filament. The grid return should never be connected to the positive A battery because distortion will surely result.

Fig. 2 is that of a hard detector valve and shows the grid return connected to the positive A battery and the negative B battery. The rheostat is in the negative filament lead.

Fig. 3 is that of a soft detector valve and shows the grid return connected to the negative filament and not the battery. This brings the connections between the filament and rheostat. A potentiometer (P) is connected across the A battery and the negative of the B battery connected to it for control of plate potential. The filament rheostat used with a soft valve should be a vernier if best results are to be obtained because the filament current and plate potential are critical. It is due to these valves being so critical that few of them are placed in manufactured sets, they no doubt figuring that unless this type of detector is operated properly it is not as satisfactory as a hard valve.

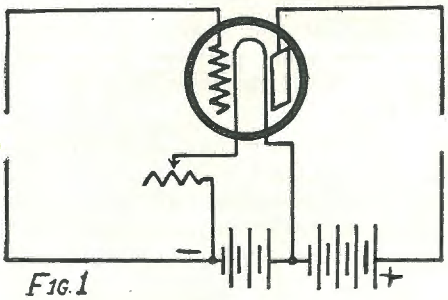


Fig. 1

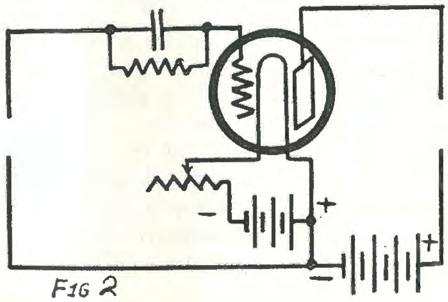


Fig 2

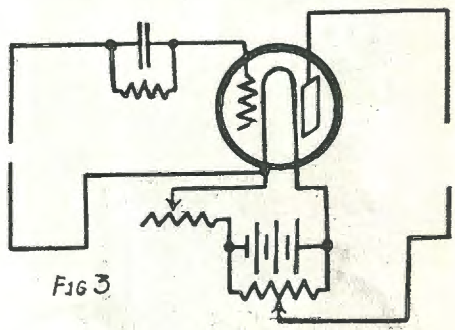


Fig 3

When a soft detector valve is used, a slight increase in filament current by the judicious use of the vernier rheostat, will make a station's signals, that were formerly weak, quite strong.

A detector valve will work connected either way, but it will work best one way and that depends on the kind of valve it is. Another thing, when comparing different detector valves, it will sometimes be necessary to retune your detector circuit when the various valves are inserted in the socket. For example: You may have your regular detector in and tune in some station, then when you insert another valve, the signals may get weaker but by retuning your set, the signals may be made stronger or weaker. If the former, the last valve is a better detector, while if the latter, it is not as good.

If you have an ammeter you can connect it in series with the filament of a soft detector valve and note how much current is required to make the valve oscillate. The writer has two soft valves of the same make, and one will oscillate readily on 6/10 ampere with the rheostat only part way cut out, while the other will only draw 4/10 ampere with the rheostat all the way out and is a very poor detector. The useful life of the latter is about at an end due to a thin filament offering a high resistance to the six-volt battery.

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, 8FJ, 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.: z2AC, z4AG, a3BD.
Oct. 12: z4AA, z1AC, z4AG, z2AC, a3BM, a3BO.
Oct. 14: z4SQ.

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' claims, the longest distance ever recorded between amateur stations.

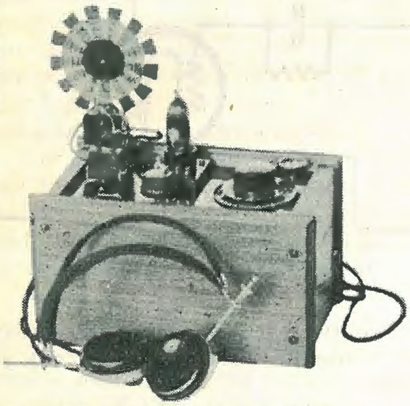
He also announces that he is now transmitting, using only ten watts input; and that so far he has had reports from Finland (FN2NCA) of successful reception. He hopes to have some reports also from England on these transmissions. He is working on 100 metres or near it most of the time, as he says this is "the only interesting wave-length left." M. Menars can be reached by mail at Le Blancat, Gans (Basses-Pyrenees), France.

A Portable Oscillating Wavemeter (70-2000 Metres)

By C. D. Maclurcan.

NOW 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



The Portable Wave-meter.

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 flash-lamp in series. See Fig. 1.

In use, this kind of wavemeter is placed in close proximity to the transmitting set, and the condenser varied

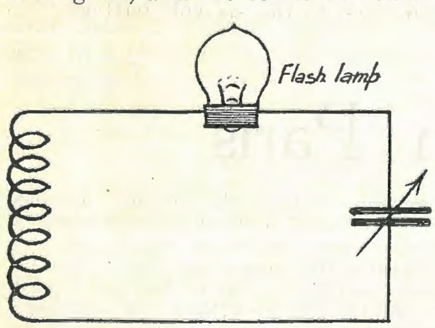


Fig. 1.

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 head, 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.

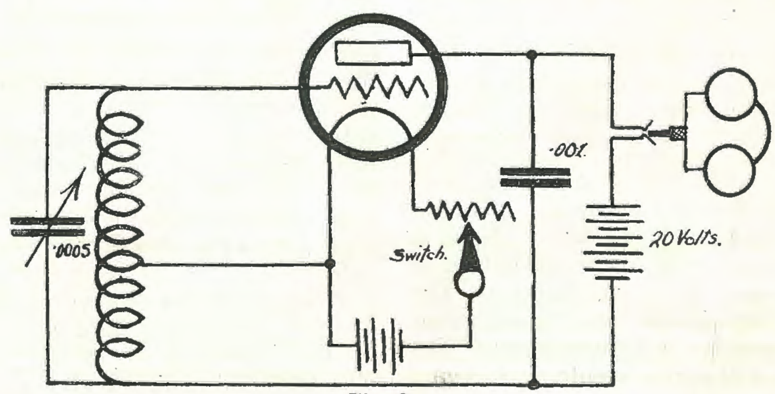


Fig. 2.

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 ⅛in. bakelite, 8½ x 5 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 of the meter until a chirp is heard in the headphones. The wavelength can then be read from the condenser dial setting on the wavemeter.

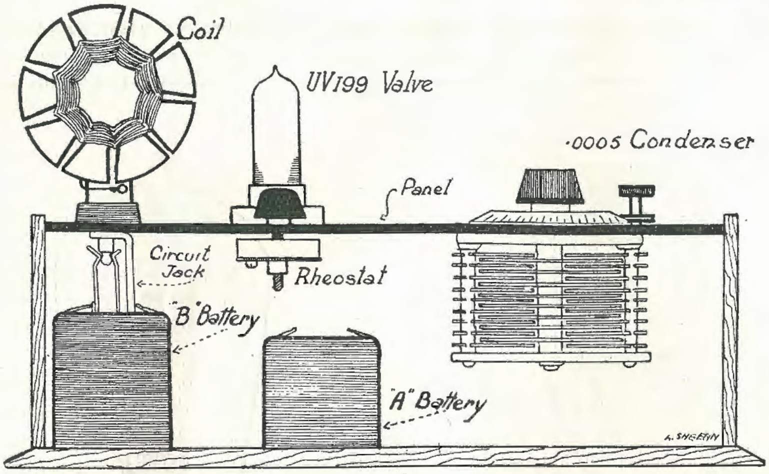


Fig. 3.

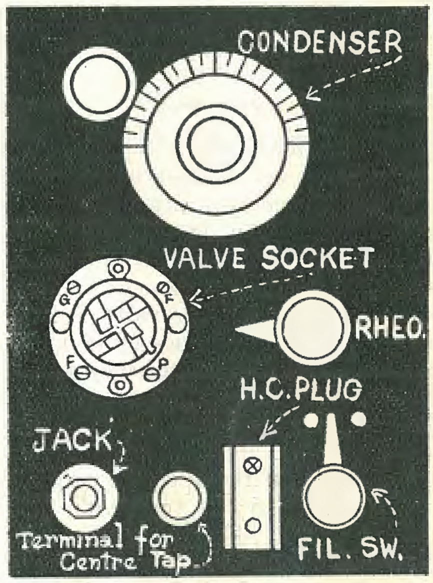


Fig. 4.

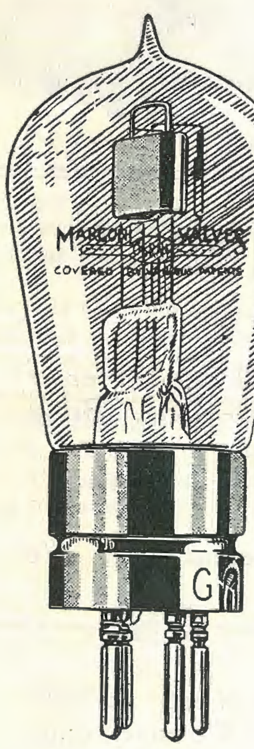
Three Popular Valves

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. As detector of high frequency amplifier 45 volts on the anode is ample.

Fil. volts.: 5; fil. current: 0.70; anode volts: 30-120; impedance: 30,000 ohms; amplification factor: 9;

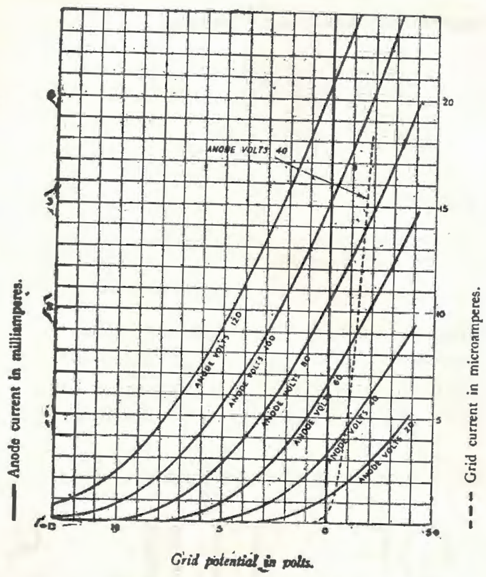


Type R5v.

overall length: 115 m/m.; max. diameter of bulb: 45 m/m.

TYPE LS5.

Designed as power amplifier; extremely useful also as low-power transmitter with moderate anode voltage. Probably the best valve yet designed for power amplification work. Has an emission of about 50 milliamps, with low impedance of about 6,000 ohms. With 120 volts on the anode and eight volts negative grid bias (normal working conditions) the



Characteristic Curves of average Valve

TYPE R. 5v.

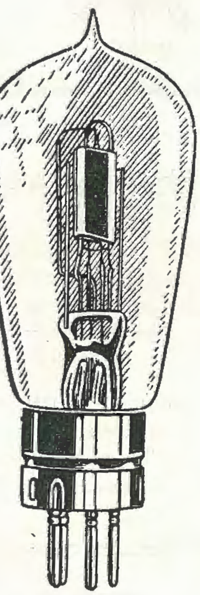
anode current obtained is about six milliamps. As transmitter it can be allowed to dissipate 10 watts at an anode voltage not enceeding 500 volts.

Fil. volts: 4.5; fil. current: 0.8 amps.; anode volts: 60-400; impedance: 6,000 ohms.; amplification factor: 5; overall length: 135 m/m.; max. diam. of bulb: 55 m/m.

Type LS3.

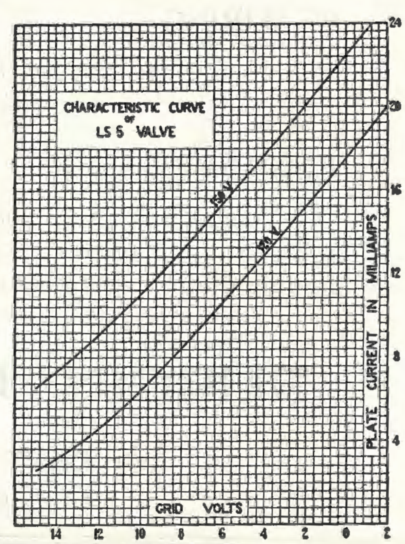
A low frequency amplifying valve designed for loud--speaker work.

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 suit-



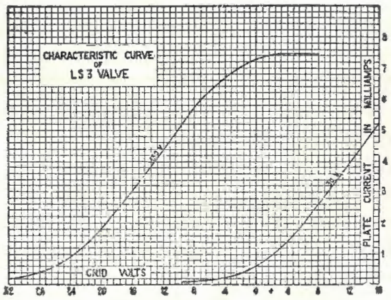
Type LSV.

able for use in the last stage of multi-valve 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,

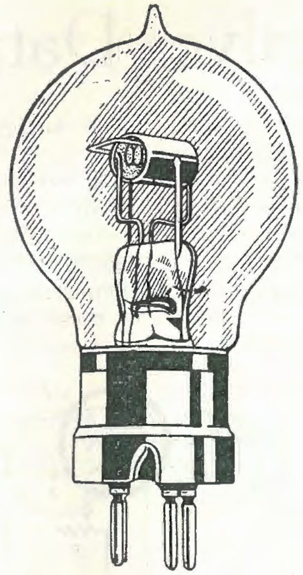


and is suitable therefore in the final stage of amplifiers using R type valves in the initial stages.

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



overall length: 110 m/m.; diam. of bulb: 54 m/m.; socket type: "R."



Type LS3.

TWO-WAY COMMUNICATION.

RADIO z3AL, the station operated by Mr. W. M. Dawson, of Ashburton, has established two-way communication with u6AWT, 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, 3AQ. 2FC, 2BL, 3LO, and 6WF.

The set used was a three-coil 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 Tuners; One-Tube Circuits; Low Loss Inductance Coils; An All-Wave Tuner—No. 46.

A Super-Five Valve Receiver—No. 47.

Radio Installation Rules; A Multi-valve Radio Frequency Amplifier—No. 48.

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

AFTER 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 wave-lengths 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 plate and filament. The grid or input circuit is one 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 any losses in it mean weak signals.

The next circuit is the plate circuit and consists of the plate of the valve, the telephones (or where amplification is used. the primary of the transformer), and the B battery, which is the plate supply.

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

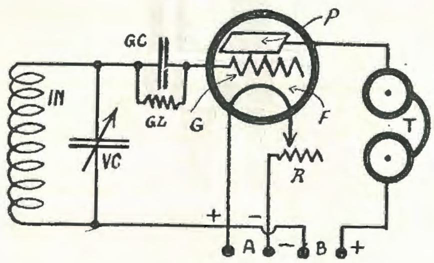


Fig. 1.

ondary of the audio frequency ampli-
the grid return lead, which is the sec-
fying transformers.

The negative of this battery connects to the transformer and the positive of the battery goes to the negative filament, not the positive.

The negative B battery is most always connected to the positive A battery. In nine out of ten sets, the set will work better that way but in all cases it is best to try both negative and positive and make permanent connection to the one giving best results. The amount of B battery voltage used with your audions will depend on the valves. If you are using a soft valve as a detector, the voltage will be anywhere from 16½ to 22½, while if you are using a hard one, higher voltages are required. Different valves of the same type will require different plate voltages for best results, although high plate voltages will paralyse a detector valve, such as the 200 or 300 types.

The grid condenser is used so that better rectification may be obtained and the grid leak may either be connected across the grid condenser or from the grid of the valve to the filament. Try positive and negative filament for best results. A great deal of the trouble in a radio set is often traced to defective grid leaks or condensers.

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 on one, two or three valves, or you may have separate rheostats for each. In the case of audio frequency amplification the filament current is not at all critical and one rheostat or a current adjuster 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 persist in doing so. When this is done 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 dealing with the filament here. In placing more than one valve on a rheostat, it is only necessary to take leads 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

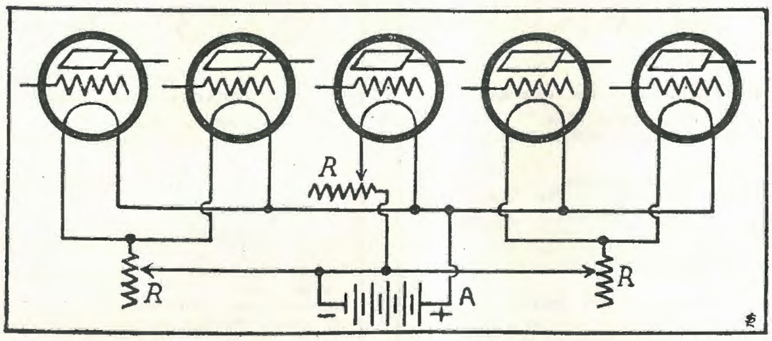


Fig. 2.

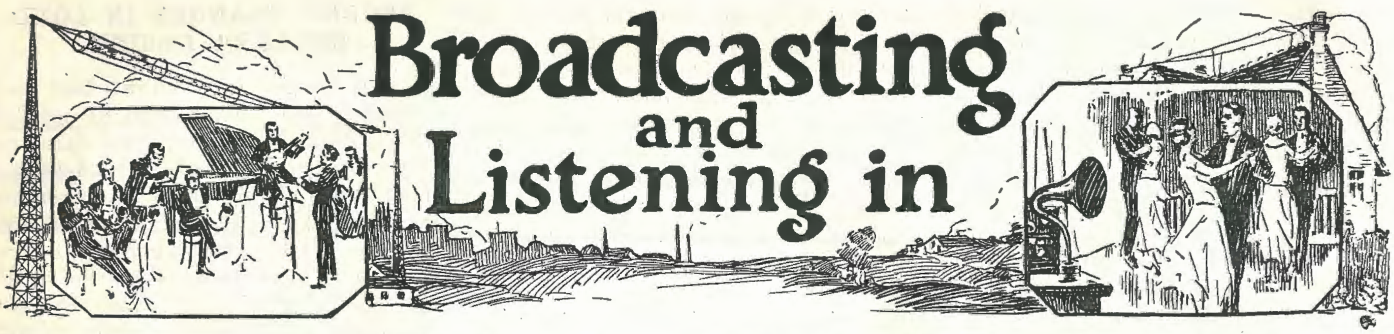
you are going to use with the set. The type of valves should be decided upon before buying the parts for your set. If you are using a soft valve as detector, you will require a four to six ohm vernier rheostat. The vernier is necessary if you are to get best results. If you are using the 201A type for 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 valves are shown but not the connecting circuits as we are only 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 UV199, but to use a 60-ohm rheostat if a storage battery was used. What his informer probably meant was, if you use dry 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.

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 receivers 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," the *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.



Broadcasting and Listening in

2FC

BROADCASTING TIMES.

Sydney Mean Time.

CALL SIGN 2FC, SYDNEY.
Wave Length: 1100 metres.
Power: 5 kilowatts.

Midday Session:

12.55 The Chimes of 2FC.
12.58 Time Signals from Farmer's Master Clock.
1.0 Coastal Farmers' Market reports, Stock Exchange information, Weather information, "Sydney Morning Herald" news service, Reuter's and Australian Press Association cables, "Evening News" midday news service.
1.30 Close down.

Afternoon Session:

3.0 The Chimes of 2FC.
3.30 Musical Programme.
3.50 Afternoon Stock Exchange information, late Weather information, "Evening News" afternoon news service.
4.0 Close down.

Early Evening Session:

6.30 The Chimes of 2FC.
6.33 Children's Hour.
7.10 Dalgety's Market reports (wool, wheat, stock), fruit and vegetable markets, late Stock Exchange information, Weather News, Shippings News, late "Evening News" news service, Reuter's and Australian Press Association cables.
7.20 Close down.

NIGHT SESSION:

7.55 The Chimes of 2FC.
8.0 Musical Programme.

The evening entertainment broadcast from Station 2FC is varied and includes Theatrical transmissions from the Theatre Royal, Her Majesty's Theatre, The Criterion Theatre, The Palace Theatre, The Tivoli Theatre, Haymarket Theatre and the Prince Edward Theatre.

Jazz music provided by the Wentworth Orchestra is also broadcast direct, and high-class musical entertainments provided at the Studios of 2FC, in which Sydney's leading artists participate, are also features of the programme.

SATURDAY: Midday, early evening and evening sessions as on week days, afternoon session as follows:—
3.15 The Chimes of 2FC.
3.18 to 3.45: Late Sporting information.
3.45 Close down.

SUNDAY: No midday, afternoon or early evening session. Church Services from one of several Churches, commencing at hour appointed for Divine Service, according to the Church, and varied by some Sacred Concert from the Studio of 2FC.
10.0 Close down.

6WF

BROADCASTING TIMES.

Perth Mean Time.
Wave Length: 1250 metres.

Midday Session:

12.30 Tune in to gramophone.
12.35 Market Reports of The Westralian Farmers, Limited.
12.38 News Service.
12.42 Weather Reports.
12.44 Gramophone Items.
1.0 Time Signal.
1.1 to 1.30 Gramophone and Pianola.
1.31 Close down.

Afternoon Session:

3.30 Tune in to Pianola.
3.35 to 4.0 Special programme, comprising Talks, Gramophone, Pianola, Westralian Farmers' Studio Orchestra.
4.1 Close down.

Early Evening Session:

7.5 Tune in to Gramophone.
7.10 Bedtime Stories.
7.45 Market Report.
7.57 Weather Report.
8.0 Time Signal.
8.1 News Cables.

EVENING SESSION:

8.10 to — Entertainment. See list hereunder.

Monday:	8.10, Lecture; 8.45, Wesfarmers' Orchestra.
Tuesday:	8.10, Professional Concert.
Wednesday:	8.10, Theatre or Hall Broadcasting.
Thursday:	8.10, Professional Concert.
Friday:	8.10, Concert Evening and Lecture.
Sunday:	7.20, Church Service.
Saturday:	8.15, Wesfarmers' Studio Orchestra.

SATURDAY:

Midday Session:

12.0 Tune in to Gramophone.
12.5 Market Reports of The Westralian Farmers' Ltd.
12.10 News Service.
12.15 Weather Report.
12.16 Gramophone and Pianola.
1.0 Time Signal.
1.1 Close down.

Early Evening Session:

7.5 Tune in to Gramophone.
7.10 Bedtime Stories.
7.45 Market Reports.
7.57 Weather Report.

Evening Session:

8.0 Time Signal.
8.2 News Cables.
8.15 Wesfarmers' Studio Orchestra.

3LO

BROADCASTING TIMES.

Melbourne Mean Time.
Wave Length: 1720 metres.

MONDAY TO FRIDAY:

Midday Session:

10.57 "Tune in" Signal.
11.0 Buckley & Nunn Studio Orchestra.
12.0 Time Signal.
12.30 "Argus" News Service, Reuter's and the Australian Press Association Cables.
1.0 Time Signal—Luncheon Hour Talk.
1.15 "Herald" News Service: Weather Report and Stock Exchange information.
2.0 Close down.

Afternoon Session:

3.0 Musical Programme.
3.40 Afternoon "Talk," Fashions, Cookery, Infant Welfare, etc.
5.0 "Argus" and "Herald" News Service.
5.15 Close down.

Early Evening Session:

6.0 Children's Hour: "Billy Bunny" Stories.
6.45 "Argus" and "Herald" News Service, Reuter's and the Australian Press Association Cables.
7.30 Close down.

Evening Session:

8.0 Theatrical Items, Lectures, Vocal and Instrumental Items.
9.30 "Argus" News Service.
10.30 Close down.

THURSDAY NIGHT.

8.0 Studio Concert.
8.30 Carlyon's (St. Kilda) Dance Orchestra.
11.15 Close down.

SATURDAY NIGHT.

Same as Week Days—Sporting Results at Hour and Half Hour.

SUNDAY.

Afternoon Session:

3.0 Pleasant Sunday Afternoon Services from Wesley Church.

Early Evening Session:

6.0 Children's Hour; "Billy Bunny" Stories.
7.0 Church Service.

Evening Session:

8.30 Concerts from the Studio.
9.0 "News of the Week," Prof. Meredith Atkinson, M.A. (Oxon).
9.30 "Argus" News Service.
10.0 Close down.

2BL

BROADCASTING TIMES.

Sydney Mean Time.
Wave Length: 350 metres.

Midday Session.

12 to 2 p.m. Musical Programme, with News Reports supplied by "The Guardian."

Afternoon Session.

3 to 5 Musical Programme, with News Reports supplied by "The Guardian."

Early Evening Session.

7 Nursery Rhymes and Bedtime Stories.
7.45. Pitt, Son & Badgery Stock Exchange Reports.

Night Session.
8 Nightly Concert.

EVENING ENTERTAINMENT.

Monday:	"Jazz" night, with vocal items from the Studio.
Tuesday:	Classical Studio Concert.
Wednesday:	Dance Night.
Thursday:	Broadcasters' Popular Concert.
Friday:	"Jazz" night, with popular items from the Studio.
Saturday:	Popular Concert.
Sunday:	Classical and Operatic Concert.

7ZL

BROADCASTING TIMES.

Hobart Mean Time.

Wave Length: 390 metres.

MONDAY TO SATURDAY.

Morning Session—11 to 12 Noon:

11.0 "Mercury" News Service.
11.30 Musical Items.

Afternoon Session—3 to 4 p.m.:

3.0 Weather and Market Reports.
3.30 Educational Lectures as arranged.

Early Evening Session—7 to 8 p.m.:

7.0 Children's Stories by Uncle Nod.
7.30 (Saturday) Latest Sporting News.

Evening Session—8 to 10 p.m.:

8.0 Vocal and Instrumental Concerts from Studio. Orchestral Music.

SUNDAY.

Afternoon Session—3 to 4 p.m.:

3.0 Musical Programme.

Evening Session—7 to 9.30 p.m.:

7.0 Church Services as arranged.
8.30 Vocal and Instrumental Concerts from Studio.

3AR

BROADCASTING TIMES.

Melbourne Mean Time.
Wave-length: 480 metres.

MONDAY TO SATURDAY.

Morning Session:
11.0 Musical Items.
11.45 Weather Report, Stock Exchange Information.
12.0 Time Signal, Close Down.

Afternoon Session:
3.0 Musical Items.
3.30 Weather Report, Afternoon Stock Exchange News.
4.0 Time Signal, Close Down.

EVENING PROGRAMME.

7.0 Children's Corner, by "Uncle Rad."
7.35 Closing Stock Exchange News.
7.45 Weather and latest Market Reports. News Bulletin.
8.0 Vocal and Instrumental Concerts.
10.0 Close down.

SUNDAY.

Afternoon Session:
3 to 4 Musical Items.

EVENING PROGRAMME.

7.0 Children's Corner, by "Uncle Rad."
7.30 Vocal and Instrumental Items (Church Services announced).
9.30 Close down.

MARCONI SET FOR THE VATICAN.

A SPECIAL broadcast receiver presented by the Marconi Company to His Holiness the Pope, through the Secretary of State, Cardinal Gasparri, has been installed in the Vatican.

The apparatus consists of an artistic Marconiphone receiver and loudspeaker combination, which enables broadcasting from the principal capitals of Europe to be received.

It is understood that the set has been placed in one of the best drawing-rooms of the Vatican and that it will be used during diplomatic receptions.

The Cardinal Gasparri, on behalf of His Holiness the Pope, has expressed great appreciation of the gift.

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.

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 (A/sia.) Limited for the construction of a five kilowatt modern broadcasting station similar to those at 2FC and 3LO has been accepted. The roof of the State Insurance building at the corner of George and Elizabeth Streets, Brisbane, has been selected as the most suitable site for the station, and on this roof administrative offices, reception rooms, studios, control rooms, station, laboratories and workshop will be erected. Transmission over land lines will thus be eliminated when studio items are to be transmitted. The station when complete will be handed over to the Government and will be controlled and operated by the engineers attached to the Queensland Radio Service.

"Quite a number of outside lines," he continued, "will be used for collections from the various picture shows, theatres, band stands, churches, etc., in the city of Brisbane, and the programmes will be organised on a large scale.

"One of the most important points which will be observed in connection with the running of the Queensland Radio Service, will be the supplying of 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 to country dwellers. A scheme is now afoot to equip each school in Queensland with a wireless set, and special educational sessions will be arranged at the Government station.

CALL SIGN AND POWER.

"The call sign of the station will be 4QG, and it will operate on a wave-length of 385 metres, using a power of 5,000 watts. It is expected that it will be in operation during the coming winter.

"The experience which has been gained in other parts of the world and also in other parts of Australia in connection with studio working has not been lost sight of," Mr. Robinson mentions, "and the design of the studios attached to 4QG is such that when completed they will be second to none in the world. Special ventilating systems are being installed and natural lighting is being effected, while at the same time all outside sound is to be excluded.

"While not attempting to impose any harassing restrictions on traders in wireless apparatus, the Government of Queensland," Mr. Robinson continued, "is determined to safeguard the interests of the public, and, with this end in view, is establishing a Radio Bureau in Brisbane. At this bureau all information regarding service and programmes will be supplied free of charge, and persons desirous of purchasing sets would also be able to visit it and secure without any cost to themselves, the advice of wireless experts."

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.

"AMPLIONS" POPULAR.

AT the recent London Radio Exhibition, orders for Amplion Loudspeakers reached an unprecedented total exceeding 150,000 instruments.

The manufacturing programme arranged to meet the demand provides an output of well over 10,000 Amplions per week.

The Australasian agents, Amalgamated Wireless (A/sia.) Limited, have now opened up several new models of Amplions, comprising the very latest designs in loud-speakers.

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—similar to the deck and engineroom 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.


The Author.

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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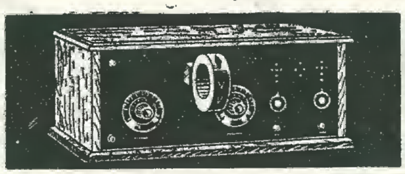

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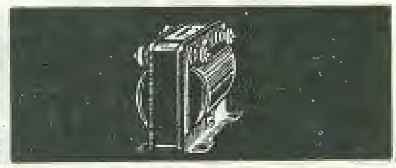

SIGNAL AUDIO FREQUENCY TRANSFORMER.
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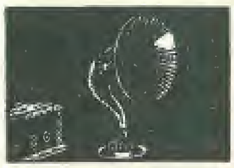

THE "MUSIC MASTER,"
the De Luxe Loud Speaker. Has an amplifying bell of resonant wood £12

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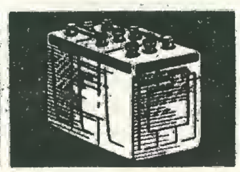
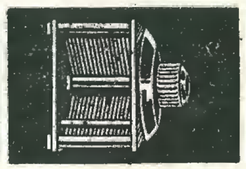
True insulation. Accurate, Reliable. Plain or Vernier. Cheap.



UNITED BATTERIES.
Made by the Clyde Engineering Co., Ltd. Announcements later.



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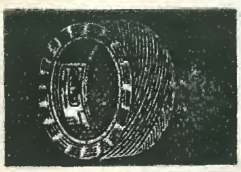

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13 different capacities, 10,000 to 100,000 ohms, ½ meg. to 5 meg. Accurate.

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Best grade. Bushings absolutely true. Inlaid with fast white enamel.

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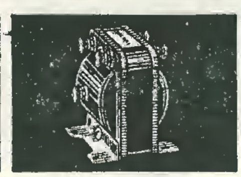

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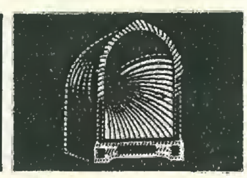

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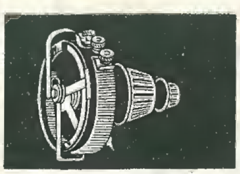

FROST RADIO 607-610 CONTROL UNIT.
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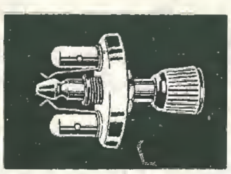
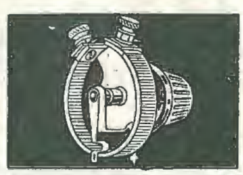


FROST RADIO 608.
Push Pull Battery Switch 4/-



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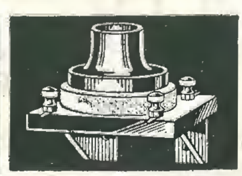

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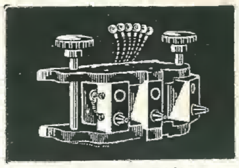

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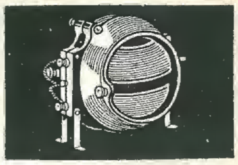

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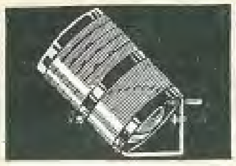

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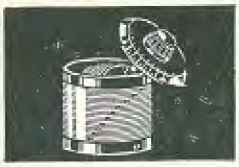

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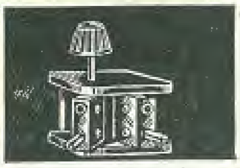

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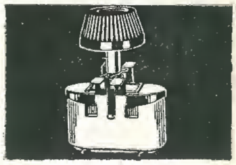

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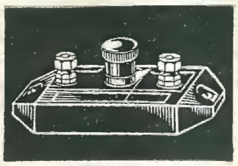

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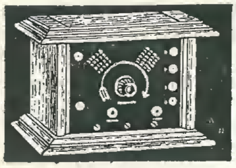

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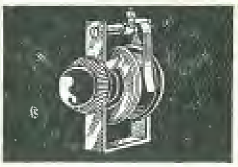

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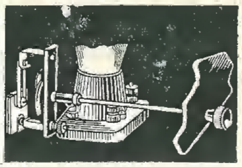

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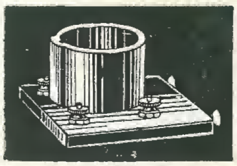

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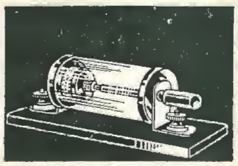

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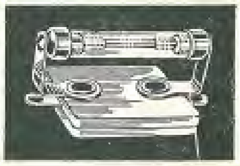

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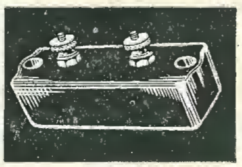

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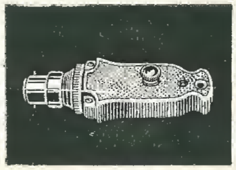

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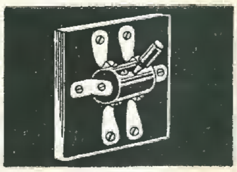

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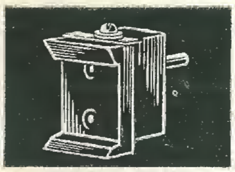

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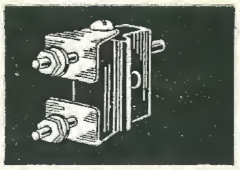

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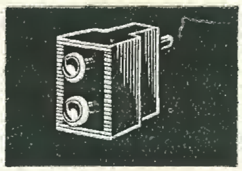

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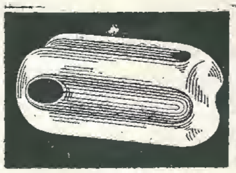

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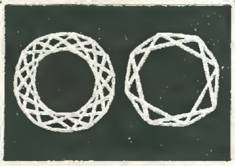

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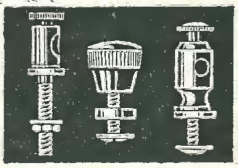

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Some Notes on the Efficiency of Short Wave Receivers

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.

By Geo. Apperley.

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:—

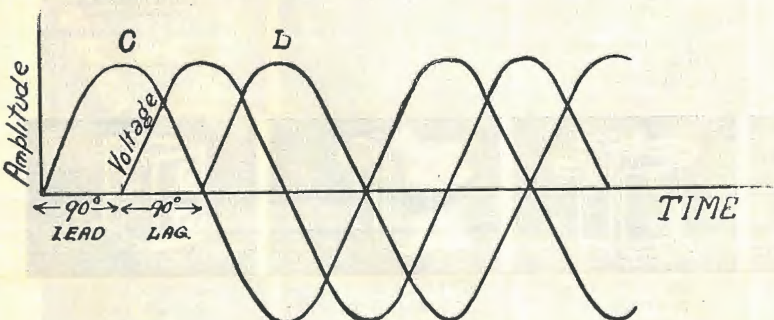

Fig 1

$$I = \frac{E}{R}$$

Where I = Current in amperes.
E = Applied volts.
and R = Resistance in ohms.

If the resistance be replaced by a condenser, the current produced depends upon the reactance (or resistance) of the condenser.

$$I = \frac{E}{\text{Reactance.}}$$

The reactance of a condenser is:

$$X = \frac{1}{2\pi fC} \text{ ohms.}$$

Where π = 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 reactance for any given capacity. As an example, the reactance of a condenser of 2 mfds. to an applied frequency of 1,000 cycles (audio frequency) is equal to

$$\frac{1}{2 \times 3.1416 \times 1000 \times .000002} = 78 \text{ ohms.}$$

If, however, the frequency is increased to 100,000 cycles (3,000 metres) the reactance 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 reactance of an inductance is equal to $2\pi fL$, where L is the 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 reactance of inductance of .02 henries would be: 2 x 3.1416 x 1,000 x 2 = 125.60 ohms. Increasing the frequency to 100,000 cycles increases the reactance to 12560 ohms.

It will thus be seen why the 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 reactance 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.

Fig. 2 illustrates a possible condition in a valve receiving circuit where due consideration must be paid to the above.

The choke L, across which it is desired to set up high potential variations from the low frequency rectified impulses, should have a high reactance at speech frequencies and therefore 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 mfds. so that it would

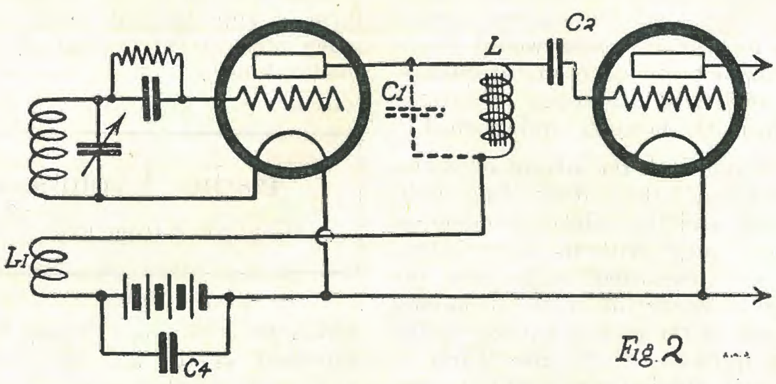

Fig 2

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 L, but the small capacity between the windings as represented by C1 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 OI represent the direction of the current and the point R marked to scale, so that O R 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 shown in magnitude and direction by O C drawn at right angles to O R. The former is known as the power component of the applied pressure and the latter the reactive component which is required to overcome the reactance E.M.F. of the condenser. The impressed voltage in the circuit is therefore the result of O R and O C and may be represented in magnitude and direction by the line C R, the angle θ being known as the angle of lead of the current with respect to

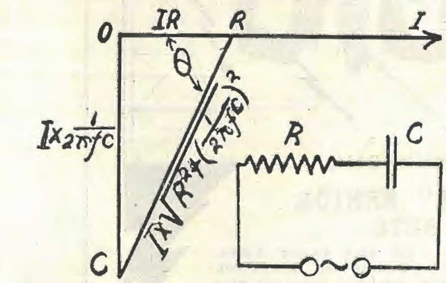

Fig. 3.

the applied voltage. O R may also represent the ohmic resistance of the circuit and O C the reactance of the condenser, so that the vectorial R C is equal to the total impedance of the combination expressed as

$$Z = \sqrt{R^2 + \left[\frac{1}{2\pi f C}\right]^2}$$

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

$$I = \frac{E}{\sqrt{R^2 + \left[\frac{1}{2\pi f C}\right]^2}}$$

Where I = Current in amperes.
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 accounts for some loss of en-

(*Continued on page* 875.)

Broadcasting and Applause

By R. S. W.

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. If 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 telephone 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.*)

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 afterwards 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 bowled 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, "Yaas, 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 of 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.*)

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. (? 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!

COASTAL RADIO SERVICE

STAFF CHANGES.

MR. H. F. COFFEY, Officer-in-Charge, Thursday Island Radio, has been transferred to Brisbane Radio on completion of his term of tropical service.

Mr. J. Leslie, Officer-in-Charge, Brisbane Radio, has been transferred to Thursday Island Radio.

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

Mr. F. 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. Autoveyors, 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. Autoveyors, 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 tag; 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.

(*Continued from page* 871.)

ergy, even although the resistance may be quite small. In practice, however, this loss, even in the average experimental condenser, is not serious and can be easily compensated for by regenerative methods.

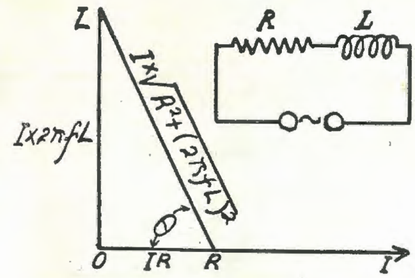

Fig. 4.

Coming now to a circuit possessing inductance and resistance only, we find a somewhat similar state of affairs existing, with the exception that the current lags behind the impressed voltage. Let the horizontal line represent the direction of the current as before. The current flowing is the same in each part of the circuit and at any instant the voltage necessary to cause the current to flow through the resistance 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 O 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.

O R may also represent the resistance in ohms and O L the reactance of the inductance from which we obtain the impedance Z of the combination as represented by L R, which is equal to

$$\sqrt{R^2 + (2\pi fL)^2}$$

The current flowing will therefore be:

$$I = \frac{E}{\sqrt{R^2 + (2\pi fL)^2}}$$

The angle Θ 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 and which is known as resonance or syntony.

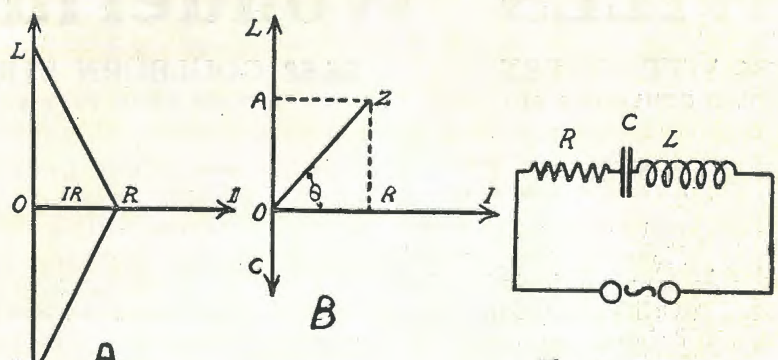

Fig. 5

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 I represents the direction of the current and the point R to scale, so that O R is equal

(*Continued on next page.*)

(*Continued from previous page.*)

to the voltage drop across the resistance. The reactive voltage due to the inductance is 90 degrees ahead of the current and is represented in direction and magnitude by O L, whilst the capacitive reactive voltage is 90 degrees behind the current and may therefore be shown in direction and magnitude by O C. If these values are unequal, as shown in Fig. 5B, the nett effect of the two, which are in the same straight line but in opposition to each other, is O L—O C = O A. The vectorial sum of the resultant reactive voltage O A and the power component O R is shown by O Z, which is equal to the voltage impressed in the circuit, the angle ⊖ being (in this case) the angle of lag of the current behind the impressed voltage. Also the impedance of the circuit is equal to the vectorial sum of the reactance of the condenser and inductance and the resistance, stated as

$$Z = \sqrt{R^2 - \left[2\pi fL - \frac{1}{2\pi fC}\right]^2} \text{ ohms}$$

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 maxi-

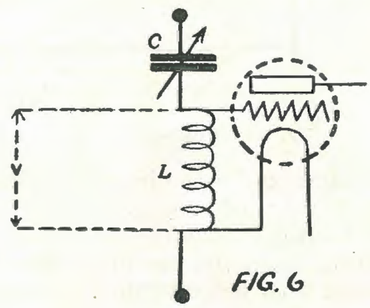

FIG. 6

mum 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 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.*)

(*Continued from previous page.*)
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 = .0005 mfds. and L = 50.7 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.

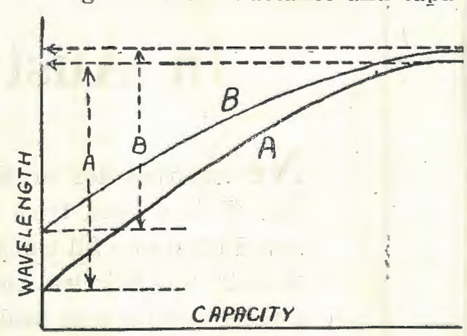

Fig. 7.

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

$$I = \frac{E}{\sqrt{R^2 + \left[2\pi f L - \frac{1}{2\pi f L}\right]^2}} =$$

$$= \frac{.001}{2} = .0005 \text{ amps.}$$

From Fig. 5A we find the reactive E.M.F. V across

L = $I\pi f L$.
= .0005 x 318.5 — .15925 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

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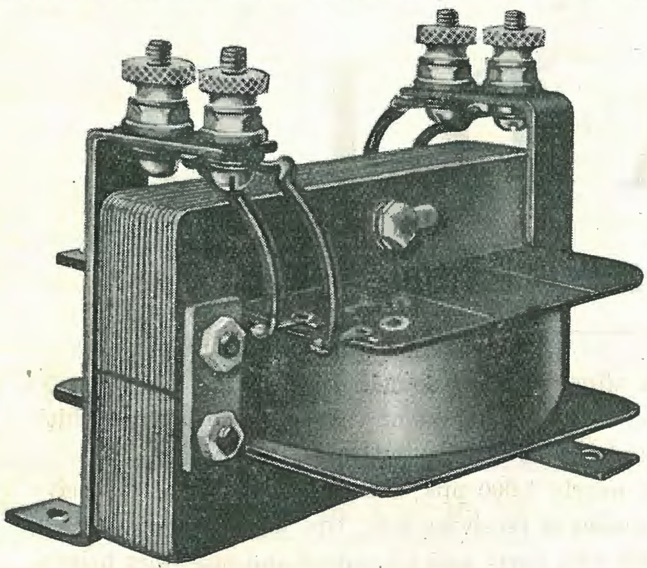

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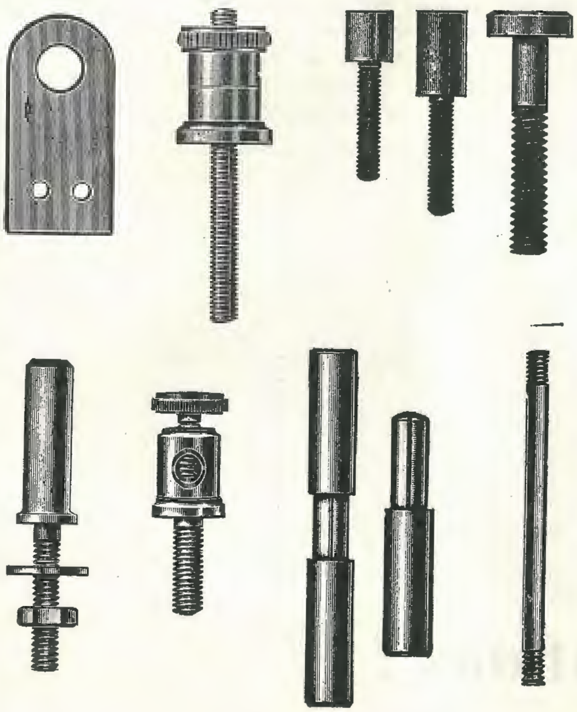

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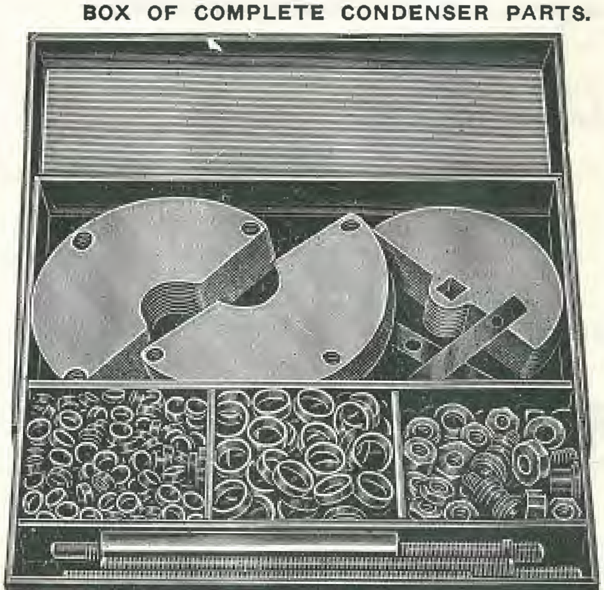
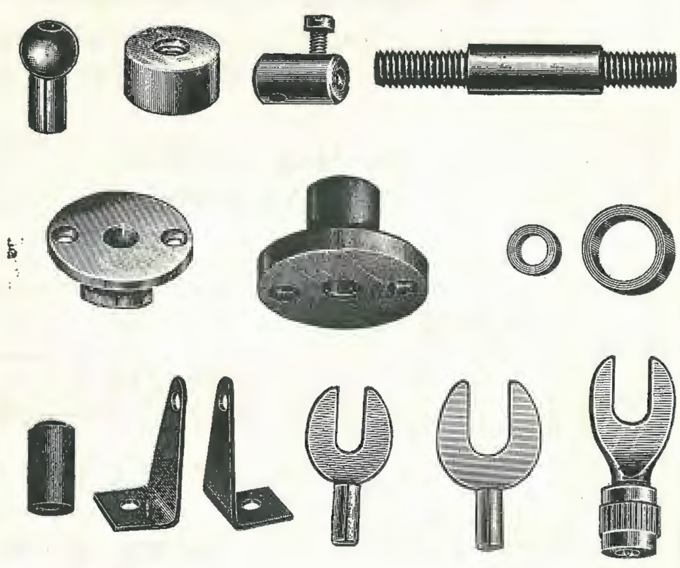




the value, but of slightly larger wire, so that the resistance of the circuit remains unaltered, the current will be the same as before, but the reactive E.M.F. across L will now be V = .0005 x 637 = .318 volts approx. It will thus be seen that it is an advantage to proportion the inductance and capacity 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 .000081 amperes, or for a change of four metres wave-length, the reduction would be .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 .00004 amperes, the reduction from resonant current being .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 in 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 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.

Talks from 3LO

A Summary of Crystal Reception

LET 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 actuate out 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 hear 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 or tune 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 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 altering its height, but to tune in this way would be inconvenient, to say the least of it. So what we do is to leave the aerial fixed and alter the inductance or capacity, or both, in the receiver circuits themselves. You see, then, that when you move the slider along you are altering the length of wire in the circuit and so altering the inductance; and when you move the condenser plates away from or closer to each other, you are altering the capacity which is equivalent to raising or lowering the aerial.

We therefore adjust either the inductance or capacity until we hear loudest signals; then we know that our set is in tune with the transmitter, that is, our circuits contain the same amount of inductance and capacity. Now, I hope you have all followed me so far and have a good idea of what is going on in your crystal set when music is coming through. In receiving wireless telephony the crystal set gives the purest results because no amplification is used, the energy received by the wireless wave alone being used and distortion in the receiving circuits is impossible.

If you are not satisfied with the strength of signals on your crystal set a valve amplifier can be added; then signals which you can just hear should be quite strong, but more of this in our next talk when I want to tell you something about valves and valve receivers. Good-night!

ILLAWARRA RADIO CLUB.

IT may not be generally known that the Illawarra Radio Club (which is the pioneer wireless society of the Illawarra suburbs) has for the past two and a half years been carrying on good work on behalf of wireless experimenters in that district. The club was inaugurated in 1922 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 their benefit.

Since the club's inception, regular fortnightly meetings have been held at the clubroom, 75 Montgomery Street, Kogarah, where instructive lectures, demonstrations, etc., are a feature of the proceedings. The club is also affiliated with a State-wide organisation of amateur wireless societies formed to protect the interests of experimenters and to keep them in touch with all the latest developments in amateur wireless circles. An attractive syllabus of lectures is at present in operation, and a practical department is now being established where transmitting and receiving sets will be regularly working, and instruction on set building and operation, code practice, traffic procedure, etc., will be given.

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 10, 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 rooms, Y.M.C.A. Buildings, 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. Seward, a member of the Society and a very keen experimenter, exhibited his partially-completed "low-loss" set, which was much admired by members.

A3BT.

AN English amateur writing from Great Shelford, Cambridge, England, states that early on December 22, 1924, he was successful in receiving signals from A3BT (strength R3 to R4) on three valves (detector and two L.F.), when the Australian was calling G2OD and held him for twelve minutes until his signals faded.

As the English experimenter desires 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 230 metres) 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. S. Childs), 55 Ridge Street, Merewether.

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.

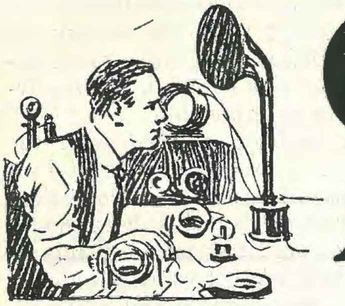
In support of its contention, the paper quotes an instance in which an amateur proved helpful. A wireless operator in Mosul, it says, recently failed to attract the attention of the high-powered official stations.

It was desired that an important communique 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 Hertfordshire amateur carried out the request through the local police.—*The Sun.*

1YB AUCKLAND.

THIS station, where many improvements have been effected, is again in full swing with concerts during the week and church services on the Sabbath. Once a fortnight "Uncle Sam" broadcasts bedtime stories woven round maori lore. These are much appreciated and are of considerable educative value to the young. Mr. J. Shipherd is responsible for all arrangements at this station.



Queries Answered

R. M. W. (Parramatta). Q.: How can interference from Pennant Hills be eliminated using a loose coupler set? A.: Use a .001 aerial tuning condenser and a .0005 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.

F. W. F. (Cremorne). Q.: Using valve receiver (circuit submitted), what is cause of difficulty in receiving 2BL and amateur stations working on short wave-lengths? A.: You omitted to mention sizes of coils used which are evidently too large to allow tuning on the lower wave-lengths. For 2BL use a 50 and 75 turn coil, and for amateur stations 20, or 25 and 30, or 35. The input secondary of the transformer should be connected to the negative of the filament instead of the positive as shown.

J. T. (Darlington). Q.: Would a .0003 vernier condenser across the reaction coil of four-valve receiver be an improvement? Is wiring correct (circuit submitted)? A.: You will get better results coupling this coil to the primary, as shown in the long-distance receiver (*Radio*, No. 45). The condenser suggested is not necessary and would add to the number of controls. Grid leak should be connected to moving arm of potentiometer and the latter connected direct to earth instead of filament as shown. Filament connections of the second valve are not correct; check up with wiring diagram of five-valve receiver, *Radio*, No. 47. Battery connections are most important, if a wrong connection is made and you work all the valves through the one switch you will probably burn them all out. Before placing valves in their sockets test with a small six-volt lamp (if using bright valves) connected to the filament leads which would be cheaper than replacing a valve.

C. R. W. (Warranfels). Q.: Recommend a firm capable of repairing an "Amplion" loud-speaker. A. Write to the Burgin Electric Co., Ltd., 340 Kent Street, Sydney, or the "Repair Dept.," Radio Electric Works, Knox Street, Sydney. Q.: What is make, gauge and resistance per yard of wire (sample submitted)? A.: Sample checks up with Beldenamel 33 B & S 1.A.1.A. resistance wire. Resistance per yard, 17.43 ohms.

A. W. S. (Pentland). Q.: Using circuit, Fig. 2, "Low Loss Tuners," *Radio*, No. 46, how many turns are required on secondary to receive on the wave-lengths mentioned? A.: 18.

C. J. W. (Yass). Q.: Supply circuit of receiver for wave-lengths below 60 metres, using three valves. A.: Reduce size of aerial. Use circuit and coils given in article on two valves portable receiver, *Radio*, No. 50, with an additional stage of audio, if desired.

J. R. (Bridge Creek). Q.: Using the P1 three-valve receiver (*Radio*, No. 40), what is cause of difficulty in obtaining satisfactory loud-speaker results from 3LO, distance 120 miles, although excellent results were obtained when in different locality? A.: The district you are in is evidently not suitable for reception of this station. You will probably get better results using the three-valve receiver (*Radio*, No. 44); for loud-speaker work an additional stage of audio may be necessary.

READERS, PLEASE NOTE!

QUERY letters which are accompanied by our coupon and comply with the following directions will receive first preference.

MAKE your letter as brief as possible and write your questions on one side of the paper, one underneath the other. All letters must be signed in full, together with the address of the sender. For publication, the writer's initials will be used or a nom-de-plume, if desired, but on no account will any consideration be given to anonymous communications.

IF requested, answers will be forwarded by post, providing the letter of enquiry contains a stamped, addressed envelope and the coupon to be found elsewhere in this issue.

IT SHOULD BE NOTED THAT IT IS IMPOSSIBLE FOR US TO ANSWER QUESTIONS REGARDING THE APPROXIMATE RANGE OF EXPERIMENTERS' SETS.

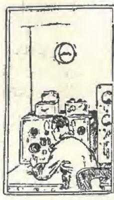
S. J. M. (Campsie). Q.: What is the best accumulator B battery for use with a four-valve set which can re-charged from a Tungar charger? A.: A "Dutho" 50-volt accumulator should be satisfactory. The cause of present battery failing to keep up after being charged is evidently due to the sediment accumulating at bottom of the cells and shorting the plates. Clean each cell out and fill with fresh acid. Unless you have a hydrometer, take the battery to a service station.

E. M. (Carlton, Vic.). Q.: Using crystal-valve circuit, Fig. 2, page 314, (Radio, No. 39), how can interference from "spark" stations be eliminated. A.: Use a coupled aerial circuit such as Fig. 4, page 315; although strength of signals may be slightly reduced this will be more than compensated for by freedom from intereference. The variable condenser in the aerial circuit should b a .001 mf. Q.: How is the capacity of a condenser calculated? A.: By the number and size of the plates. A 43-plate condenser is usually of .001 mf and a 23 plate .0005 mf. The capacity of a three-plate condenser would not be very high, it could be used as a vernier attachment.

B. H. (Rockdale). Q.: Is circuit (submitted) of valve receiver selective? A.: No. Use a .0005 mf. variable condenser across the plate coil. Variable connection for the B battery is shown connected to the A battery. The positive of the former, which is usually variable, should be connected to the 'phones and the negative to the positive of the A. Q.: What would be the most efficient dry cell valve? A.: Any standard English or American, such as DE3, UV199, WD12, DV3, or "WECO."

A. R. M. (Strathfield). Q.: Are connections of series-parallel switch correct (diagram submitted)? A.: No. Six studs only are required; see connections shown in "Two-valve Broadcast receiver," *Radio*, No. 38. Q.: Is 163 ft. aerial too long? A.: Yes; for the stations you desire to receive one of 100 ft., preferably single wire will be sufficient, but for amateurs working on the lower wave-lengths this should not be longer than about 50 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 ST100 circuit satisfactory? A.: Yes. Q.: Would aluminium well bushed be suitable for a panel? A.: No; use Radion or standard bakelite.

J. E. S. (South Kensington). Q.: When using the P1 with a stage of audio and an 11 plate condenser across the plate coil what is cause of "broad" tuning? A.: The condenser used is not large enough, use a .0005 mf. variable (23 plate); try also a .001 mf. variable aerial tuning condenser with a series-parallel switch. Q.: Would it be necessary to use a three-coil circuit? If so, please supply same, using detector and two audio. A.: Use the three-valve receiver, page 634, *Radio*, No. 43. Q.: Would



MOVEMENTS OF MARINE WIRELESS OFFICERS

FEBRUARY.

MR. J. E. CLEARY signed on s.s. *Suva* at Sydney, 12th.

Mr. G. Maxwell relieved Mr. T. V. Tressler on s.s. *Iron Chief* at Sydney, 12th.

Mr. L. E. Ternes signed off s.s. *Macedon* at Sydney, 12th, and relieved Mr. C. E. Robinson on s.s. *Junee* at Sydney, same date.

Mr. T. V. Tressler relieved Mr. W. P. D'Arcy on s.s. *Esperance Bay* as 2nd operator at Sydney, 13th.

Mr. R. O. Sexton signed on s.s. *Sussex* at Newcastle, 9th.

Mr. L. M. Tongs signed off s.s. *Boorara* at Melbourne, 3rd, and signed on s.s. *Carina* as 3rd operator at Melbourne 4th.

Mr. F. L. Stevens signed off s.s. *Katoomba* at Melbourne, 10th and signed on s.s. *Karoola* at Melbourne, 12th.

Mr. T. A. Jones signed on s.s. Katoomba at Melbourne, 10th.

Mr. L. C. Farnsworth signed off s.s. *Loongana* at Melbourne, 12th, and signed on s.s. *Oonah* at Melbourne, same date.

Mr. H. F. Hartley signed off s.s. *Levuka* at Sydney, 19th, and signed on s.s. *Wyreema* at Sydney, 20th.

Mr. F. L. Stevens signed off s.s. *Karoola* at Sydney, 19th, and signed on s.s. *Levuka* at Sydney, same date.

Mr. G. Pow signed on s.s. *Karoola* at Sydney, 19th.

Mr. C. F. Griffith signed off s.s. *Barunga* at Melbourne, 12th, and signed on s.s. *Aroona* at Melbourne, same date.

Mr. J. P. Banney signed off s.s. *Aroona* at Melbourne, 12th, and signed on s.s. *Barunga* at Melbourne, same date.

Mr. W. R. Baird signed off s.s. *Largs Bay* at Fremantle, 17th, and signed on s.s. *Centaur* as 2nd operator at Fremantle, same date.

Mr. F. B. Dunstall signed off s.s. *Centaur* at Fremantle, 17th, and signed on s.s. *Largs Bay* as second operator at Fremantle, same date.

Messrs. G. B. Fullwood, A. Trinscott and N. A. Parker signed off s.s. *Booral* as senior and 3rd operators respectively at Sydney, 23rd.

Mr. W. P. D'Arcy relieved Mr. T. V. Tressler on s.s. *Esperance Bay* as 2nd operator at Sydney, 23rd.

Mr. G. H. Tracey relieved Mr. L. E. Ternes on s.s. *Junee* at Newcastle, 25th.

Mr. L. E. Ternes relieved Mr. G. H. Tracey on s.s. *War Spray* at Newcastle, 25th.

Mr. A. B. Sharland signed off s.s *Boorara* as senior operator at Sydney, 24th, and signed on s.s. *Gilgai* at Sydney, same date.

Mr. A. S. Griffiths signed off s.s. *Aroona* at Sydney, 21st, and relieved Mr. S. Hamilton on s.s. *Mareeba* at Sydney, same date.

Mr. L. G. Curnock relieved Mr. N. M. Leeder on s.s. *Tarcoola* at Sydney, 25th.

Messrs. C. Gray and L. W. Moore signed on s.s. *Changsha* as 2nd and 3rd operators at Sydney, 25th.

an AP double filament valve be satisfactory with two De3's as amplifiers? A.: Use, preferably, De3's throughout. Q.: Why does receiver refuse to oscillate on low wave-lengths? A.: Using condenser and switch recommended you should have no difficulty; if unsuccessful, 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 long distance stations.

V. B. C. (Queanbeyan). Q.: Using the P1 and two stages of audio with potentiometer and grid bias battery, should satisfactory loud-speaker results be received from 2BL and 2FC situated 200 miles from Sydney? A.: Providing you use high grade apparatus and a good aerial, yes. It often depends upon the locality, many places being "dead," as far as some stations are concerned. Q.: Will this receiver require any modification to receive American and N.Z. stations? A.: We presume you refer to broadcasting stations, in which case you will probably get better results using the "Low Loss Tuner," *Radio*, No. 46.

J. W. N. (*Urana*). Q.: Advise cause of "whistling," using four-valve receiver (1 R.F. detector and two audio) circuit submitted. A.: Omitted to state ratio of second transformer which is probably cause of trouble. Use a grid leak on the detector valve and a potentiometer with the moving arm connected to earth, which will enable you to control oscillation. Q.: Explain cause of car battery heating up. Q.: See answer to *S.J.M.* The sediment may often be dislodged by shaking the cell after the acid has been removed and replaced by distilled water. If the deposit has settled down and become hard it can sometimes be released by completely filling the cell to the top with distilled water and leaving it inverted in a basin so that the paste falls as it becomes detached.

R. H. S. (Lake Macquarie). Q.: Using four-valve receiver (circuit submitted), what is cause of difficulty in receiving 2BL? A.: Omitted to state size of coils which should be primary 50, tuned anode 75, and reaction 50. A .001 mf. fixed condenser should be shunted across the 'phones. Q.: Adding another valve, would you advise audio or radio frequency? A.: For loud-speaker results from the stations mentioned the P1 with two stages of audio should be sufficient; three stages of audio are not recommended. Present receiver should give satisfactory results for all-round purposes. To add a further stage of radio, see circuit of five-valve receiver, *Radio*, No. 47.

W. E. H. (Longreach). Q.: Supply circuit for experimental transmitter. A.: See article on "Experimental C.W. Transmitters" published in *Radio*, No. 31, and "A Simple Valve Transmitter," *Radio*, No. 51.

F. R. R. (Noble Park). Q.: Using the P1, three-valve, receiver described previously, what is cause of "whistling" when receiver is touched? Q.: Use a lower ratio transformer in the second stage, preferably, 3½, or 4 to 1. You will probably find an improvement using a UV201A as detector and UV199's as amplifiers or, three UV201A's for working a loud-speaker. You have possibly overlooked error in circuit published, no connection being shown between the A and B batteries. Try mounting the valves on cushions as mentioned in "Microphonic Noises," *Radio*, No. 43.

C. E. D. (Broken Hill). Q.: Using valve receiver (circuit submitted), would you recommend adding a stage of radio for reception of 2BL, 3AR and 6WF? A.: Should you have difficulty in picking up these stations on your present receiver, use the long-distance receiver, *Radio*, No. 45. Q.: What size coils are necessary for receiving these stations? A.: 2BL and 3AR, primary, 50; secondary, 75; and reaction, 50; for 6WF, 150, 200 and 100 respectively. Q.: What is cause of filament of Marconi "R" 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 earth? A.: This is only used for transmitting purposes or when induction from lighting mains is experienced. Q.: Would a .001 condenser be better than either of those shown in circuit? A.: Yes, a .001 mf. fixed across the 'phones will be an improvement.

A. W. S. (Townsville). Q.: Is it possible to use a "Ford" spark coil as an I.C.W. transmitter? If so, please supply circuit and particulars. A.: Yes; see article on spark coil-valve transmitters, *Radio*, No. 11.

S. J. W. (Abbotsford). Q.: Using the five valve receiver, *Radio*, No. 47, what type of valves would you recommend? A.: As you have already installed six ohm rheostats you should use Marconi's "R's." UV101A's may be used; you will, however, require fixed resistances of 24 ohms in series with your present rheostats.

F. B. (Hines Hill). Q.: Recommend circuit of a two-valve receiver capable of receiving 2FC, 2BL, 3LO, and other eastern stations. A.: Use the two-valve, long-distance receiver, *Radio*, No. 45, if this is not satisfactory, and a stage of audio. Q.: What is the best time here for receiving KGO? 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. C. H. (Hawkes Bay). Q.: What type of "dull emitter" valves would you recommend for adding to my present two-valve receiver? A.: Either UV199, Marconi DE3, DV3, "Weco," or WD12 would give satisfactory results. Which ever you decide to employ, care should be taken to use the correct filament and plate voltages specified.

S. L. G. (East Brunswick). Q.: Using the five-valve receiver, *Radio*, No. 47, advise how to eliminate interference from 3LO. A.: Unless you have had previous experience with valve receivers use the three-valve receiver described on page 634, *Radio*, No. 46. You will find this very selective. Although two B batteries are specified, a tapped battery may be used. The jacks may be eliminated but are advisable for maximum efficiency. Any standard type of "dull emitter" valves may be used; see advertisements in this paper.

W. F. P. (Taree). Q.: Using a "Weco" valve, what should be the resistance of the filament rheostat? A.: Either six or 30 ohms. It should be noted when in full operation the filament glows dull 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.

"Static" (Trundle). 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. 10, and "Loop Aerials and Direction Finding," *Radio*, No. 33. Q.: Advise cause of trouble experienced with P1 receiver, *Radio*, No. 38. A.: Suggest your valve is faulty. Replace with another; if this does not overcome your trouble the fault, is apparently in your grid leak or condenser. Q.: Should aerial be connected to movable or stationary plates? A.: To avoid hand capacity effects, connect to fixed plates of condenser.

W. H. W. (Chatswood). Q.: Would a three-coil regenerative receiver be better than the P1? A.: No. Q.: Has a three-coil circuit any advantage over a two-coil? A.: The former is more selective; there would be, however, a slight decrease of signal strength when receiving long-distance stations. Q.: Is the "unit" system as efficient as a straight-out three-valve receiver? A.: No; the former generally necessitates using longer connections which decreases the efficiency. Q.: Can radio and audio frequency be added to the P1 or three-coil receiver? A.: Yes; see three-valve receiver, *Radio* No. 44. A two-valve receiver employing one stage radio (tuned anode) and detector was published in *Radio*, No. 45, a stage of audio may be added, if desired.

A. J. M. (Rockhampton). Q.: Supply particulars to make the new paper loud-speaker. A.: An article on "Loud-speakers with Paper Diaphragms" was published in *The Wireless World and Radio Review*, No. 275, obtainable at this office, price 6d.

G. P. (Sackville Reach). Q.: Re "Low Loss Tuners," *Radio*, No. 46, Fig. 2; what is number of turns required for the secondary? A.: 18.

C. J. W. (Willoughby). Q.: Give wiring diagram for adding a second stage of audio amplification to a crystal receiver. A.: Connect the primary of the second transformer in place of the present 'phone terminals with secondary connections, as in the first stage. Why not use a two-valve crystal reflex circuit, such as Fig. 5, *Radio*, No. 46, page 605? A second transformer will not then be needed.

R. R. L. (Balmain). Q.: Using the P1, 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, no 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 sponges, as described in "Microphonic Noises," *Radio*, No. 43.

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. 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 on loud-speaker? A.: Without a wiring diagram we are unable to state. If you are still unable to obtain satisfactory results, after the alterations suggested have been made, you will require a stage of Radio amplification. Q.: Is bare copper wire more efficient than insulated wire? A.: For panel wiring, use, preferably, No. 16 bare copper with spaghetti tubing for insulating where leads are liable to come in contact with each other. To obtain maximum efficiency, use jacks for plugging in on the second and third valve; this will assist you in ascertaining whether the fault is in the detector or amplifiers. Connections are shown in the three-valve receiver, page 634, *Radio*, No. 46.

W. N. (Guildford). Q.: Using three-valve receiver, page 634, *Radio*, No. 46, would using two Jefferson 4 : 1 transformers affect reception of distant stations? A.: Use either a 5 : 1 or 6 : 1 for the first stage, 4 : 1 or 3½ : 1 would be satisfactory for the second stage. Q.: What size coils should be used for reception of Melbourne, 7ZL and 6WF? A.: For 3LO: primary, 150; secondary, 250; and reaction, 100. For 7ZL, same as for 2BL. For 6WF, same as 2FC. Q.: Should four dry cells be used for filaments of DV3 valves? A.: Three dry cells will be sufficient. Q.: What is cause of "crackling" noise experienced when receiving 2BL? A.: Evidently using too high plate voltage. For the valves mentioned, used 16-22 for the detector, and 60-120 for the amplifiers.

C. J. W. (Yass). Q.: Using the 60-600 metre receiver, *Radio*, No. 45, can R.F. choke be dispensed with? A.: No. Q.: Can this receiver be used for reception between 40 and 200 metres? A.: Use preferably the two-valve portable receiver, *Radio*, No. 50. Q.: Will a Mullard "Ora" as detector and two Cossor valves as amplifiers be satisfactory? A.: Yes. Q.: Will a 4½ volt dry cell be satisfactory for the C battery? A.: No, use two or three dry cells which will enable you to vary the voltage for best results. This will have to be found by experiment. Q.: Would the "Low Loss Tuner," *Radio*, No. 46, with two stages of audio, give as good results as the 60-600 metre tuner? A.: This depends upon the wave-lengths over which you desire to receive; both are designed for different wave-length ranges.

E. B. (Bexley). Q.: Would Ediswan AR06 valves be satisfactory for the P1, three-valve, receiver, *Radio*, No. 40? A.: These are not recommended as amplifiers. Q.: Could a three-volt 30 amp accumulator be used for filaments of these valves? A.: No, use dry cells.

W. L. G. (Newtown). Q.: Using loose coupler and one stage amplifier, *Radio*, No. 37, what is cause of continuous "hum" in 'phones? 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.: Evidently grid leak or condenser at fault. Make sure correct filament and plate voltages are used with valve as specified by the makers.

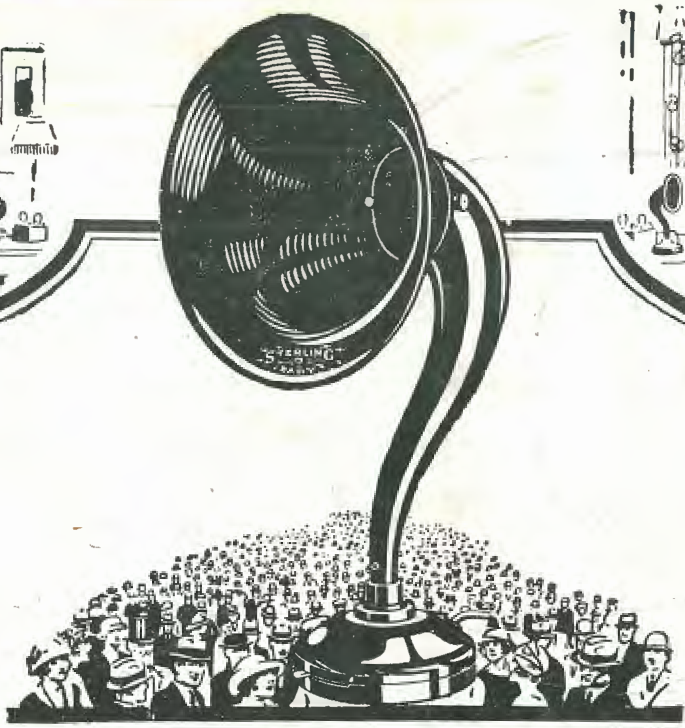
R. C. L. (South Perth). Q.: Is it possible to use an extra stage of radio amplification in a single valve reflex circuit? A.: No. A valve may be used as both a radio and audio frequency amplifier, see Fig. 4, page 315, *Radio*, No. 39.

K. B. S. (Sandringham). Q.: Can secondaries of audio transformers be used as choke coils in a two stage amplifier? Is this method advisable? A.: Yes; it is not, however, recommended, as it is practically impossible to obtain a potential step-up between valves, as is the case with the transformer, whilst it has all the disadvantages of iron core L.F. coupling devices.

z2AC WORKS INDO-CHINA.

MR. IVAN O'MEARA, of z2AC, Gisborne, has been "lying low" for quite awhile, except for one or two small matters (!), such as getting his signals aboard the airship *Shenandoah* while she was cruising over the Great Lakes.

It appeared as though he wearied of two-way communication with North and South America, and, like Alexander of old, yearned for fresh worlds to conquer. So while all eyes (and ears) were turned towards Great Britain and America, 2AC quietly started a "yarn" with a wireless man 'way up in French Indo-China. M. Fournier, of the French Government station HVA, at Hanoi, Tonkin, was his fellow-conspirator, and it is stated that the two communicated in Morse for a considerable time from 1.45 a.m. onwards and until dawn brought about a fading of the signals. M. Fournier's station used a power of about 80 watts on a wave-length of 90 metres.



Printed by Shipping Newspapers, Ltd., 16 Bond Street, Sydney, and published for the Proprietors by Sydney Ernest Tatham, 97 Clarence Street, Sydney, N.S.W.