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SIXPENCE

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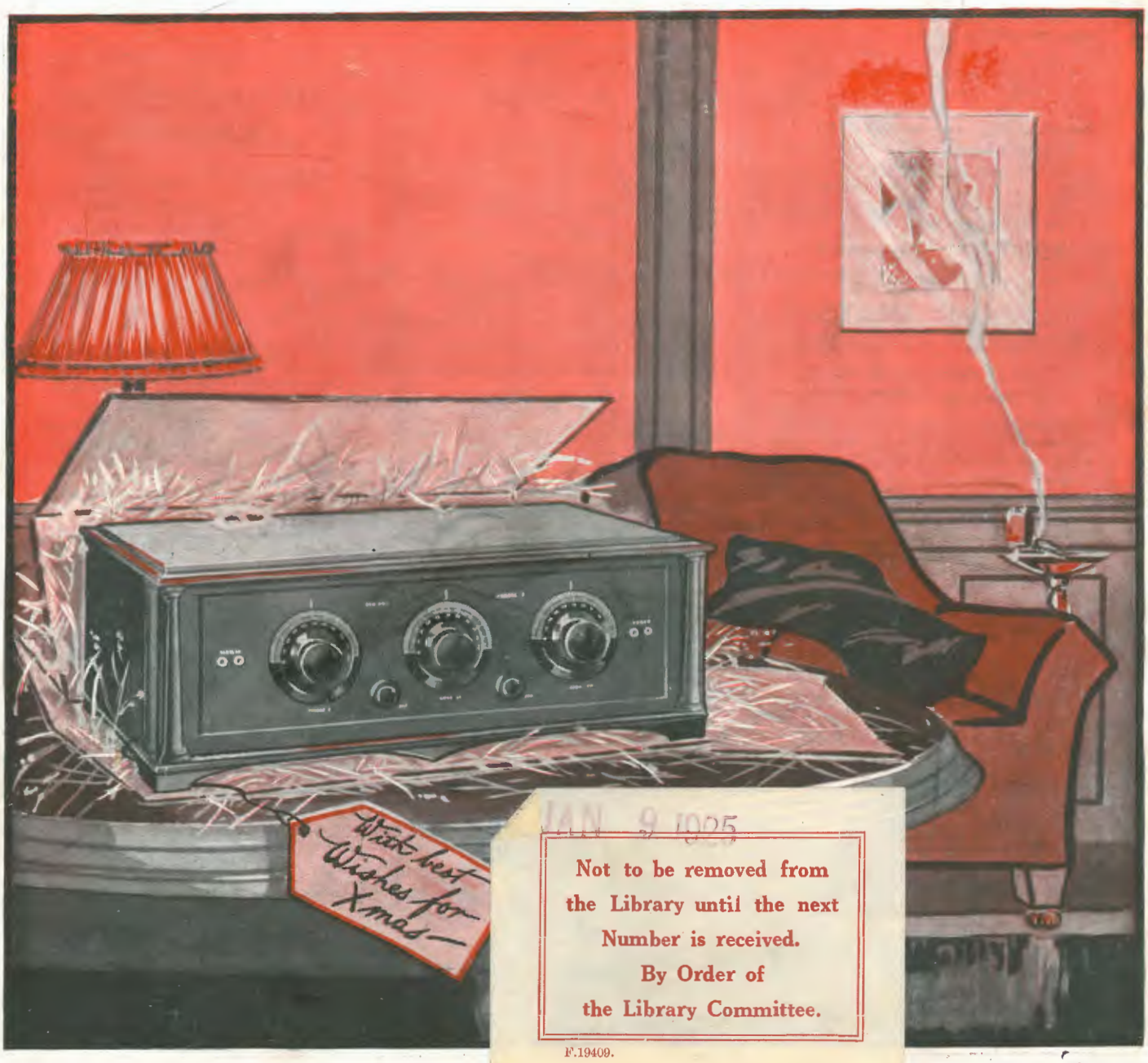

MAKE THIS A RADIO CHRISTMAS!

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

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Vale 1924—Salve 1925

IN the past this magazine has more or less successfully strived to make its "editorials" as novel in treatment and subject-matter as possible. It has been considered that "leading articles," as they are most generally written to-day, are a rather *un*-necessary evil, but as this evil still does exist, although, no doubt, before long, as he can see who would read the writing on the wall, they will become, to quote a misguided genius, "as dead as the dado," there is no reason why they should not be made pleasant during their declining days by making the type of matter as delightful to read and—let it be said—as pleasurable to write, as possible. To fulfil these requirements it is considered that *Radio's* Radiotorials should be a little "different." Usually, they are: But with the Radiotorial of the Christmas issue it is another matter—quite another matter.

AS Yuletide is a season when one looks back and thinks of, and, perhaps, regrets the things one did or might have done, and then, looking to the future, forms those inevitable New Year resolutions and plans—few of which, alas! will ever be carried out—so it is with the Radiotorial of the "Good Cheer" issue. One simply must pause a moment, draw breath, review the past and re-adjust one's sights on the target of the future.

IT is safe to say that hardly will there be published a holiday issue of any periodical in this Continent which will not contain a "leader," the theme of which will be in the nature of that outlined above. On this occasion, at least, the Radiotorial of the Christmas issue of *Radio in Australia and New Zealand* will be in no way different to those appearing in other Australasian journals.

NO other publications in Australia, do they concern sport, the stage, Labour questions, the film business, financial matters, primary products or other interests or callings, can look back on such a year as this closing one has been for Wireless.

SEASON'S GREETINGS.

The Proprietors, Editor and Staff of "RADIO" extend their best wishes to all readers for a Merry Christmas and a bright and prosperous New Year.

IT is not intended to here recapitulate the triumphs of 1924; they are too fresh in our minds and so numerous that space precludes. Nor is it necessary to emphasise the proportions to which the general trade and the public interests have grown in contradistinction to the way they grew in 1923—the veriest schoolboy can realise that. What can be done, however, is to take the year as a whole and utilise the knowledge and experience gained from it for the betterment of the coming one.

WHILE on the subject, it might be as well as to state that Wireless should always be taken as a whole and a little less should be said concerning individual effort.

WIRELESS *is* a whole, and only by keeping this fact in mind can it make the swift and phenomenal progress that is its lawful right. Broadcasting, broadcast listening, experimental Wireless, both amateur and commercial, and all the other branches of the industry can be likened to those grotesquely fretsawed segments of wood which we in our youth used to spend many absorbed hours in putting together, so as to evolve a wooden ball which, once completed, we could roll about to our heart's content. If a segment were inserted in its wrong place, a portion of it would protrude from the sphere and this would retard or even stop its progress.

SUCH a simile illustrates the state of Wireless to-day. As long as various parts or interests fit properly together, the ball will roll on as fast as we can push it. Let there be friction or lack of co-operation and the rate of progress will be hindered or even stopped. This would be unthinkable.

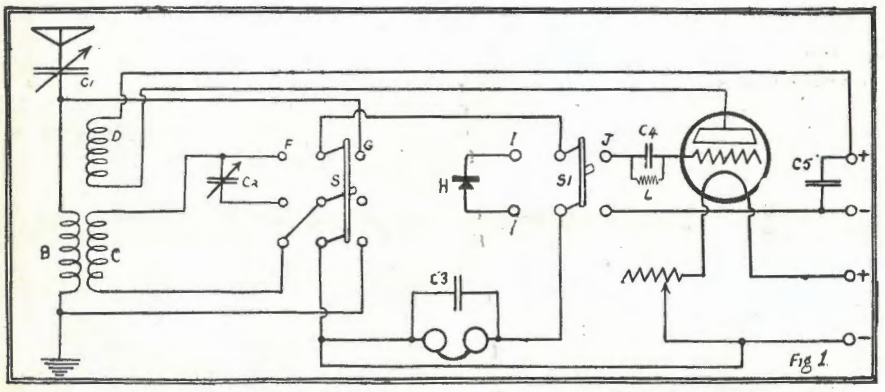
CO-OPERATION is the big secret of progress. Let us, then, at this time of "Peace on earth and goodwill toward men," adapt the spirit of Co-operation as our settled policy in all affairs affecting the progress of Wireless.

Crystal-Valve Circuits

Employing Switches for changing a Crystal to a Valve Receiver or vice versa

IN this, our Christmas issue, we publish several circuits of general interest to all broadcast listeners and of particular interest to many.

No doubt, a great number of listeners-in who have, with their modest crystal sets, enjoyed broadcasted programmes for months past, will be requiring a valve set for Christmas, or a valve that can be added to their present apparatus.



Wiring diagram of Crystal and Valve Combination Panel. Details are as follows: C1, Aerial Tuning Condenser; C2, Secondary Condenser of Crystal Circuit; C3 'Phone Condenser; C4, Grid Condenser; C5, High Tension Battery By-pass Condenser; B, Aerial Coil; C, Crystal Circuit Secondary Coil; D, Valve Regenerative Coil; S and S1, Change-over Switches; L, Grid Leak.

Having secured one, the necessary steps should be taken to protect it, as it is known the cost of a piece of crystal is about one shilling, but a valve—well, if one has been unfortunate enough to short one's high tension battery across the filament—one knows what valves cost.

How many experimenters and listeners-in have returned home at night to find that their pet valve—"the best valve in Sydney"—has been burned-out, owing to Master or Miss Inexperience endeavouring to tune-in the midday time signals or afternoon musical session? Quite a number (ourselves included).

Hours and hours of explanation and pools of tears will not replace that particular valve—because it was "the best valve in Sydney."

But we must not blame Master or Miss Inexperience. We are the only ones to blame through not having a switch in circuit that would enable the children to listen-in if they wished to do so, without damaging our receiver.

It is quite a simple matter to add a switch or two and then the fears of burned-out valves will be allayed.

Fig. 1 shows the wiring and switching arrangement for a crystal-valve combination panel. C1 is the aerial tuning condenser and B the aerial coil. By carefully following the diagram it will be seen, when the switch S is in the position marked F, and switch S1 in the position marked I, we have a complete inductively coupled crystal receiver, which will give results equally good as any other receiver of the loose-coupled type.

Those who are using a carborundum crystal should experience no more trouble changing over to the switching arrangement, than the users of non-potentially operated crystals, such as Galena. If carborundum crystal is at present being used, connect the potentiometer, battery and crystal between points I in place of H.

Fig. 2 is a diagram of the complete crystal circuit when switches S and S1 are in the positions F, and I, respectively. When it is desired to use the valve instead of the crystal, the only change necessary is to throw switch S over the position G and S1 to J. This connects the aerial to a single valve regenerative set and, after the usual filament and anode battery adjustments are made, the valve receiver is in operation.

It will be noticed in Fig. 1 that a separate coil C is used for the crystal, "B" the aerial coil being common to both the secondary coil C of the crystal circuit and reaction coil D of the valve circuit.

Fig. 3 is a diagram of the single valve regenerative receiver which is connected in circuit when the switches S and S1 are placed in positions G and J respectively.

The coils for use with this receiver are of the usual honeycomb type and the necessary sizes for the various wave-lengths may be selected from the tables published in past issues of *Radio*. The aerial tuning condenser C1 is variable and has a capacity of .001 mfd., whilst the variable condenser C2 used in conjunction with the crystal circuit has a capacity of .0003

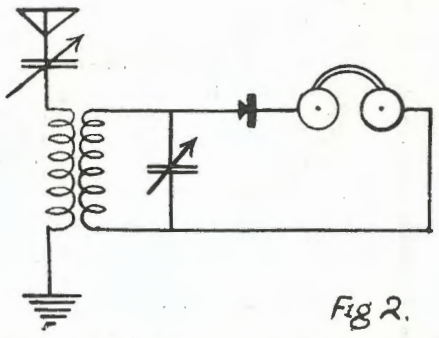


Diagram of Loose-coupled Receiver employed when switches S and S1 are in positions F and I respectively.

mfd. C3, the telephone fixed condenser, has a value of .001 mfd, the grid condenser C4, .0003 mfd. fixed capacity and C5, a by-pass fixed condenser of 1mfd., the latter being included in the circuit as a path for oscillating currents, which would be, if the condenser were not inserted,

considerably damped by the resistance of the H.T. battery. The grid leak L has a variable resistance of 2 to 5 megohms, and the filament a resistance that will vary according to the make of valve in use.

We feel sure a great number of readers will be pleased with the wiring diagram of this arrangement, as many have asked for a wiring sketch for a panel of similar design.

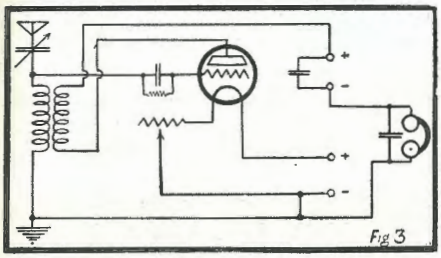
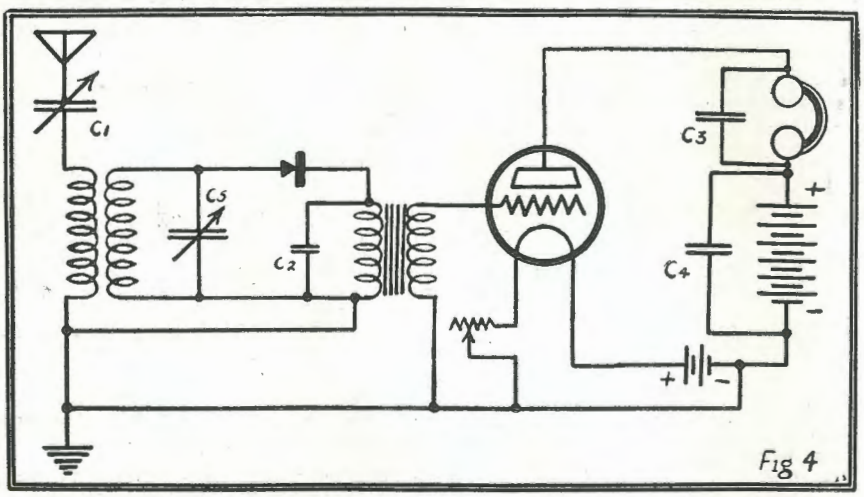


Diagram of Single Valve Regenerative Receiver connected to the aerial when switches S and S1 are in positions G and J respectively.

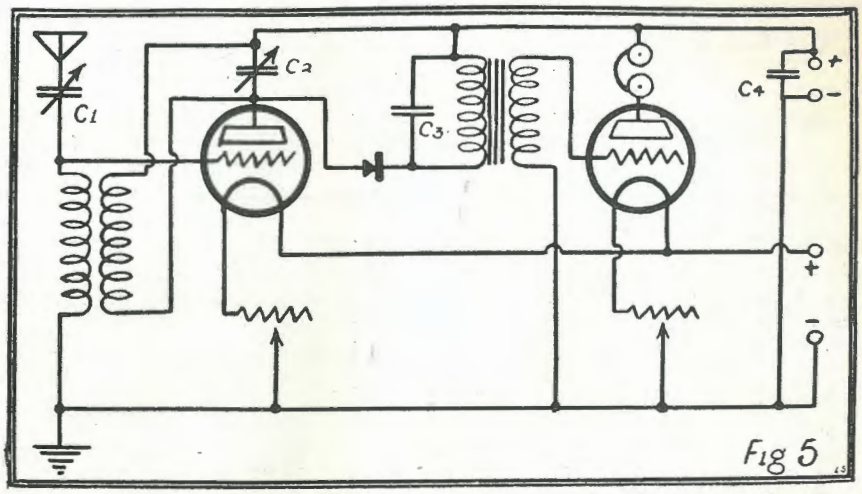
It is possible there are others who do not wish to discard an old friend —the loose-coupler, which has never given any trouble and always brought in good, clear, distortionless signals: There is really no need to do so; one can add a valve to the present set and decidedly stronger signals will be the result. This can be done at a very small cost.

Fig. 4 is a diagram of an ordinary loose-coupler, connected by means of a one to three ratio low frequency transformer to a single valve circuit. It will be found that this receiver is easy to construct and stable and simple to operate. However, particular care should be taken when joining the transformer in circuit, to see that the input secondary lead is taken to the negative lead of the A battery and not to that of the filament.

As the filament resistance is in the negative lead, the case in most circuits, it will be readily seen, that by connecting the IS (input secondary) lead to the negative of the filament a resistance of anything up to 40 ohms is connected in series with the transformer secondary and a varying negative potential is applied to the grid. But should the lead be taken direct to the negative of the A battery, the resistance of the circuit is reduced and the grid receives a non-varying negative bias.



Wiring diagram of a Loose-coupled Receiving Set with one stage of Transformer-coupled Audio Frequency Amplification.



Wiring diagram of a combined Crystal and Two-valve Receiver, using first valve as a Radio Frequency Amplifier, adopting the Tuned Anode method and a Crystal Detector, with one stage of Audio Frequency Amplification.

The values of the various condensers in this circuit are similar to those of Fig. 1: C1 is varable and has a capacity of .001 mfd.; C2, fixed, .001 mfd.; C3, fixed, .001 mfd.; C4, fixed, 1 mfd., and C5, .0003 mfd. variable. As in the other circuits, the value of the filament resistance will depend upon the type of valve used.

Fig. 5 is a diagram of a two-valve and a crystal combination, using one valve for radio frequency amplification, a crystal detector and the second valve as an audio frequency amplifier.

The radio frequency amplification in this circuit is of the tuned anode method, and as tuned anode was dealt with in the last issue of *Radio* (No. 45), it will not be necessary to deal

(*Continued on page* 618.)

Low Loss Tuners

By S. KRUSE.
Technical Editor of "Q.S.T."
(Reprinted from "Q.S.T.")

WE have lately received so many communications from our readers asking for details and particulars of a good Low Loss Receiver, that it has been decided to re-publish the article below which is reprinted from "QST," and has already appeared in "Radio."

WE can thoroughly recommend this receiver, as we have received scores of letters from highly satisfied experimenters who built it on the first occasion and they invariably state that the results they achieved were far beyond their most optimistic expectations.

THERE has developed a most remarkable amount of interest in the design of good tuners lately, but the past few years most of us have been using very, very poor tuners—and most of us would not even believe that they were poor.

WHAT IS A GOOD TUNER?

Let use decide at the start what a good tuner must do—then we can start thinking of the ways to make it do those things. Very well, a good tuner must—

1. Cover the right wave-length range; 2. tune sharply; that is, cut out unwanted signals; 3. be simple and have few controls; 4. not send out a strong carrier wave when receiving C.W. with an oscillating tube; 5. be absolutely reliable, so that the same dial settings will give the same result every time; 6. be low-priced and easy to build.

These are six things that we are going to demand of our tuner. We will now think them over, but at the start I will tell you that, when we are done with requirements No. 1 and No. 2, we will automatically have taken care of the rest.

WAVE-LENGTH RANGE.

The average broadcast receiver fits the broadcast waves. The average amateur tuner is a joke that starts at 180 or 190 metres and goes up (not down) to 700 metres or so. Recently I found that one of the strongest amateur stations in Illinois for years had been using a tuner that would not go below 195 metres; the Heavens know what its upper limit was! Yet the owner of this thing was sure that "the short waves are no good—they never get to us!"

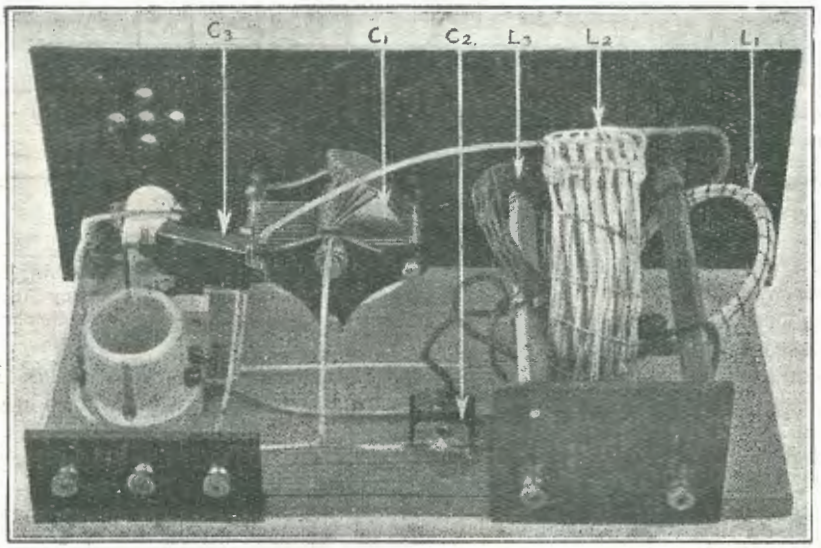


Fig. 1.

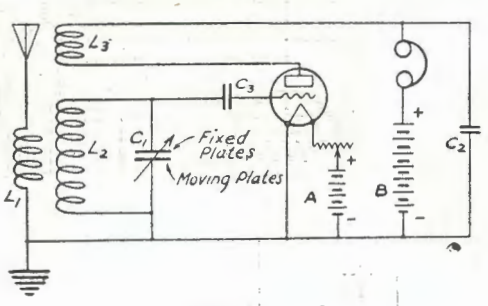


Fig. 2.

A BEAUTIFULLY SIMPLE COUPLER, BUILT BY PERRY O. BRIGGS AND USED AT 1BGF (U.S.A.).

Note the special shape of the condenser plates, suggested by Mr. Hassel; and also the low-resistance secondary coil. This rig has defeated and replaced several expensive tuners.

L1—Primary coil, six turns of No. 12 D.C.C. wire wound on 3in. tube and then tied together with thread to make it self-supporting. The coil is secured to a shaft, so that the coupling to the secondary can be varied by tilting the primary coil.

L2—Secondary coil, basket wound around 14 steel wire pegs set into a board on a 4½in. circle. The coil looks as if the wires are twisted together but this is not correct; the winding is made by passing the No. 12 D.C.C. wire outside of one peg and then inside of two as shown in the small sketch. The wire pegs are 3/32in. Before removing the winding from them the turns are secured with waxed thread.

L3—Tickler coil, 12 turns No. 18 bell wire wound on 14 pegs set in 2⅞in. circle. This coil is hinged also, being tilted by the tickler shaft.

C1—THE ONLY TUNING CONTROL. Fada variable condenser originally having capacity of 500 micromicrofarads (.0005 mf.), but with moving plates cut as suggested by Hassel.

C2—Fixed mica condenser, capacity 1,000 micromicrofarads, or .001 microfarads.

C3—Dubilier grid condenser—no leak used.

Wave-length range with the windings shown is 95-370 metres covering all amateurs and most broadcasting. To raise the range to cover all broadcasts increase the turns in L2 to about 40; the exact number needed will vary, as basket-wound coils cannot be made uniform by hand when using heavy wire. At the same time, it may be necessary to increase the number of tickler turns slightly to make the tube regenerate well on the uppr waves.

Why is this? Partly it is a "hang-over" from the times when amateurs had a 375 metre special wave-length, and partly it is just plain carlessness.

The effect of over-large coils and condensers is a very bad one. Not only are all short-wave stations tuned in at the bottom of the condenser scale but the extra hardware introduces needless resistance. Note that in the tuners pictured in this article the range does not go above what is actually needed.

If you don't want to make a new tuner then peel some of the extra wire off your coil and get rid of the extra condenser plates, until the wave-metre tells you that you are just reaching up to 220 metres—then you can get down to 100 without trouble.

RESISTANCE AND SHARP TUNING.

A high resistance circuit will not tune sharply. There are no exceptions to this rule—a high resistance circuit *will not tune sharply*. Put that down as rule A—the first commandment in making any tuner that will be worth using. Just to get it down good and solid, let's say it once more, in capitals—A HIGH RESISTANCE CIRCUIT WILL NOT TUNE SHARPLY!!

Both amateur and commercial tuner-makers seem to be having an awful time in learning to believe that simple fact. They do all manner of weird things to get around it, they add more tubes, put in needless controls, invent curious circuits, and very rarely do the simple and sensible thing they should have started with—cut down the resistance of the tuned circuit. But interference increases all the time and even the slowest are now admitting that we must have sharper tuners. And quite a few are beginning to admit that the way to make sharper tuners is to use the same old circuits with lower resistances.

WHAT CAUSES THE RESISTANCE?

Before one can cut down resistances one has to know where they come from. One can divide the resistances that occur in a tuned receiving circuit into four general classes: the coil resistance, the condenser resistance, the resistance caused by things connected to the tuned circuit, and the resistance that is "coupled into the circuit."

COIL RESISTANCE.

About the worst defect of most tuners lies in the high resistance of the coils used. This resistance is not generally in the wire, at least not in the cases where wire larger than No. 16 A.W.G. (B. & S.) is used. The resistance is in the things that are near the wire—the tube on which the wire is wound, the varnish with which the coil is painted, sometimes even the insulation of the wire itself. A perfect coil would be one wound on air and insulated with air. We can't make such a thing but we can come pretty close to it by using wedge-shaped strips, as shown in the Reinartz-type tuner of Fig. 4, or by making "basket" coils, as shown in the other two tuners. If you absolutely must wind the wire right on a tube, then at least follow the methods given by Mr. Hassel's article (*QST* for December); they are very much worth while. Above all things, avoid heavy varnishes, stranded or "Litz"

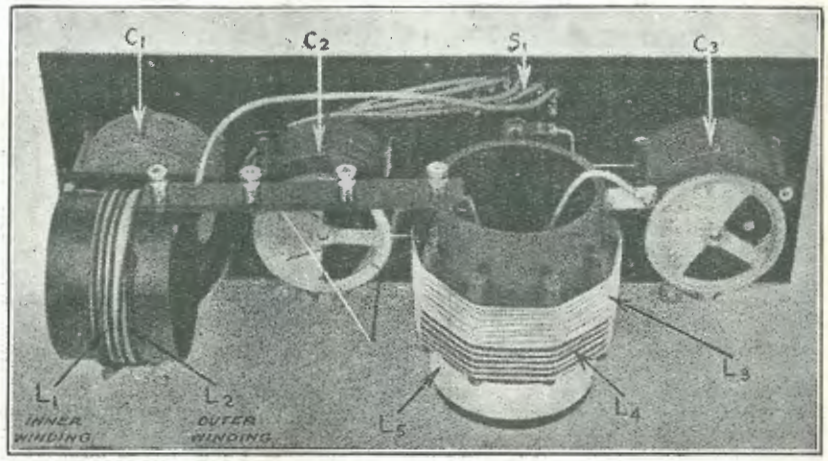


Fig. 4.

Fig. 5.

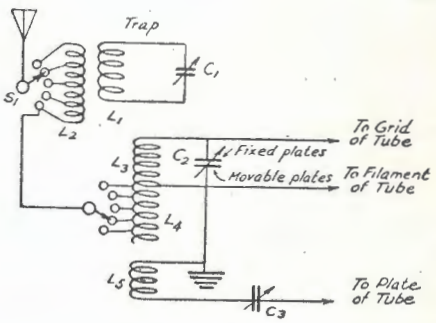


Fig. 6.

A CAREFULLY DESIGNED REINARTZ-TYPE TUNER BUILT BY BOYD PHELPS AND USED AT 1HX—10A—1XAQ (U.S.A.).

A WAVE TRAP IS BUILT INTO THIS TUNER.

L1—Secondary of the wave trap. Thirteen turns of No. 16 D.C.C. wound on a 3⅝in. tube.

L2—Primary of the wave trap. Five turns of light single-conductor lamp cord wound directly over L1 and tapped at each turn to the upper switch on the panel. This switch changes the coupling of the trap to the antenna, or cuts the trap out when it is not wanted.

L3—12-turn secondary coil, wound of No. 16 D.C.C. wire over wedge-shaped wooden strips ¾in. high. These strips rest on the surface of a bakelite tube 3⅝in. in diameter. The turns of this coil are slightly spaced.

L4—Five-turn primary coil, wound of the same piece of wire as L3. Turns are spaced so that taps can be taken easily to the lower switch on the panel. This switch does NOT tune but adjusts the antenna coupling.

L5—Plate coil. Eighteen turns of No. 16 D.C.C. wire wound closely on the bakelite tube ½in. below the primary.

C1—Trap-tuning condenser. 1,000 micromicrofarads (.001 microfarads).

C2 and C3—General Radio type 247 panel-mounting condensers with geared verniers. Capacity, 500 micromicrofarads (.0005 microfarads).

Wave-length range with the windings shown is 90-225 metres, no secondary taps being needed for the amateur range. The tuning is practically unchanged with different antennas. Wave-length range of the trap is from 80 to 310 metres, allowing it to cut out troublesome 300 metres sparks such as NAO. To change this tuner to fit the broadcast range, increase the turns of the secondary coil L3 to about 40. Increase the turns of the trap coil L1 to about 30.

wires, and soldering pastes. Use good heavy solid wires, tie them into place mechanically, instead of pasting them down, use resin for soldering, and keep the coils at least two inches clear of all other parts of the set—panels, condensers and rheostats included.

TAPS FROM COILS.

Tapped coils in the tuned circuit are always poor business; only careful engineering will enable you to avoid trouble. Try to cover the wavelength range with a single coil and if you do not succeed use a separate loading coil, not too close to the main coil.

CONDENSER RESISTANCE.

As long as one uses a poor coil (like those of most tuners) it does not make much difference whether the variable condenser is good or bad. But as soon as one uses a really good coil, there is a big difference between a not-very-good condenser and a really good one. This difference does not show up as a great increase on strong signals but in the form of a lot of new signals that were never heard before. In one particular case we found that we could read 6PL very nicely with a single tube when using a good condenser (a Cardwell in this particular test) but could barely hear him with a condenser having thick moulded composition ends. A General Radio 247 condenser gave about the same results as the Cardwell, while it was entirely impossible to hear the signals when using a fibre-insulated condenser.

WHAT MAKES A GOOD CONDENSER?

It is rather hard to set down air-tight rules for recognizing a good condenser by looking at it. In general a good variable condenser is of the air type and is built so that leakage must go through long paths in material that is not too thick or wide. In the case of condensers with end-plates this means that the stator bolts should be far from the rotor bearing and that the end plates should be as thin as possible. Where

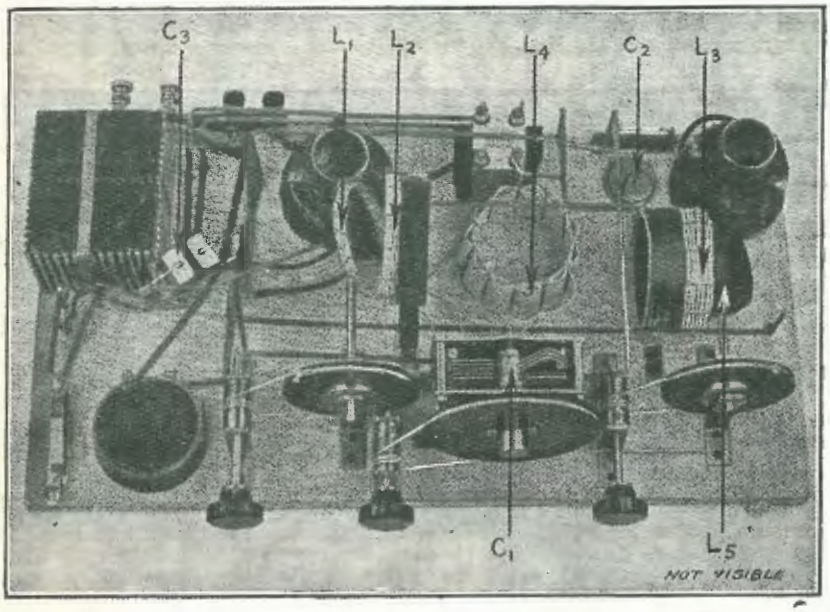


Fig. 7.

A RADICALLY DIFFERENT LOW-LOSS COUPLER BUILT BY F. H. SCHNELL AND USED AT 1MO—1BHW—1XW (U.S.A.).

L1—Antenna coil, five turns, 2½in. diameter wound and mounted as in 1BGF tuner.

L2—First section of secondary, six turns, No. 16 D.C.C. wire, basket-wound as shown below, diameter 3¼in.

L3—Second section of secondary, 12 turns wound same as L2.

L4—Secondary loading coil, 30 turns, wound like L2 and L3. Other positions for this loading coil were tried but it disturbs the tickler action if not cut in where indicated. A really satisfactory switching system has not been found; still the results are excellent over the entire range.

L5—Tickler coil, 11 turns No. 28 D.C.C., 2½in. diameter, arranged to be turned by tickler shaft.

C1—Allen D. Caldwell, condenser, three rotary, four stationary plates, capacity about .0002 microfarads.

C2—Grid Condenser mica, capacity, 1,000 micro-microfarads (.001 microfarads).

C3—Mica by-pass condenser, capacity .001 microfarads.

Ratio of belted verniers is 6¼:1 on the secondary tuning condenser, but 4¼:1 on the tickler and the primary coil.

The two-part secondary completely avoids interaction between the tickler and the antenna-coupling.

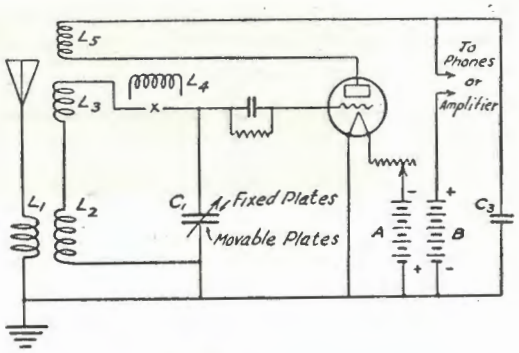


Fig. 8.

Either one of them can be moved without causing the note to slide around, as is the annoying habit of ordinary tuners.

The grid leak has a resistance of four megohms as a UV201A tube is used. Short wave range 63 to 123 metres; long wave range, 113 to 227 metres. For broadcast range, L2 should have 12 turns; L3, 20 turns; L5, 22 turns; and C1 a capacity of .0005 microfarads. Other values and dimensions unchanged.

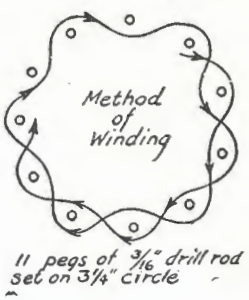


Fig. 9.

If there are components in your receiving set that need renewal, buy them now and make sure that you will hear everything that is on the air during the Christmas holidays. It will be worth it.

insulating bushing are used they should be large and be turned spool-shaped (as in the large Coto-coil condenser) so that only the rims will touch. Naturally the use of thin insulating washers or small diameter bushings will result in a poor condenser; it will have high resistance and the zero capacity will be high. In any case, the insulating material must be good—black fibre and low-grade compositions are never good, while hard rubber or Pyrex glass can always be trusted. Moulded bakelite is also good, if carefully used, but sheet bakelite does not seem to show up quite as well, although much superior to fibre and compositons.

MEASURED RESISTANCES.

Different manufacturers measure their condenser resistances at all sorts of frequencies—the result being that no one knows anything. When writing to a maker, ask what the resistance is at 1000 cycles, a convenient value which ought to be standard. A 500 micromicrofarad (.0005 mf.) condenser, set at full capacity, should not have a resistance of over 60 ohms at 1000 cycles: a really excellent condenser will not have resistance of more than 20 or 25 ohms at 1000 cycles; assuming the same capacity.

MOUNTING THE CONDENSER.

Always connect the condenser so that the wire to the grid-leak and grid condenser comes from the stationary plates, and the wire to the filament comes from the rotary plates. It is then possible to tune in signals without trouble from "hand capacity," one of the most exasperating things in radio. This connection puts the stationary plates at high voltage, hence the screws that hold the condenser to the panel must not connect to the stationary plates. If they do, get a different condenser. Do not, however, make the mistake of throwing out a condenser, just because it has metal end plates. This construction is perfectly O.K. as long as the metal end plate is not connected to the stationary plates.

RESISTANCES "CONNECTED INTO" THE CIRCUIT.

We have finished when we have made a good coil, mounted it carefully, and connected it to a good variable condenser. The whole affair can be ruined by connecting in a "moulded mud" socket or a camswitch of poor construction. In general, stick to the idea of not having any switches at all in the tuned circuit—it is a bad practice. Avoid composition sockets—they save 6d. and ruin the tuner. Get a good socket that is made of porcelain, hard rubber or moulded bakelite. If you are in doubt as to your socket, write to the maker and ask him what the material is.

When running leads from the "high" side of the coil to the stationary plates of the condenser, and from there to the tube, run them up in the air. Nine times out of ten it makes no difference at all, but make sure.

RESISTANCE "COUPLED INTO" THE CIRCUIT.

When one is finished assembling a good coil, a good condenser and a good socket into a tuned circuit, the whole result can be entirely ruined by too-close coupling to another circuit which has high resistance. Now an antenna circuit always has resistance that is very high; as a usual thing the resistance is 10 or more times that of a good circuit such as the one suggested. Naturally, it will spoil our beautiful secondary to couple closely to such a bad circuit—the signals will be louder but the sharpness of tuning will be entirely spoiled. The closest possible coupling is that obtained in a single circuit tuner—which is enough to account for the well-known broad tuning of that ancient circuit.

There are still other ways of coupling resistance into a circuit; any piece of metal placed near a coil will raise the resistance, so will any large piece of insulating material. Therefore, keep the coils well in the clear as stated before.

SHIELDING THE CABINETS.

Several experimenters complain that their sets do not work as well when in the cabinets as when outside. This simply means that the cabinets fit too closely—they violate the rule that coils must be kept in the clear.

Shielding around the shafts is usually worse than needless—it raises the resistance of the tuned circuits and it is quite needless if the tuner was properly designed. Where the purpose of shielding is to keep out static and such noises the cabinet should be made very large and lined with sheet copper, all parts of this lining being kept at least two inches from the tuner coils.

CUTTING DOWN RESISTANCE BY REGENERATION.

We are told by text books that regeneration has the effect of reducing the resistance of a poor input circuit. Ballantine does not agree with this and says (page 209, 1st edition) "The fact that the tickler coupling, or rather the feed-back energy, does not compensate for the actual resistance of the grid circuit, at least so far as signal response is concerned..... is also shown by the several curves, representing the effects of various inserted resistances in the tuned grid circuit."

Those who are interested in the theory of the matter may look up Ballantine's Fig. 117. It is only necesseary to say that some dozens of us have experimentally checked Ballantine's statement and find that in practice he is entirely correct—regeneration does not make a poor secondary into a good one. The signal strength can be brought up by regeneration but it will never be as high as with a good secondary. Neither will the tuning ever be as sharp as if we had started with a low-resistance secondary; and, finally, the good secondary will bring into audibility some stations that cannot be heard with the poor secondary. These statements are, of course, beyond doubt when operating non-regenerative, but I am insisting that they are also true when operating regenerative and when operating with the tube oscillating.

About the worst form of the "compensation - of - resistance - by-regeneration" idea is the business of attempting to turn the antenna itself into a low-resistance circuit by regenerating into it. In the first place, the desired result does not take place—the thing never tunes sharply—and in addition there is sent out a carrier wave that makes life miserable for a five-mile radius, around, for anyone who happens to listen on the same wave-length.

(*Continued on page* 617.)

One-Tube Circuits

ANALYSIS of the Copp, Kauffman, Reinartz, Ambassador, Haynes, and other regenerative circuits, using honeycomb, spiderweb and other lattice-wound, as well as tube-wound coils.

(Reprinted by courtesy of "The Wireless Age.")

By JOHN R. MEAGHER.

WE have selected a topic "near and dear" to a vast number of broadcast listeners; the much talked-of and little-understood subject of single-valve regenerative receiving circuits.

What immediately comes to mind when we say "single valve circuits"? Why, of course; all the numberless circuits that have appeared in radio papers. We have the Copp, the Kauffman, the Reinartz, the Ambassador, the Haynes, single, double and triple circuits of all kinds, the British aircraft, the honeycomb, the spider web, the variometer-variocoupler: and so on, without end.

There is no reason why each should not have its distinctive name and yet, as they are all like, it is not correct to say they are different from each other.

It has been said that one regenerative circuit should work as well as any other regenerative circuit, provided the design of each is equally good. Many readers accepted such a statement without a word, others doubted it and some thought it to be wrong. Among our own acquaintances in the radio field we do not know of a single person who would agree enthusiastically to the correctness of the statement. And yet now, in reaffirmation, we say that of all these circuits not one differs from the standard regenerator; even more, we say there is only one basic circuit and that all the others may be reduced to that simple one. (Shown in Fig. 1.). Let us look into the matter.

Simple tuning circuits first: In Figures A, B and C we have three tuning arrangements that look as though they were different. We can substitute B for A or A for B and, with proper design, cover the same wave-length range. The efficiency of one compared to the other depends upon the design; we are not concerned with that here. We point out merely that in effect A and B are alike. Now C is the same as B. To be sure, the shunt capacity across the coil is made of two condensers in series, and a resistance R as indicated, but the condenser across the coil in B could be represented with its equivalent resistance in series, thus taking care of R. If the condensers VC and C in C are designed properly, they, in combination with the coil in C, will cover the same wave-length range as the arrangement shown at B. Thus C and B are alike, but A and B are also alike, so A, B and C are similar to each other. (C is meant to represent a single circuit aerial system with a shunt variable condenser VC; the antenna resistance is represented at R and the antenna-ground capacity at C.)

The fact that the relative efficiencies may be different, as stated above, should permit one to be sufficiently broadminded to accept the similarity of A, B. and C.

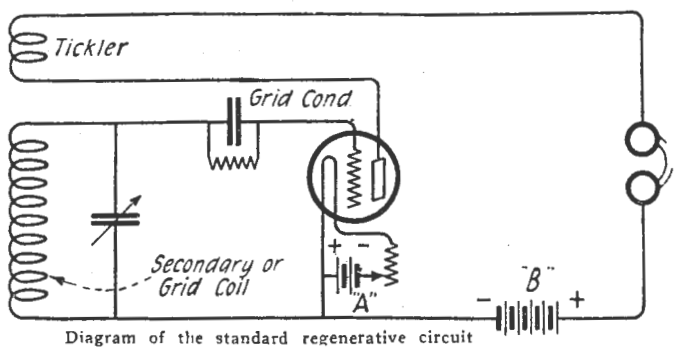


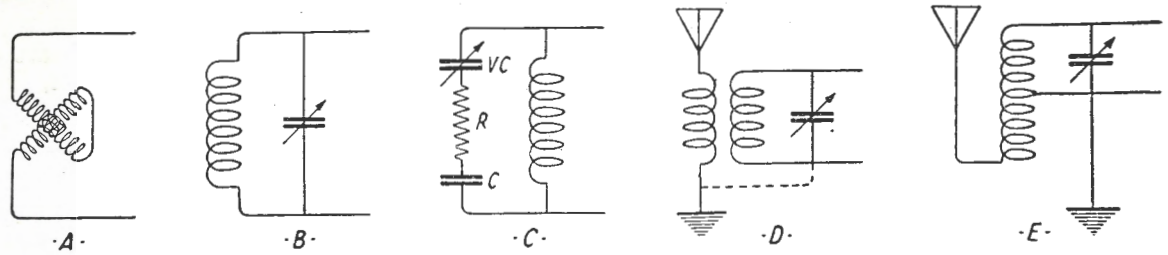
Diagram of the standard regenerative circuit

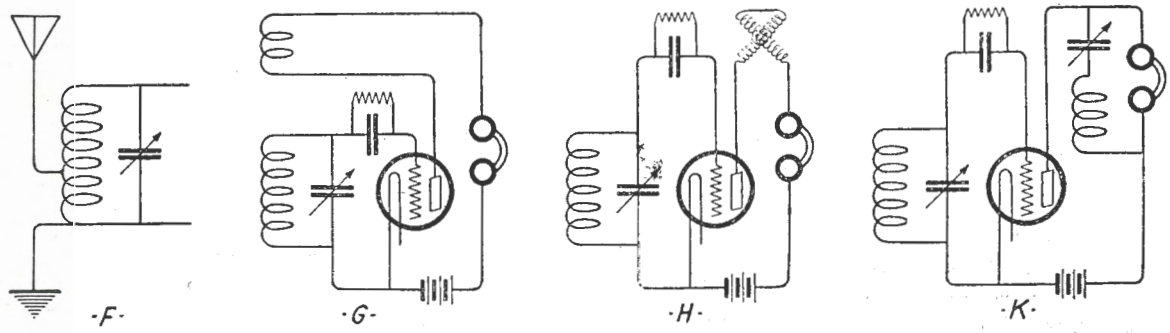
Glance now at antenna circuits. At D is shown a loose coupled or double circuit arrangement. Note that the secondary is similar to the B above and that B is the same as A. Now we know that it does not change the circuit to ground the filament in order to keep that section at ground potential, so the filament or bottom side of the secondary may be connected to the ground as shown in dotted lines. The circuit is not altered. Nor need we represent the primary as being to one side of the secondary; we may easily swing the primary about and without changing a single connection represent D as at E. Or, if we wish, instead of using a separate primary coil we may make dual use of a corresponding part of the secondary as shown at F. Here the primary is from the aerial connection on the coil to the ground.

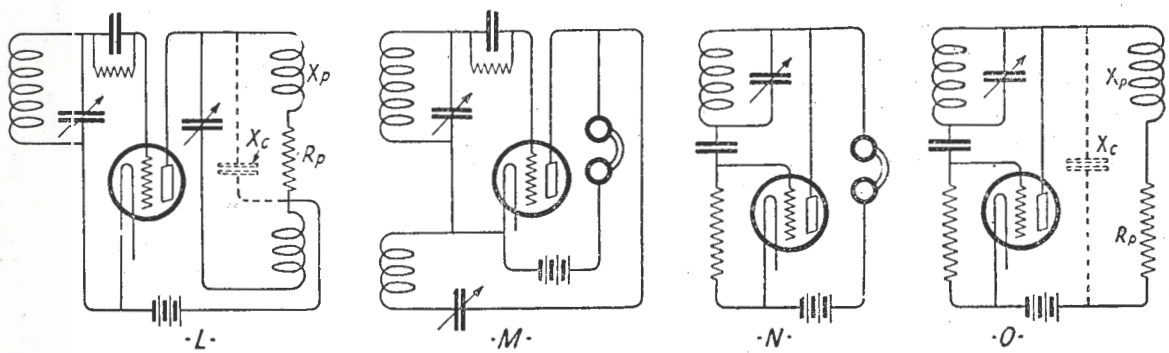
The secondary is from the top of the coil to the ground. The primary and secondary turns may be the same as in E, so that in effect F is like E, and, as E is the same as D, all three are alike.

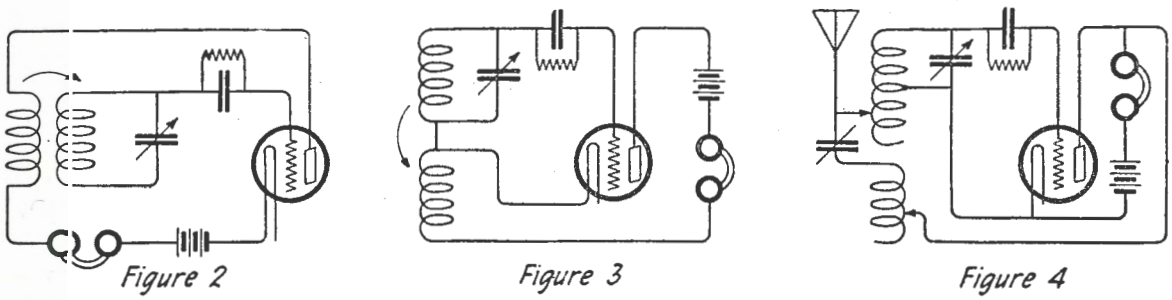
Again, we shall say that the effect on efficiency does not concern us here.

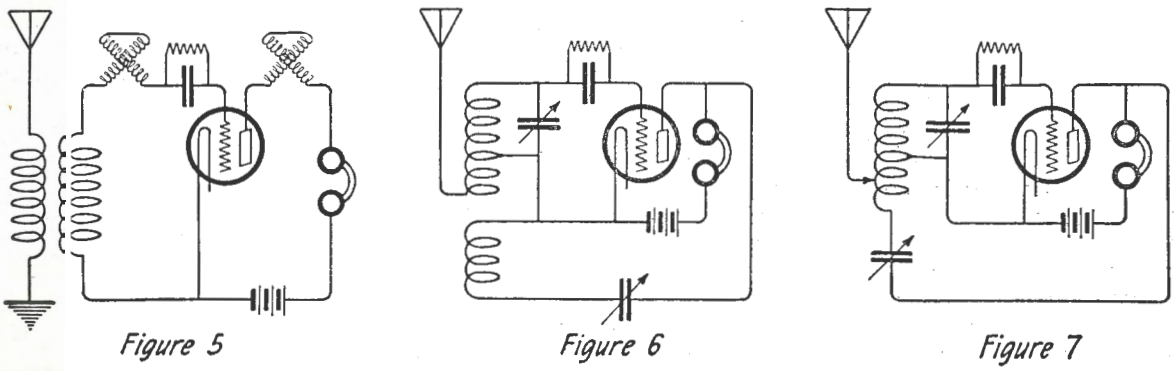
Consider for a moment the two main types of regenerative circuits, the tickler feedback as at G and the tuned plate as at H. The antenna circuit, does not bother us, as we have shown at D, E, and F, the similarity of apparently different antenna systems. At G the grid is excited—caused to vary in voltage with changes in plate current—which changes are caused by initial variations of grid voltage—by magnetic coupling with the plate circuit and to some extent by capacity coupling between the grid and plate. At H, the grid is excited partly by magnetic coupling between the grid and plate circuits, but mainly through the grid plate capacity. The latter is here of more importance than in the tickler feedback because the variometer may











CIRCUIT DIAGRAM OF POPULAR ONE-TUBE REGENERATIVE CIRCUITS.

be set to offer a higher impedance to the plate current variations than the untuned tickler can offer. Therefore the plate voltage variations in the case of the variometer—or otherwise—tuned plate may be considerably greater than the voltage variations on the plate with tickler feedback. Consequently, the small grid-plate capacity plays a more important role with the tuned plate system. However, in both methods inductive and capacitative coupling is employed to a greater and smaller extent and, as in effect and results there is little actual difference between them, we may say that G is like H. Remember that in place of the variometer in H we may substitute the coil and condenser as from A to b.

Of course, in detail we must realise there is a difference in these circuits, but in general principle there is a similarity, which it is worth while to recognise in order to properly classify our knowledge of radio.

Now examine a method of regeneration that appears radically different from either G or H; this is the Weagent X circuit, as shown in K. Here the low frequency output is shunted by a series inductance and capacity. We like to think of this circuit as shown in L. Here the headset is represented by the inductance Xp, the resistance Rp, and the distributed capacity of the headset Xc. The total presents some low value of impedance to radio frequency variations, not sufficient, however, to make the plate voltage variations great enough to excite the grid through the small grid-plate capacity, but when the complete tuned circuit comprised of the headset (Xp, Xc and Rp), the coil and condenser is adjusted to the frequency of the plate current variations, there is a considerable drop across the headset, or in effect their impedance is increased and the action is similar to a regular tuned circuit such as H. Indeed, if we mentally substitute a condenser and coil in place of the variometer of H it will be noted that L is like H. K can also be shown, as at M, which is in every way identical with K. In M the plate coil may or may not be in inductive relation to the grid coil, if it is coupled to it, we could connect the aerial to a portion of it so the primary would be a section of the plate coil even as it may be a section of the secondary coil as shown at F.

We have to consider still another arrangement. The Ultra-audion, as shown at N. This can be represented as at O, where the headset is shown as an inductance in series with a resistance and shunted by a condenser repesenting the distributed capacity Xp, Rp and Xc, respectively. This has a slight impedance to radio frequency variations, so the voltage on the plate will vary as the grid voltage variations affect the filament-plate resistance. Ordinarily the voltage fluctuations, being small because of the small impedance of the headset or external plate circuit compared to the filament-plate resistance would not be sufficient to excite the grid through the grid plate capacity so the grid is connected, not to a point (the filament) of constant voltage, but instead of the plate, which varies slightly in voltage. These variations are impressed directly on the grid through the tuned circuit and the grid or stopping condenser. Thus the voltage variations on the plate, even though they are small, serve to excite the grid. In a way, then, O can be compared to H as the grid is excited by the voltage variations on the plate and the plate voltage variations are made to excite the grid partly through the grid-plate capacity, but mostly through the direct connection from plate to grid. If the external plate circuit impedance is below a certain value in comparison with the internal plate impedance or plate-filament resistance, self-oscillation could not be secured. This condition applies also to H.

And now, for a second, let us look at the standard regenerative circuit of Figure 1. We can represent this in two similar diagrams, Figure 2 and Figure 3. At a casual glance they appear different, and indeed are known by different names, but a close inspection will show that they are alike.

Now to review the comparisons we have made, we have shown:—

A equal to B equal to C.
D equal to E equal to F.
G equal to H.
K equal to L equal to H equal to M.
N equal to O equal to H.
1 equal to 2 equal to 3.

And, of course, it can be seen that G is equal to Figure 1 and as G is equal to H, it follows that G. H. K, L, M, N, O, 1, 2 and 3 are equal to each other. Very simple, yes?

And now, just for fun, let us compare two circuits in ordinary use that do not look at all like each other. The Reinartz and variometer variocoupler are fairly good extremes. See Figures 4 and 5.

First in accordance with (D equal E) change the antenna circuit of the variometer set to the still double circuit of E. In the secondary (Figure 5) change the tuned circuit from A to B, as we have shown A equal to B. Now for the plate circuit. We have shown M equal to L and H so we can replace H with M in our variometer set of Figure 5. This looks like Figure 6 now. And, of course, it is immediately apparent that the antenna coil may be changed as from E to F, so the primary is part of the secondary coil, or as mentioned before, we can make the primary part of some other coil coupled to the secondary, in this case the plate coil, as we have done in Figure 7. This looks a whole lot like Figure 4 now, doesn't it? Indeed, the only difference between 4 and 7 seems to be in the plate coil arrangement. Actually, they are alike, for obviously it does not matter here whether the condenser is placed between two sections of the plate coil or at either end. As a matter of fact, in operation, 7 would have a point of advantage over 4 as change of aerial inductance in 7 does not change the plate circuit adjustment as much as an equal variation in 4.

Any one-valve regenerative circuit is like the standard regenerator of Figure 1.

As a final word, the writer knows that it is essential to study this talk with an open mind. A great deal of information is presented here, which may enable the student to see circuits as a simple unit, rather than as a mass of unrelated details.

A WELL-KNOWN bird-lover was recently heard to remark that he did not know how sparrows and other small birds would get on when wireless eventually replaced ordinary land-line telegraphy, as there would be no wires for these birds to perch on!—*Punch.*

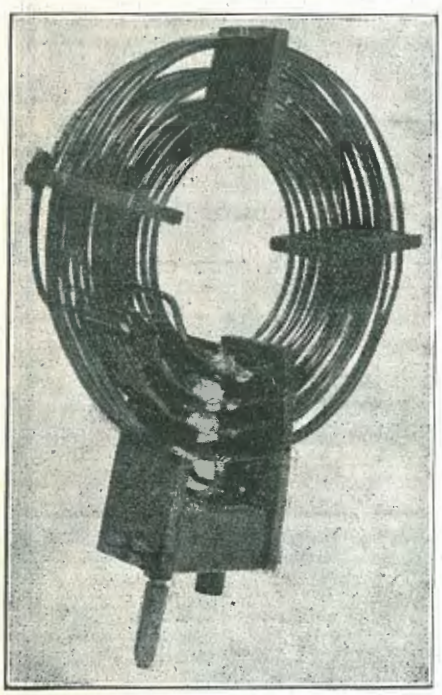
Low Loss Inductance Coils

A NEW form of interchangeable inductance coil having low losses and of simple construction. Air dielectric coils are becoming increasingly popular, and, in order to minimise losses, dead-end turns must be avoided. The loss due to the plug and socket holder is inappreciable, and the plug-in coil is convenient for the purpose of coupling.

By F. H. HAYNES.

(Reprinted by courtesy of "The Wireless World and Radio Review.")

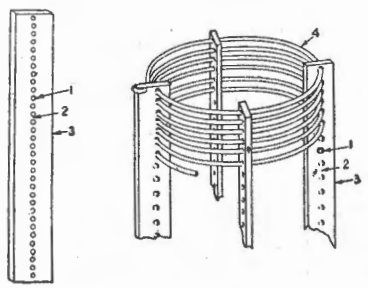
ATTENTION has recently been devoted to the construction of tuning coils having minimum losses and in this connection experiments have been made with various forms of inductances for the purpose of determining those patterns which deliver a maximum energy to the detecting or amplifying apparatus. It is admitted, of course, that the ratio of inductance to capacity employed in the tuning circuit to produce maximum efficiency will depend upon the constants of the aerial system to which it is connected, but apart from such considerations as these, there are certain fundamental aims in the design of the tuning inductances themselves which lead to improved reception.



Low Loss Plug-in Coil of strong construction bound with No. 16 enamelled wire.

Foremost among the causes of loss of efficiency in tuning inductances is the capacity which is present between the turns and the dielectric loss brought about by the insulating material. The writer has made tests with coils of various designs which show conclusively that coils having air dielectric are superior to those in which solid dielectrics are employed and particularly is this the case when tuning to short wave-lengths, say, below 600 metres.

The difficulty in the construction of an air dielectric coil is that of rigidly supporting the turns without adopting a design embodying a great deal of precision in instrument work. A description has already been published (in *The Wireless World*) of solenoid coils making use of insulating strips for supporting the turns. The construction consisted of shaping the turns of wire by bending round a former of suitable size and threading the spiral thus produced on to four insulating strips with uniformly spaced holes. Such a coil is not very difficult to construct, but as the number of turns increases, it will be found that the friction between the strips and the turns of wire increases so much that the finished solenoid is apt to be tapering towards one end. It will be observed, moreover, that there is almost a limit to the number of turns that can be threaded on to the strips for as the number of turns increases, the friction becomes proportionally greater and there is difficulty in forcing the strips along the wire. Another objection exists inasmuch as the drilled strips are very liable to break, owing to their thinness and the weakening of them by the drilling of the holes.

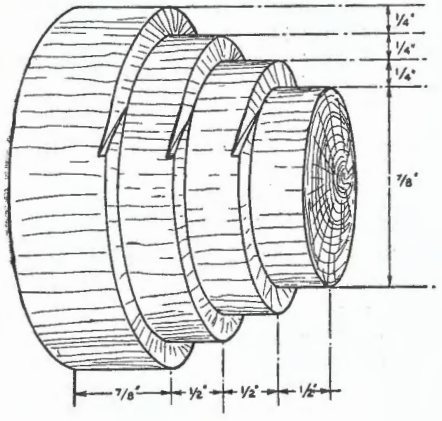


An Air Dielectric Solenoid inductance, made by threading the drilled slips on to a wire spiral.

Solenoids thus built up can be easily tapped out to tune to the required wave-length, but it became apparent that by making use of only a portion of a tuned coil that a loss of efficiency might arise, and it is therefore desirable to use coils embodying exactly the required number of turns. This leads one to make use of interchangeable plug-in coils and, although it may be suggested that the customary form of mounting with pin and socket is not good, tests reveal that providing the socket connection is well designed, the losses arising through this cause are almost negligible, whilst the great advantage is secured of interchangeability with

standard coils, and inductances of various sizes. A single layer solenoid coil, too, requires more turns to produce a given inductance than a coil of more compact design, and bearing this and the foregoing points in mind, a plug-in air dielectric coil of the type shown in the accompanying illustrations was designed.

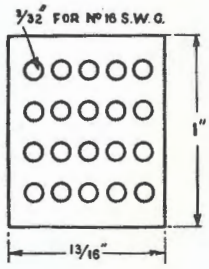
In this coil the long supporting strips with a tendency to snap are dispensed with and replaced by rectangular pieces. The difficulty of



Former for shaping the turns for the several layers.

building a long single layer coil, owing to friction between turns and insulating pieces, is also overcome as considerably fewer turns are employed for each layer, whilst the finished inductance is much more compact and is interchangeable in a standard holder with other inductances.

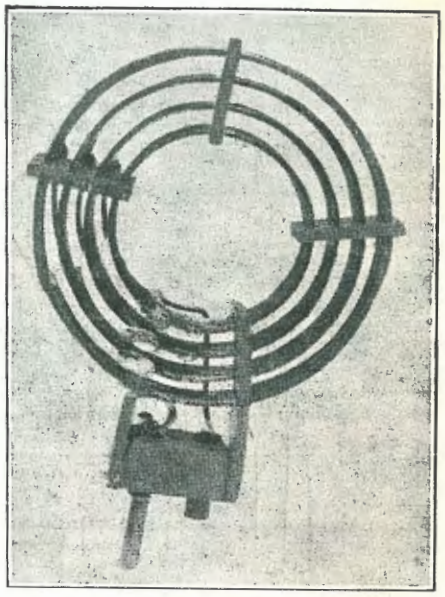
The gauge of the wire selected for winding such a coil is governed primarily by the mechanical strength required in the finished coil. The coils shown are for tuning to wavelengths below 200 metres and have only twenty turns and, consequently, it was necessary to employ a heavy gauge wire such as No. 16 S.W.G. Wire as fine as No. 20 S.W.G. might be used where the spacing between the turns is less and the coil consists of a larger number of turns. The holes through which the wire has to pass should be about a third as large again as the diameter of the wire in order to simplify construction, for it will be found that the turns will lie quite uniformly together and remain quite evenly spaced as the turns will probably engage on one particular side of the holes.



The supporting pieces: Being almost square, they are much stronger than the strips formerly employed and are easier to wind.

To shape the wire, a wooden former was made, having, in this instance, four rings of decreasing diameter and of the requisite total width. Rotating this former it was only necessary to wind each face full and then continue on to the next smaller face by passing the wire over a small cut to prevent the turns slipping. With all the four surfaces wound full the wire is allowed to run slack and is cut up into four coils, each comprising the same number of turns. It is quite easy now to thread the ebonite spacing pieces on to the smallest coil and then to proceed to fit the other coils on to the ebonite pieces in turn. All four coils are thus wound in the same direction and they are connected in series by linking across the finishing end of one with the commencing end of the next.

A method of attachment for the pin and socket holder can be seen



Another view, showing the spacing between the layers.

from the photograph and the tension put upon the ebonite strips which causes them to bend, produces a very firm grip upon the turns of the inductance. The wire employed in this instance, as with the coils previously described, has an enamel covering in order that the surface may not become oxidised, which would give rise to an increase in the high frequency resistance of the winding.

SPARE OUR BLUSHES!

Mr. W. V. K. Dunne, of Wooroona, Duaringa (Qld.), has forwarded a twelve months' subscription to "RADIO."

During the course of his letter he writes: "The publication ("Radio") is easily the best and most suitable for us unfortunates in the back-blocks, and I can assure you it is often referred to as a dictionary."

"Radio" Visits 2BL

SOME IMPRESSIONS BY ARTIST HARRY JULIUS.

Low Loss Tuners

(*Continued from page* 609.)

SHORTENING UP THE CONVERSATION.

We have been talking about our two most important points—Wavelength Range and Sharp Tuning. This leaves four more points, but luckily we do not have to take them up; they will take care of themselves, as we shall see.

PLANNING A GOOD TUNER.

If we are to use the lessons learned above it would be a good idea to start by trying them on a very simple tuner; perhaps it will be so much improved that we do not need a more complicated one. The simplest tuner of all is the "single circuit"—but I draw the line at that. It is entirely too good a sending set when it starts oscillating, and it never can be made to tune really sharply, as I have stated above. The next most simple tuner is a two-circuit tuner in which the antenna is not tuned. This has no more adjustments than the single-circuit, but it does tune much more sharply, and it does not transmit so strongly. Then we may add regeneration by means of a tickler or a variometer in the plate. Personally, I prefer a tickler, as it has much less effect on the secondary tuning, also because it is far less "tricky" in handling.

WHAT IS NEW ABOUT IT?

What is there new about a loose coupler with a tickler? Not a thing—not a thing in the world. But just the same, there will be something very new and different in your radio shack if your coupler is re-built along the lines suggested in this paper. That something will be the results obtained. You will hear stations not heard before, you will forget interference that was terrible in the past. This is not mere talk, it has been plentifully proven by a large group of our members. The old "loose coupler with a tickler" is still with us, and doing beautifully in its new form. In broadcast reception also we can so improve the plain two-circuit regenerative tuner that it will make most of the elaborate new circuits look rather small.

THE OTHER FOUR POINTS.

The other four requirements have now been taken care of, for we have a tuner that is (3) equipped with very few controls, (4) does not send out a strong carrier, because the antenna coupling is low, (5) is absolutely reliable in operation, and (6) is about the cheapest receiver in existence.

(*Continued from page* 605.)

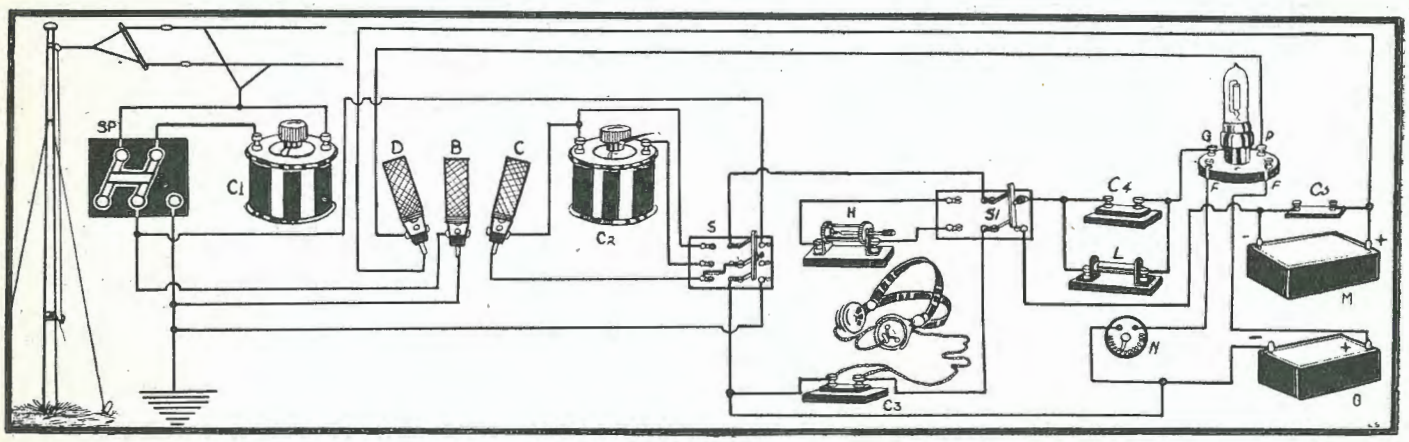
with it again here. The crystal may be of Galena or Carborundum, the former being the most convenient.

this type. This is to some extent overcome by coupling the tuned anode coil to the aerial coil.

The values of the condensers in Fig. 5 are as follows:—Aerial C1, .001 mfd.; Anode C2, .0003; C3, .001 mfd., fixed; C4, one to two mfds.

The honeycomb coils will, of course, vary in size according to the wavelength to which it is desired to tune.

The three circuits given above should enable all listeners-in to have quite a busy time over the Christmas holidays trying each and finally selecting the one most suitable for the individual needs.



Pictorial diagram of the Crystal-valve Combination Panel. Details of component parts are as follow: SP, Series-parallel Switch; C1, Aerial Tuning Condenser; C2, Crystal Circuit Secondary Tuning Condenser; S and S1, Change-over Switches; B, Aerial Coil; C, Crystal Circuit Secondary Coil; D, Valve Circuit Regenerative Coil; H, Crystal Detector; C3, Telephone Condenser; C4, Grid Condenser; C5, High Tension Battery By-pass Condenser; M, High Tension Battery; L, Grid Leak; O, Filament Battery, and N, Filament Resistance.

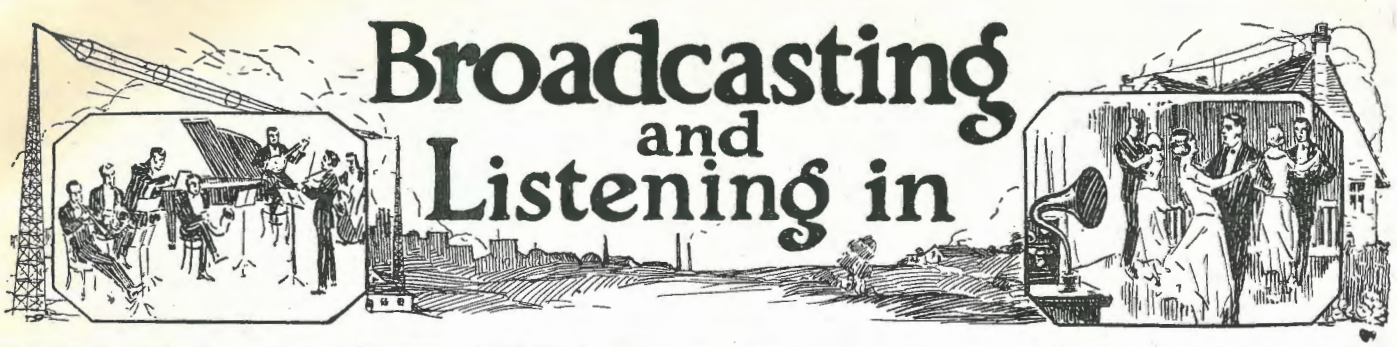
Owing to the low resistance of the crystal circuit, the tuning of the anode circuit becomes somewhat flat and amplification is reduced in circuits of

English Amateur Operators

ADVICES received from London make pleasing reference to the recent N.Z. successes in the matter of long-distance wireless. Mr. C. W. Goyder, the chief British operator, who is just now in the limelight is quite a young man, being only about 20 years of age. His experiments started before he left the Mill Hill School, and he was responsible for setting up a transmitter some months ago, by means of which he was one of the first amateurs to get into communication with other amateurs in the United States. He received much notice on that occasion, but he is naturally prouder of his latest achievement in getting into touch with Mr. F. D. Bell, of Waihemo. The set he used was fitted in one of the rooms of the science laboratory at Mill Hill School. Mr. Goyder lives at Mill Hill, and he has been in the habit of getting up in the morning an hour or two before dawn and conducting his experiments. It was on a Saturday morning when Mr. Goyder was trying to connect with America, that he got into touch with N.Z. It was quite a surprise to the operators at both ends.

Mr. E. J. Symonds, of Gerrard's Cross, whose call sign is G2OD was really the first British experimenter to hear a N.Z. station. This was on the previous Thursday. He was also the first to have his own Morse code messages heard in Maoriland the next morning.

Mr. Goyder, working the Mill Hill School set, then established the two-way communication on the Saturday morning. He repeated his performance on Sunday. The young experimenter states that in sending the messages, both he and Mr. Bell repeated each word twice but no sentence had to be repeated. Mr. Goyder received N.Z. on a two-valve set, comprising one detector and one low-frequency valve. His aerial is a transmitting one, 40ft. high, but electrically is only 15ft. off the school roof, with a counterpoise earth underneath it and is unscreened.



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.

Educational Session:

3.0 The special Education Session, which has been arranged by the N.S.W. Department of Education, will be held on Mondays, Tuesdays, Wednesdays, and Thursdays of each week. Friday, Musical Programme from 3 p.m. to 3.45 p.m.
3.3 The Chimes of 2FC.
3.50 Musical Programme.
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:

12.55 Time Signals. "Argus" and "Herald" News Service, Reuter's and the Australian Press Association Cables.

Afternoon Session:

3.30 Musical programme.
4.45 "Argus" and "Herald" News Service.

Early Evening Session:

6.30 Children's Hour; "Billy Bunny" Stories.
7.0 "Argus" and "Herald" News Service, Reuter's and the Australian Press Association Cables.

Evening Session:

8.0 Theatrical Items, Lectures, Vocal and instrumental items.

TUESDAY NIGHT.

Carlyon's (St. Kilda) Dance Orchestra.

SATURDAY:

Midday Session:

12.55 Time Signals. "Argus" and "Herald" News Service, Reuter's and the Australian Press Association Cables.

Afternoon Session:

3.15 Musical programme.
4.0 "Herald" News Service. Results of Races and other sporting events broadcasted immediately details received.

Early Evening Session:

6.30 Children's Hour; "Billy Bunny" Stories.
7.0 "Argus" and "Herald" News Service, Final Sporting Results.
8.0 Vocal and Instrumental Concerts.

SUNDAY:

Afternoon Session:

3.0 Pleasant Sunday Afternoon Services from Wesley Church.

Early Evening Session:

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

Evening Session:

8.30 Concerts from the Studio.

BAGNIO, Manila, radio station recently picked up messages from the experimental broadcasting station of the General Electric Company at Schenectady, New York. Musical items were also heard.

MR. W. EDWARDS, F.I.M.T., who recently arrived in Sydney *en route* for N.Z., where he will install long distance radio sets is a DX radio expert who has predicted that in less than a year Sydney will be listening to dance music broadcast from the Savoy Hotel, London. Already, he says, Capetown is listening-in to the Savoy Band.

OVER 100 State schools are at present listening-in to the broadcast educational lectures of the N.S.W. Education Department. The organiser, Mr. W. S. Reay, recently stated that reports received from country schools were very encouraging and that a growing interest in these sessions is being exhibited by the parents and many people in the outback towns.

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.

SUBSEQUENT to prosecutions launched by the N.S.W. Postal Department against illegal listeners-in, the secretary, Mr. H. P. Brown, states that there has been an enormous increase in the number of licenses taken out.

TWENTY minutes after a photograph of President Coolidge was transmitted by wireless from London on November 30, it was reproduced in New York. The feat was carried out by the Marconi Company and, according to latest advices, the Radio Corporation of America expects to inaugurate almost immediately a regular wireless photograph service across the Atlantic.

THE Melbourne Police Wireless Patrol has hitherto been hadicapped to a certain extent by the fact that so far only a receiver has been installed in the cars. Shortly, however, this will be remedied and transmitters will be placed on the floors of the machines, while telescopic aerials will be attached to the running boards.

Notes on Aerials

By R. C. PHILIPP (Ex-Wireless Officer, 2nd Corps, B.E.F.)

THE study of aerials and their various forms is an extremely interesting one. The beginner is not always very much concerned about the calculations involved in the different types, but he certainly does want to know the results to be obtained by using the various kinds, or perhaps he has a certain amount of space in which to put up an aerial and therefore

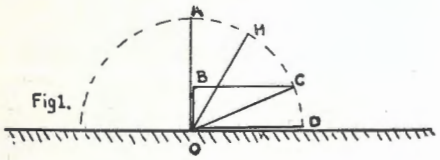


Fig1.

wishes to know the most efficient arrangement without undue experimenting. The following remarks may help in this direction, and they are written to those mainly concerned with listening-in to the broadcasting stations.

The first governing factor is the type of reception, whether crystal or valve. With a valve set the type of aerial is not always of such importance as it is to the user of a crystal set, who, in order to get satisfactory results, must give his aerial careful consideration. The next thing to be considered is the distance from the broadcasting station. At 50 miles a crystal set will not give audible signals from a loop aerial, whereas a good single wire aerial, 30 to 40 feet high, should give good signals.

Now considering maximum signal strength, it is well-known that the *ideal* aerial would be a plain vertical wire. Therefore, looking at Fig. 1, and taking the outside aerials in this order of merit, the vertical aerial O.B.A. would be first, and next O.H., but since these types present obvious difficulties of erection (unless one happens to live next to a factory with a tall chimney!) we pass on to the usual arrangement, O.B.C. Then O.C. is next—which is very inefficient and should be avoided—and, lastly, to O.D., in which the signals would be a minimum.

From the last paragraph it is seen that the strength of signals depends upon the height, and where two aerials are of the same ultimate height, such as O.B.C. and O.C., then it is the average height which counts —which, in the case of O.B.C., is just double that of O.C.

Remembering to keep B.C. as high from the ground, and as distant from all other objects (trees, buildings, etc.), as possible.

Now let us compare the characteristics of three different aerials, each using the same total (200ft. in the case of those constructed by the author for test purposes) length of wire, but occupying different amounts of space, as shown in Fig. 2, Fig. 3, and Fig. 4. Of the three, Fig. 2 gives the strongest signals, and is the most widely used. It is somewhat directional, depending upon the ratio of the horizontal length compared to the length of the vertical portion. As the vertical height becomes more and more in comparison with the horizontal length, so are the directional effects found to be less and less noticeable. In Fig. 3, the long, single aerial is replaced by one using a number of short parallel wires forming a compact arrangement. In this case the total length of wire is made up by using nine horizontal wires, each 19ft. 6in., spaced two feet apart and connected to the lead-in of 25ft. 6in., totalling, roughly, 200ft.

The signals will be found rather weaker than those of the single wire aerial, but, on the other hand, it is very directional and for anyone living within a few miles of the broadcasting station, I much prefer it to the outside aerial, since it is easily in-

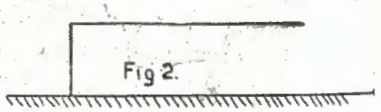
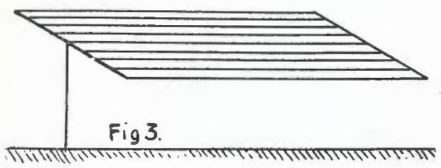


Fig 2.

stalled in the average roof and will work a crystal set very well.

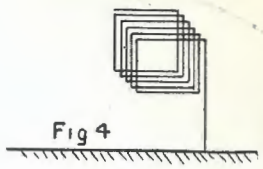
The type shown in Fig. 4 is still more directional, although it gives weaker signals, but, at the same time, will work a crystal set within a few miles of the transmitting station, and goes in one's roof extremely well. When working a valve set off this loop, it is usual to bring both ends down to the set and connect on to aerial and earth terminals, but with

a crystal set better results will be obtained by bringing only one end down and connecting it on to the aerial terminal while the earth terminal of the set is connected to earth in the usual way. Signals may be much improved by considerably increasing the length of wire used on the loop, for instance, for reception



of 1,100 metre waves the author gradually increased the length of wire and found signals improve until about 550ft. of wire was used, after which any increase of length only produced a negligible increase in signal strength, and, later on, an actual decrease in strength (these results being obtained with a crystal set). With a frame or loop aerial it must also be remembered that the larger we make our frame, the stronger will be the received signals, even though we keep the total length of wire the same by winding fewer turns. The voltage induced in a loop by the ether waves is proportional to the product of the height and length, that is, the area.

The effects of resistance in an aerial are not always understood. I have frequently been told by listeners-in that there is no need to use an aerial wire of, say, 3/20, as they can "hear beautifully" on a single wire of No. 30 gauge. No doubt, but signals would be improved by using the heavier wire, and, what is more important, tuning will be sharper. (In sharp tuning there is one position of the slide on our tuning coil which gives us the loudest signals, and a small movement away from that causes a sharp falling away in signal strength, whereas in flat tuning the signals will not be so loud and are spread over a greater area of the tuning coil). In this connection it is worth remembering that the readability of a signal depends not only upon the strength of signals received, but also upon the relative strength of those signals compared to those



of the signals which we do not want to hear, that is to say, it is better to have weaker signals and no interference rather than to have loud signals accompanied by stations sending whom we do not wish to hear. This is where the loose coupler scores over the single coil set.

Radio is one of the greatest gifts given to mankind. Make the best of it during the holidays.

Re-Building H. T. Batteries

IT often happens on joining up a set that has been put aside for a few weeks to "listen-in" that it commences to "howl" immediately the first stage of audio is brought into operation. Provided that the adjustments are satisfactory, the trouble will almost surely be located in the high tension battery—due to one or more of the individual cells having become "dead." Of course, the best thing to do is to scrap the old battery and invest in a new one, but many amateurs will probably prefer to do the next best thing—re-build the faulty high tension battery.

One or more "dead" cells introduces a considerable resistance into the high tension circuit. This resistance acting as a coupling between valves sets up a howl, or causes crackling and other parasitic noises in the telephones, with consequent reduced strength of reception. The chemical consumption of zinc in faulty cells is sometimes due to dampness causing a short circuit, or to the more probable effects of local action. Local action is

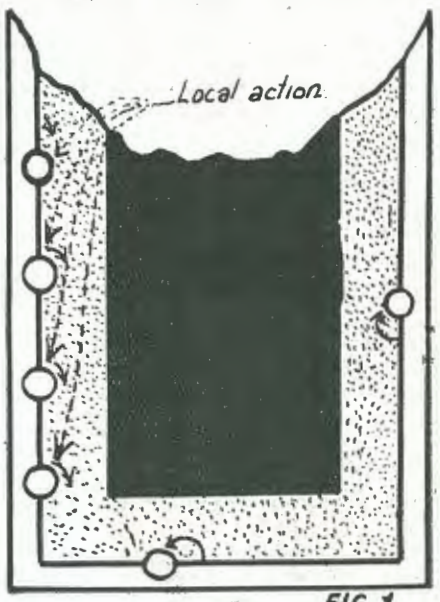


FIG. 1.

set up by the small particles of iron, carbon, and other impurities embedded in the zinc sheeting, used to form the outer part of the cell, coming in contact with the electrolyte. These minute particles being electro-negative to the zinc, set up tiny currents of electricity as shown in Fig. 1, and their chemical action is in every respect similar to the chemical action of the cell itself. This action goes on continuously, whether the battery is in use or not, and thus puts a limit on the life of it.

If the high tension battery is built up of three-cell torchlight battery units, it is quite an easy matter to cut out the faulty cells and re-build them. A high resistance voltmeter placed across the positive and negative terminals of each unit should read from 3.5 to 4.5 volts. If the reading is much below 3.5, the unit should be marked with a cross for re-building. Failing a voltmeter test, a four-volt torchlight bulb may be used. (See Fig. 2.) If the bulb filament burns brightly, the unit may be considered in good condition, but if it burns

with a red or dull red the unit should be crossed off. However, do not hold the lamp across the battery longer than a second, which is quite long enough to gauge its condition.

With a hot soldering iron remove the faulty cells by melting the solder holding the terminal tags together, then move all the effective cells together and re-solder the tags. Now, with a penknife, remove the paper surrounding the faulty units, and there will be no difficulty in locating the "dead" cell or cells by the corroded deposit of the sal-ammoniac electrolyte on the zinc. With the back of a penknife, break away the top wax covering, and cut the wires connecting the faulty cell with the good cells. The consequent gap can either be bridged with a piece of thin wire, or by replacing with a good cell removed from one of the other faulty units.

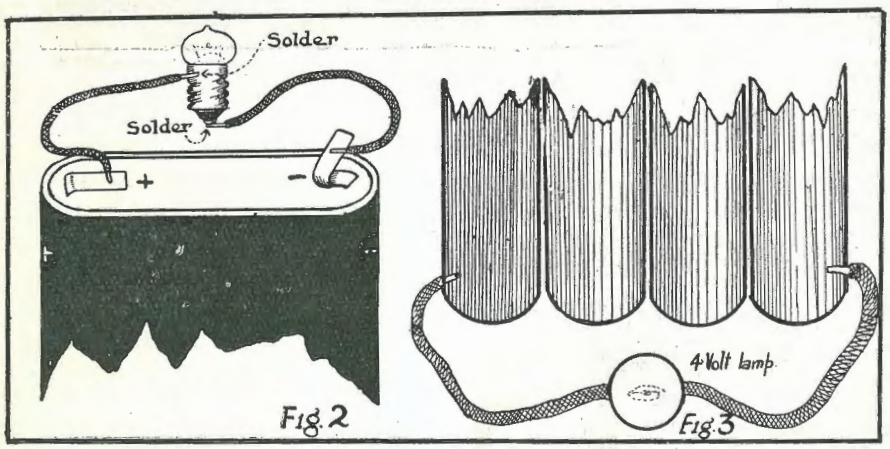


Fig. 2

Fig. 3

When the unit is re-built, test with a volt-meter, or lamp (see Fig. 2) and then, if satisfactory, dip the unit into a tin of melted paraffin-wax, and wrap around with wax-paper. A hot knife passed over the wax-paper, will cause it to adhere firmly to the unit.

If the centre cell of the unit is removed, care must be taken to replace the insulating paper separating it from the two outer cells, otherwise a short circuit will probably result.

The reconstructed cells may now be added to the original battery.

In a battery of this kind, consisting of 25 three-cell units, only five units were found to need attention after the battery had been put aside for six weeks. Of course, if the original voltage is required, new units will have to be purchased to replace the worn-out cells.

If this is necessary, join the negative of the first new unit to the negative terminal of the high tension battery on the set, placing the older cells towards the positive end.

This arrangement places the bulk of the current load on the new cells (while the older ones supply current to the amplifiers only), as the voltage from five to six units is usually ample for the average soft detector valve.

With cells of the block type, the cutting out process is a little more complicated. If possible, separate the rows, usually consisting of seven to ten individual cells, and cut out the "dead" cells with a penknife. If only one cell is inoperative, cut it right out and bridge the gap with a piece of fine wire, and then test the remainder of the cells with a voltmeter or lamp, as shown in Fig. 3.

Touching the first and fourth zinc should give the same voltage or glow as a good three-cell unit across the latter's positive and negative terminals. After the first and fourth cell, test the second and fifth, passing quickly down the row until they are all tested.

Fig. 4 shows two Australian everready 21-cell batteries, a 10-cell geco battery unit battery re-built from the originals which were quite useless. They have now been giving good service on a three-valve set for over three months and are still going strong, and without the need for replacing the dead cells by new ones. Occasionally one cell will give out and has to be

Buy a portable radio receiving set for Christmas, so that you can take it with you on your holidays at the seaside or in the mountains.

ANOTHER BOUQUET.

"I must thank you for your most interesting and valuable paper," writes an Auburn (N.S.W.) reader during the course of a letter to the Editor, "especially this week's number (No. 43). I think it is the best sixpenny-worth placed on the market. Before the day is out on which I buy it I have read it from cover to cover, missing not a word.

"I think Marconi's article is absolutely enthralling, and I hope to secure every copy until the article is ended. (This article was completed in Nos. 43 and 44.—Ed. "R.") I look forward every fortnight to your paper, and pass it round when I have read it—but I always re-claim it for future reference."

SPECIAL ANNOUNCEMENT

Free Gift Books!

XMAS SUBSCRIPTION OFFER

The Proprietors of **"RADIO"** have pleasure in announcing that they have decided to present to the first one hundred new subscribers to **"RADIO"** Magazine any one of the three under-mentioned books. The conditions are that such subscription must be received before January 15, 1925, and that the offer is limited to the first one hundred subscribers.

1. **Bound Volume, SEA, LAND & AIR, Vols. 2 or 3.**
   Ordinary Price 17/6
2. **YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY, 1913-1919 editions (many containing full-size Wireless Map of the World). Ordinary Price 15/–**
3. **HANDBOOK OF TECHNICAL INSTRUCTION FOR WIRELESS TELEGRAPHISTS, by Hawkhead & Dowsett (1st Edn.)**
   Ordinary Price 7/6

As there is only a limited stock of the above publications, subscriptions will be filed in order of priority of reception.

This is a splendid opportunity to make an acceptable Xmas present to your Wireless friend—a year's subscription to **"RADIO,"** together with a first-class book on Wireless.

Remit 10/- subscription NOW, and make sure of securing the book you like best.

FILL IN THIS FORM.

The Circulation Manager,
RADIO in AUSTRALIA and NEW ZEALAND,
97 Clarence Street, Sydney, N.S.W.

Dear Sir,—

I enclose herewith 10/- (ten shillings) for twelve months' subscription (twenty-six issues) to RADIO, commencing from the next number; also please send me book No. —
(Number of book required.)

Please forward each issue of RADIO to—

Full name .....

Address .....

(Special) .....

removed by the aid of a hot soldering iron.

Re-built H.T. Batteries.

Do not forget to solder the negative terminal of one cell to the positive terminal of its neighbour, otherwise the wrongly joined up cell will act in opposition to the others, and taking the instance of the resultant loss of one cell reversed in a three-cell unit, the available voltage will be equal to three 1.5 volts or 1.5 volts instead of 4.5 volts. that a correctly joined up unit should give.

From a wide experience with high tension batteries it has been found that the life of a dry cell battery is proportional to its internal resistance when new. The higher its internal resistance, within limits, the longer the life of the cell. A good battery of 30 cells when new should have a resistance of about 15 ohms and rising to about 100 ohms towards the end of the useful life of the battery, thus the internal resistance is a very good indication of the useful life of a dry cell battery.

Let this Christmas be different to any one that has gone before. Let it be a real and up-to-date Yuletide. Buy or build a receiving set.

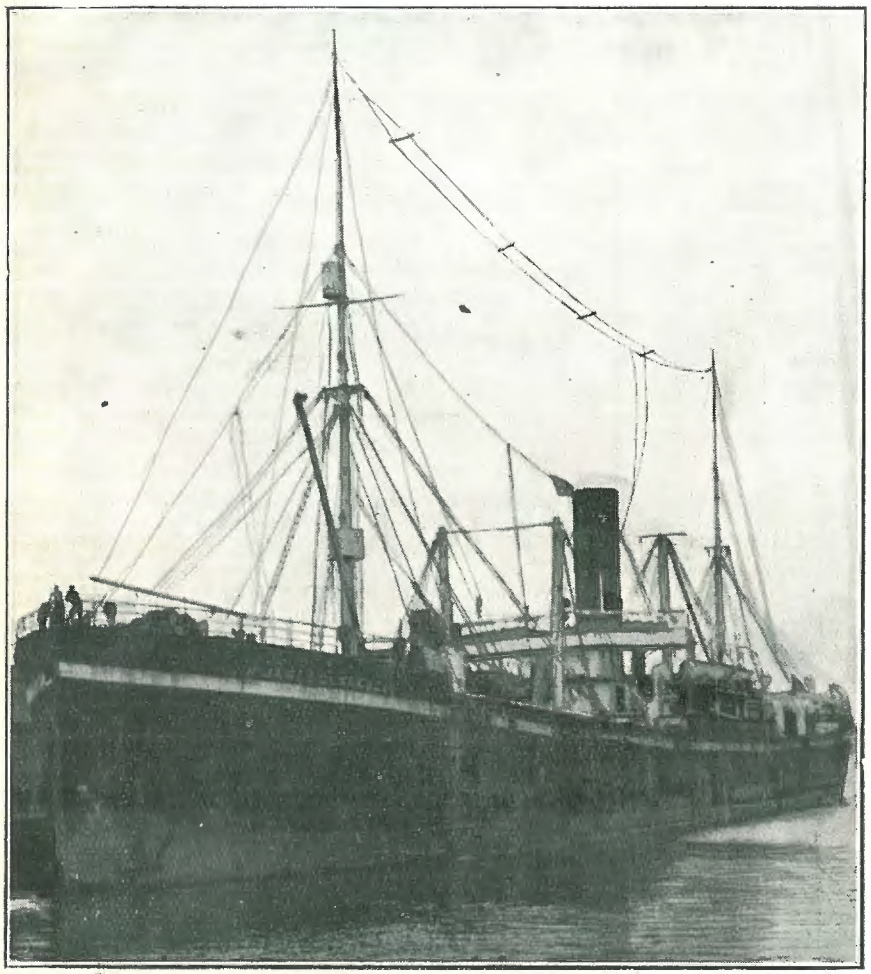
Radio in the Antarctic

(*By C.R.C.*)

THERE arrived in Hobart recently a Norwegian whaling vessel, the *Sir James Clarke Ross,* direct from Norway and bound for the Ross Sea. Her consort, three little steamboats of not more than five hundred tons, are named *Star I, Star II.* and *Star III.* respectively.

Modern whaling is not like it used to be in the bad old days of the last century; the *Sir James Clarke Ross* is fitted with every scientific appliance from a freezing plant (not that that will be required) to a darkroom for photography.

And one of the finest radio plants afloat is also to be found aboard this truly remarkable vessel. A wireless telephone installation of 1000 watts is installed in the spacious radio "shack" and the range of this set is considerable.



"The Sir James Clarke Ross."

Each of the little vessels that will accompany the expedition is also fitted with radio, so that at any moment it will be possibe for the "mother ship" to call her "little ones" together for a big catch.

The chief wireless operator of the *Sir James Clarke Ross* is Mr. L. Jensen, who is as keen as mustard on his work and a born "experimenter." During the trip it is Mr. Jensen's intention to keep in touch with civilization as far as possible by means of the radiophone. It should be possible for Australian radio men to pick up his signals fairly easily, especially when the days begin to get shorter.

WIRELESS WHALING.

Down south amongst the ice floes, whaling is a hazardous occupation. Time and again during the last trip to the Ross Sea it was thought that one of the little whalers had been crushed to pulp in the ice pack.

But radio always came to the rescue. A voice out of the stillness of the Antarctic gloom brought hope to the commander of the expedition, Captain Larssen, and relief to a stricken crew. (At the moment of going to press we learn that Captain Larssen has since died.—Ed. *R.*)

During actual operations it was often the case that one of the little vessels came upon a school of whales in some isolated spot far from the main fleet. Then the radio would flash across the ether the magical message, "A fish! A fish!"

THE PRESENT VENTURE.

While the *Sir James Clarke Ross* was in her homeland in the early months of the present year, after her eventful cruise to the Ross Sea, she underwent numerous repairs and was generally overhauled.

Her radio equipment was added to and embellished, particularly the wireless telephone apparatus, which

had been found so useful in southern waters.

When the vessel called at Hobart on the last occasion, Mr. Jensen intimated through the Hobart *News* that reports of reception from the *Clarke Ross* would be very welcome on his return from Antarctica. He would be transmitting almost every evening on 2100 metres, and he would also be listening-in for Australian stations.

The call is AQE. Listen-in!

HEARD IN HOBART.

Mr. T. Watkins picked up the *Sir James Clarke Ross* on November 18 at his experimental station, 7AA, West Hobart. Gramophone records and announcements were heard very distinctly. The vessel was then berthed at Port Chalmers, N.Z.

MEDICAL AID BY WIRELESS.

TWO more instances of the use of wireless in securing medical treatment for sailors at sea have been reported.

The s.s. *Airway*, bound from Newport, Mon., to La Plata, on September 25, informed the *Desna* by wireless that an apprentice was dangerously ill and that medical advice was urgently needed. The *Desna* accordingly changed her course to meet the other ship, then some eighty miles to the northward. When the vessels met, the *Desna's* doctor went aboard the *Airway* and found the patient in a serious condition,, suffering from double pneumonia. Medical facilities on the *Airway* being inadequate, the patient was transferred to the *Desna*, where he made rapid strides towards recovery, and on arrival at Liverpool was discharged to hospital. There is no doubt that the boy's life was saved by the aid of wireless messages.

Strange Effect of an Ocean Breeze

AN amateur listener-in, for the convenience of receiving his favourite broadcast station in bed, placed his set immediately in front of the partially open window of the bedroom. All went well for a few nights, when reception, for some mysterious reason, gradually became fainter and fainter. Stations that usually came in comfortably on two pairs of 'phones could just be heard, while DX stations were entirely inaudible. On mentioning this to a neighbouring amateur, who happened to have access to electrical testing instruments, it was decided to investigate matters. First the accumulator was re-charged, and then the H.T. Battery tested with a voltmeter and found to be quite in order. Then followed a general examination of all joints, and a thorough cleaning of contacts, but with little improvement. A megger, an instrument used to test insulation of telegraph and electric light lines, generating 250 volts, and giving an insulation test up to 20 megohms or twenty million ohms, was then brought into use. The aerial was tested and it was found that the insulation which should have read infinity was down to 9,000 ohms, a very low test indeed. The aerial was then lowered for inspection, and the compo. insulators were thoroughly washed in water and then re-hoisted. A further megger test showed that the insulation resistance was now over 20 megohms, or infinity. After this test the insulation of the panel was suspected, in view of its proximity to the window, and a test between the aerial terminal and negative terminal of the low tension battery of the secondary circuit measured 11,000 ohms, and further tests between other parts were only a few thousands ohms higher. A close examination of the back of the panel revealed a dampish film along the top of the ebonite, which smeared when rubbed with the finger. From this it became apparent that the poor results were due to no other reason than a layer of saline moisture being deposited on the panel and aerial insulators by a breeze blowing from the sea.

The remedy was to wipe the surface of the panel with a wetted rag well wrung out, drying with a warmed cloth, and then placing the whole set in front of a warm fire for a few hours for a thorough drying out. After this the set broke into oscillation on quite a loose reaction coupling and 2BL came in across the Tasman Sea comfortably on two valves, with two pairs of telephones in circuit.

The above stresses the absolute necessity of aerials located near the sea coast being suspected of low insulation after a "blow" from seaward, and also the desirability of keeping a set out of a direct line from an open window, unless properly enclosed for protection against dampness.

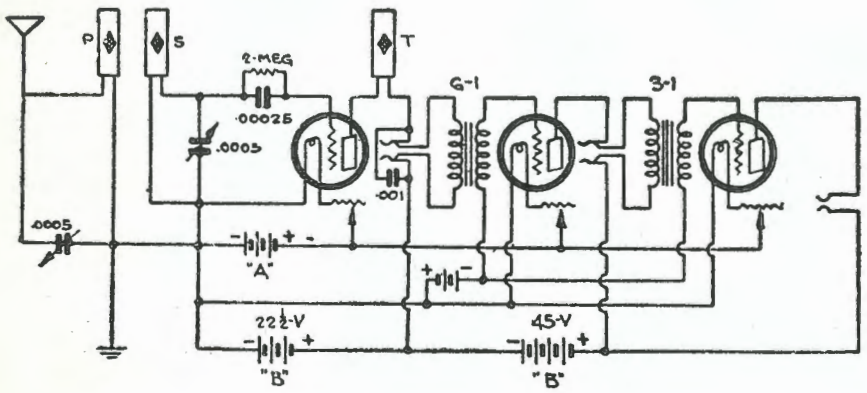
A CORRECTION.

IN Figure 5 of the article entitled, "How to Make an Audibility Meter" (*Radio*, No. 45), the letterpress read, "Showing how to wind the Eureka wire inductively." The last word, of course, should have been "non-inductively."

An All-Wave Tuner

WHEN it comes to a three-valve set, you will have to go a long way way to do better than can be done with the all-wave three-coil set about to be described—if you can put up a fairly good-sized aerial.

It is a regeneratice set that uses either spider web coils for short wave-lengths, or honeycomb or duo-lateral coils for long wave-lengths. It consists of a primary, secondary and tickler as the tuner. Of course, for loud-speaker operation, two stages of audio frequency amplification must be included.



The drawing shows the three coils marked P, S and T. They are mounted together so the primary and tickler coils may be moved away from the secondary coil, which is fixed. This is best done by using the regular honeycomb coil mounting. The drawing shows them separated for clearness but in practice they are mounted side by side, just as close as you can get them.

If you use honeycomb coils, you will require coils of 25, 35, 50, 75 and 100 turns to cover the broadcasting wave-lengths. The coil having more to do with the wave-length range of your set being the secondary. With loose coupling between primary and secondary, you will find tuning of this circuit very sharp and until you get accustomed to it, it is suggested that fairly close coupling be used. That is, have the primary and secondary coils separated about two inches.

There are two variable condensers used and it would be a good idea to have both of them verniers. One of the best verniers is the type in which the vernier is incorporated in the dial.

While a great deal has been written about logging stations on certain settings with a neutrodyne set, the same thing may be done on this type of set. If, due to variation in coupling, the secondary condenser must be moved a degree or so either way, it is accomplished quicker than it takes to tell it. In fact, after one has used a three-coil set for any length of time, all the tuning is done with the secondary variable condenser and the primary condenser only used when exceedingly sharp tuning on weak signals is necessary.

For day in and day out operation, summer and winter, you have to go a long way to beat a three-coil regenerative set which will do most of the things other five-valve sets do, and do them quieter. However, it will not work satisfactorily on a loop aerial, although we know of cases where some did, but we are not trying to pick out isolated cases, the article being intended for the average case.

In building this set, keep these things in mind. Make all the grid connections as short as possible, even though you have to lay the transformers on their sides, the shorter the better. The grid leak and condenser should be mounted directly on the socket.

HULA DANCE TO RADIO MUSIC.

IN Papeete on the Island of Tahiti in the South Seas, far removed from the world of affairs, George Bambridge, an old resident, again linked himself with civilisation through a radio receiver of his own construction.

In a letter received by KGO, A. C. Jewett, also of Papeete, tells how "Bambridge made himself a radio set with the object of picking up Morse. He made his own batteries on the back of an old gramophone record. Some of his gadgets are mounted on pine sticks whittled out by hand and held in place by rubber bands."

Suddenly one night, while listening for Morse there came floating out of the air the sweet tones of a violin. Bambridge was astonished. He immediately improved his set and now hears KGO programmes regularly, very much to his delight.

"Hawaiian dance music recently played by your stations," according to Jewett, "came through Bambridge's set splendidly. A Tahitian maid danced the Hula to it, and natives passing in the street thought it was a gramophone playing." Tahiti is seventeen miles south of the equator and about 4300 miles from KGO.

QUERIES ANSWERED.
COUPON.

"RADIO
in
Australia & New Zealand."

December 24, 1924.

The United States Broadcasting Stations

Feeling that such a list will prove of considerable interest and use to our many experimental readers, we herewith append particulars as to wave-length and call-sign of the principal United States broadcasting stations.

(Reprinted by courtesy of "The Wireless Age.")

KDKA	Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.	326
KDPM	Westinghouse Elec. & Mfg. Co., .. Cleveland, O.	270
KDPT	Southern Electric Co. ..... San Diego, Calif.	244
KDYL	Newhouse Hotel ..... Salt Lake City, Utah	360
KDYM	Savoy Theatre ..... San Diego, Calif.	280
KDYQ	Oregon Institute of Technology, Portland, Ore.	360
KDZB	Frank E. Siefert ..... Bakersfield, Calif.	240
KDZE	Rhodes Department Store ..... Seattle, Wash.	270
KDZI	Electric Suppy Co. ..... Wenatchee, Wash.	360
KDZR	Bellingham Publishing Co., Bellingham, Wash.	261
KFAD	McArthur Bros., Mercantile Co. .. Phoenix, Ariz.	360
KFAE	State College of Washington, Pullman, Wash.	330
KFAF	Western Radio Corp.....Denver, Colo.	360
KFAJ	University of Colorado.....Boulder, Colo.	360
KFAR	Studio Lighting Service Co....Hollywood, Calif.	280
KFAW	The Radio Den.....Santa Ana, Calif.	280
KFAY	Virgin's Radio Service.....Medford, Ore.	283
KFBB	F. A. Buttrey & Co.....Havre, Mont.	360
KFBC	W. K. Azvill.....San Diego, Calif.	278
KFBE	Reuben H. Horn.....San Luis Obispo, Calif.	242
KFBG	First Presbyterian Church.....Tacoma, Wash.	360
KFBK	Kimball-Upson Co.....Sacramento, Calif.	283
KFBL	Leese Bros.....Everett, Wash.	224
KFBS	Trinidad Gas & Electric Supply Co. and the Chronicle News, Trinidad, Colo.	360
KFBU	The Cathedral.....Laramie, Wyo.	283
KFCB	Nielsen Radio Supply Co.....Phoenix, Ariz.	238
KFCF	Frank A. Moore ..... Walla Walla, Wash.	360
KFCP	Ralph W. Flygare.....Ogden, Utah	360
KFCV	Fred Mahaffey, Jr.....Houston, Tex.	360
KFCZ	Omaha Central High School.....Omaha, Nebr.	258
KFDD	St. Michael's Cathedral..... Boise, Idaho	252
KFDH	University of Arizona.....Tucson, Ariz.	268
KFDJ	Oregon Agricultural College.....Corvallis, Ore.	360
KFDX	First Baptist Church.....Shreveport, La.	360
KFDY	South Dakota State College..Brookings, S. Dak.	360
KFDZ	Harry Q. Irverson.....Minneapolis, Minn.	231
KFEC	Meier & Frank Co.....Portland, Ore.	248
KFEK	Augsburg Seminary.....Minneapolis, Minn.	261
KFEL	Winner Radio Corporation.....Denver, Colo.	254
KFEQ	J. L. Scroggin.....Oak, Nebr.	268
KFER	Auto Electric Service Co.....Fort Dodge, Iowa	231
KFEV	Felix Thompson Radio Shop.....Casper, Wyo.	263
KFEY	Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho	360
KFEZ	Associated Engineering Societies of St. Louis, St. Louis, Mo.	248
KFFB	Jenkins Furniture Co.....Boise, Idaho	240
KFFE	Eastern Oregon Radio Co.....Pendleton, Ore.	360
KFFR	Nevada State Journal.....Sparks, Nev.	226
KFFV	Graceland College.....Lamoni, Iowa	280
KFFX	McGraw Co.....Omaha, Nebr.	278
KFFY	Pincus & Murphy.....Alexandria, La.	275
KFGC	Louisiana State University....Baton Rouge, La.	254
KFGD	Chickasha Radio & Elec. Co., Chickasha, Okla.	248
KFGL	Snell & Irby.....Arlington, Ore.	234
KFGQ	Crary Hardware Co.....Boone, Iowa	226
KFGB	Heidbreder Radio Supply Co.....Utica, Nebr.	224
KFGX	First Presbyterian Church.....Orange, Tex.	250
KFGZ	Emmanuel Missionary Coll..Berrien Spgs., Mich.	286
KFHA	Western State College of Colo., Gunnison, Colo.	252
KFHH	Ambrose A. McCue.....Neah Bay, Wash.	261
KFHJ	Fallon & Co.....Santa Barbara, Calif.	360
KFHR	Star Electric & Radio Co.....Seattle, Wash.	283
KFI	Earle C. Anthony (Inc.).....Los Angeles, Calif.	469
KFIF	Benson Polytechnic Institute.....Portland, Or.e	360
KFIO	North Central High School.....Spokane, Wash.	252
KFIQ	Yakima Valley Radio Broadcasting Association, Yakima, Wash.	242
KFIU	Alaska Elec. Light & Power Co., Juneau, Alaska	226
KFIX	Reorganised Church of Jesus Christ of Latter Day Saints, Independence, Mo.	240
KFIZ	Daily Commonwealth and Oscar A. Huelsmman, Fond-du-Lac, Wis.	273
KFJB	Marshall Electric Co.....Marshalltown, Iowa	248
KFJC	Seattle Post-Intelligence.....Seattle, Wash.	270
KFJF	National Radio Mfg. Co., Oklahoma City, Okla.	252
KFJI	Liberty Theatre.....Astoria, Ore.	252
KFJK	Delano Radio & Electric Co.....Bristow, Okla.	233
KFJL	Hardsacg Manufacturing Co.....Ottumwa, Iowa	242
KFJM	University of North Dakota; Grand Forks, N.D.	280
KFJQ	Electric Construction Co., Grand Forks, N. Dak.	280
KFJR	Ashley C. Dixon & Son.....Stevensville, Mont.	258
KFJX	Iowa State Teachers' College, Cedar Falls, Iowa	280
KFJY	Tunwall Radio Co.....Fort Dodge, Iowa	246
KFJZ	Texas Nat'l Guard, 112 Cav., Fort Worth, Tex.	254

Education by Radio

TWENTY thousand Californian school teachers scattered over the valleys and mountains of the State are now being aided by radio broadcasting. Theirs is the job every morning of getting over 600,000 children to be punctual in attendance at school.

From Monday morning, November 3, at 9 o'clock, however, their task has been easier, for a series of weekly programmes furnished by the State Board of Education and broadcast by KGO, the General Electric Pacific Coast station, has proved to be so interesting that children want to be at school in time to hear them.

Schools throughout the State report great enthusiasm for the new venture, according to Grace C. Stanley, Commissioner of Elementary Schools, State Department of Education, who has charge of the work. It is not known at the present time how many pupils actually listened in on the first programme, but schools in isolated districts, which were so greatly benefited are expected to be in the lead of those tuned in on the broadcasts.

It is planned to feature Californian history and geography in the lessons by radio. Professors of the various universities and colleges of the state and other eminent educators and story-tellers will contribute. No lesson will be more than twenty minutes long, and will begin with music and end with music. The story-telling method of teaching will be used. That is, interesting stories will be told about the geographical and historical features of the State, aimed to entertain pupil listeners as well as educate them. Fresh personalities will be thus brought constantly into the minds of the thousands of school children, each with a fascinating story about some river, mountain or character of Californian history. The problem of the country school teacher will in this manner not only be lessened, but teachers are enthusiastically reporting their belief that they themselves will receive benefit and instruction from speakers over the air.

This is said to be the first time in America that a state-wide plan to use radio in public schools has ever been attempted. The idea is said to have originated in a conference this summer on rural education held in San Francisco, when requests from delegates that some attempt to reach the schools in the rural sections of the State by radio was made. A committee consisting of Will C. Wood, State Superintendent of Public Instruction, and Archibald Anderson, President of the San Francisco State Teachers' College, was appointed to take up the question. After carefully studying the problem, the committee decided to work with the General Electric station, KGO.

(*Continued from page* 636.)

KFKA	Colorado State Teachers' Coll.	Greeley, Colo.	273
KFKB	Brinkley-Jones Hospital Assn.,	Milford, Kans.	286
KFKQ	Conway Radio Laboratories	Conway, Ark.	250
KFKV	F. F. Gray	Butte, Mont.	283
KFKX	Westinghouse Elec. & Mfg. Co.,	Hastings, Nebr.	341
KFKZ	Nassour Bros. Radio Co.,	Colorado Springs, Colo.	234
KFLA	Abner R. Wilson	Butte, Mont.	283
KFLB	Signal Electric Mfg. Co.	Menominee, Mich.	248
KFLD	Paul E. Greenlaw	Franlinton, La.	234
KFLE	National Education Service	Denver, Colo.	268
KFLQ	Bizzell Radio Shop	Little Rock, Ark.	261
KFLU	Rio Grande Radio Supply House,	San Benito, Tex.	236
KFLV	A. T. Frykman	Rockford, Ill.	229
KFLX	George R. Clough	Galveston, Tex.	240
KFLZ	Atlantic Automobile Co.	Atlantic, Iowa	273
KFMB	Christian Churches of Little Rock,	Little Rock, Ark.	254
KFMQ	University of Arkansas	Fayettesville, Ark.	263
KFMR	Morningside College	Sioux City, Iowa	261
KFMT	George W. Young	Minneapolis, Minn.	231
KFMW	M. G. Satern	Houghton, Mich.	266
KFMX	Carleton College	Northfield, Minn,	283
KFNF	Henry Field Seed Co.	Shenandoah, Iowa	266
KFNG	Wooten's Radio Shop	Coldwater, Miss.	254
KFNJ	Warrensburg Electric Shop.	Warrensburg, Mo.	234
KFNL	Radio Broadcast Association.	Paso Robies, Calif.	240
KFNV	L. A. Drake	Santa Rosa, Calif.	234
KFNX	Peabody Radio Service	Peabody, Kans.	240
KFNY	Montana Phonograph Co.	Helena, Mont.	261
KFNZ	Royal Radio Co.	Burlingham, Calif.	231
KFOA	Rhodes Co.	Seattle, Wash.	455
KFOC	First Christian Church	Whittier, Calif.	236
KFOD	The Radio Shop	Wallace, Idaho	224
KFOJ	Moberly High School Radio Club,	Moberly, M.	246
KFOL	Leslie M. Schafbuch	Marengo, Iowa	234
KFON	Echophone Radio Shop	Long Beach, Calif.	234
KFPB	Edwin J. Brown	Seattle, Wash.	224
KFPT	Cape & Johnson	Salt Lake City, Utah	360
KFQE	Dickenson-Henry Radio Laboratories,	Colorado Springs, Colo.	224
KFQF	Donald A. Boult	Minneapolis, Minn.	224
KFQY	Farmers' State Bank	Belden, Nebr.	360
KFSG	Echo Park Evangelistic Assn.,	Los Angeles, Calif.	278
KGB	Tacoma Daily Ledger	Tacoma, Wash.	262
KGG	Hallock Watson Radio Service.	Portland, Ore.	360
KGO	General Electric Co.	Oakland, Calif.	312
KGU	Marion A. Mulrony	Honolulu, Hawaii	360
KGW	Portland Morning Oregonian	Portland, Ore.	492
KGY	St. Martin's College	Lacey, Wash.	258
KHJ	Times-Mirror Co.	Los Angeles, Calif.	395
KHQ	Louis Wasmer	Seattle, Wash.	360
KJQ	C. O. Gould	Stockton, Calif.	273
KJR	Northwest Radio Service Co.	Seattle, Wash.	283
KJS	Bible Inst. of Los Angeles,	Los Angeles, Calif.	360
KLS	Warner Bros. Radio Supplies Co.,	Oakland, Calif.	360
KLX	Tribune Publishing Co.	Oakland, Calif.	509
KLZ	Reynolds Radio Co.	Denver, Colo.	283
KMJ	San Joaquin Light & Power Corp.,	Fresno, Calif.	248
KMO	Love Electric Co.	Tacoma, Wash.	360
KNT	Walter Hemrich	Kukak Bay, Alaska	263
KNX	Electric Lighting Supply Co.,	Los Angeles, Calif.	360
KOB	New Mexico College of Agriculture & Mechanic Arts,	State College, N. Mex.	360
KOP	Detroit Police Department	Detroit, Mich.	286
KPO	Hale Bros.	San Francisco, Calif.	423
KQP	Apple City Radio Club	Hood River, Ore.	360
KQV	Doubleday-Hill Electric Co.	Pittsburgh, Pa.	270
KQW	Charles D. Herrold	San Jose, Calif.	360
KRE	Berkeley Daily Gazette	Berkeley, Calif.	275
KSD	Post-Dispatch	St. Louis, Mo.	546
KTW	First Presbyterian Church	Seattle, Wash.	360
KUO	Examiner Printing Co.	San Francisco, Calif.	360
KUY	Coast Radio Co.	El Monte, Calif.	256
KWG	Portable Wireless Telephone Co.,	Stockton, Calif.	360
KWH	Los Angeles Examiner	Los Angeles, Calif.	360
KYQ	The Electric Shop	Honolulu, Hawaii	270
KYW	Westinghouse Electric & Mfg. Co.,	Chicago, Ill.	536
KZM	Preston D. Allen	Oakland, Calif.	360
WAAB	Valdemar Jensen	New Orleans, La.	268
WAAC	Tulane University	New Orleans, La.	360
WAAD	Ohio Mechanics Institute	Cincinnati, Ohio	360
WAAF	Chicago Daily Drovers' Journal.	Chicago, Ill.	286
WAAM	I. R. Nelson Co.	Newark, N.J.	263
WAAN	University of Missouri	Columbia, Mo.	254
WAAW	Omaha Grain Exchange	Omaha, Nebr.	286
WABB	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	266
WABD	Parker High School	Dayton, Ohio	283
WABE	Y.M.C.A.	Washington, D.C.	283
WABG	Arnold Edwards Piano Co.	Jacksonville, Fla.	275
WABH	Lake Shore Tyre Co.	Sandusky, Ohio	240
WABI	Bangor Railway & Electric Co.	Bangor, Me.	240
WABL	Connecticut Agricultural College.	Storrs, Conn.	283
WABM	F. A. Doherty Automotiv & Radio Equipment Co.,	Saginaw, Mich.	254
WABO	Lake Avenue Baptist Church,	Rochester, N.Y.	283
WABP	Robert F. Weinig	Dover, Ohio	266
WABQ	Haverford College Radio Club.	Haverford, Pa.	261
WABR	Scott High School	Toledo, Ohio	270
WABU	Victor Talking Machine Co.	Camden, N.J.	226
WABV	John H. DeWitt	Nashville, Tenn.	263
WABW	College of Wooster	Wooster, Ohio	234
WABX	Henry B. Joy	Mount Clemens, Mich.	270
WABY	John Magaldi, Jr.	Philadelphia, Pa.	242
WABZ	Coliseum Place Baptist Church,	New Orleans, La.	263
WBAA	Purdue University	West Lafayette, Ind.	360
WBAH	The Dayton Co.	Minneapolis, Minn.	417
WBAN	Wireless 'Phone Corporation	Paterson, N.J.	244
WBAO	James Milliken University	Decatur, Ill.	360
WBAP	Wortham-Carter Pub. Co. (Star Telegram),	Fort worth, Tex.	476
WBAV	Erner & Hopkins Co.	Columbus, Ohio	423
WBAX	John H. Stenger, Jr.	Wilkes-Barre, Pa.	360
WBAY	Western Electric Co.	New York, N.Y.	492
WBBA	Plymouth Congregational Church.	Newark, Ohio	360
WBBD	Barbey Battery Service	Reading, Pa.	234
WBBG	Irving Vermilya	Mattapoisett, Mass.	248
WBBH	J. Irving Bell	Port Huron, Mich.	246
WBBJ	Neel Electric Co.	West Palm Beach, Fla.	258

WBBL	Grace Covenant Church	Richmond, Va.	283
WBBM	Frank Atlass Produce Co.	Lincoln, Ill.	226
WBBN	A. B. Blake	Wilmington, N.C.	275
WBBP	Petoskey High School	Petoskey, Mich.	246
WBBR	Peoples Pulpit Association	Rossville, N.Y.	273
WBBT	Lloyd Bros.	Philadelphia, Pa.	234
WBBU	Jenks Motor Sales Co.	Monmouth, Ill.	224
WBBV	Johnstown Radio Co.	Johnstown, Pa.	248
WBBW	Ruffner Junior High School	Norfolk, Va.	222
WBBY	Washington Light Infantry	Charleston, S.C.	268
WBBZ	Noble S. Watson	Indianapolis, Ind.	227
WBS	D. W. May (Inc.)	Newark, N.J.	360
WBT	Southern Radio Corporation	Charlotte, N.C.	360
WBZ	Westinghouse Elec. & Mfg. Co., Springfield, Mass.		337
WCAD	St. Lawrence University	Canton, N.Y.	280
WCAE	Kaufmann & Bauer Co.	Pittsburgh, Pa.	462
WCAG	Clyde R. Randall	New Orleans, La.	268
WCAH	Entrekin Electric Co.	Columbus, Ohio	286
WCAJ	Nebraska Wesleyan University, University Place,	Nebr.	360
WCAK	Alfred P. Daniel	Houston, Tex.	263
WCAL	St. Olaf College	Northfield, Minn.	360
WCAO	Sanders & Stayman Co.	Baltimore, Md.	360
WCAP	Chesapeake & Potomac Tel. Co, Washington, D.C.		469
WCAR	Southern Radio Corp. of Texas, San Antonio, Tex.		360
WCAS	William Hood Dunwoody Industrial Institute,	Minneapolis, Minn.	280
WCAT	South Dakota State School of Mines,	Rapid City, S. Dak.	240
WCAU	Durham & Co.	Philadelphia, Pa.	286
WCAV	J. C. Dice Electric Co.	Little Rock, Ark.	360
WCAX	University of Vermont	Burlington, Vt.	360
WCAZ	Carthage College	Carthage, Ill.	246
WCBA	Charles W. Helmbach	Allentown, Pa.	280
WCBC	University of Michigan	Ann Arbor, Mich.	280
WCBD	Wilbur G. Voliva	Zion, Ill.	345
WCBE	Uhalt Radio Co.	New Orleans, La.	263
WCBG	Howard S. Williams	Pascagoula, Miss.	268
WCBH	University of Mississippi	Oxford, Miss.	242
WCBM	Charles Schwarz	Baltimore, Md.	360
WCBX	Radio Shop of Newark	Newark, N.J.	233
WCBZ	Coppotelli Brothers' Music House, Chicago Heights,	Ill.	
WCK	Stix-Baer & Fuller Dry Goods Co., St. Louis, Mo.		360
WCX	Detroit Free Press	Detroit, Mich.	517
WDAE	Tampa Daily Times	Tampa, Fla.	360
WDAF	Kansas City Star	Kansas City, Mo.	411
WDAG	J. Laurance Martin	Amarillo, Tex.	263
WDAH	Trinity Methodist Church (South), El Paso, Tex.		268
WDAK	The Courant	Hartford, Conn.	261
WDAP	Drake Hotel	Chicago, Ill.	360
WDAR	Lit Brothers	Philadelphia, Pa.	395
WDAS	Samuel A. Waite	Worcester, Mass.	360
WDAU	Slocum & Kilburn	New Bedford, Mass.	360
WDAY	Radio Equipment Corporation	Fargo, N. Dak	244
WDBC	Kirk, Johnson & Co.	Lancaster, Pa.	258
WDBL	Immanuel Lutheran Church of Valparaiso,	Valparaiso, Ind.	273
WDBP	Superior State Normal School	Superior, Wis.	261
WDM	Church of the Covenant	Washington, D.C.	234
WDZ	James L. Bush	Tuscola, Ill.	278
WEAA	Frank D. Fallain	Flint, Mich	250
WEAF	American Tel. & Tel. Co.	New York, N.Y.	492
WEAH	Wichita Board of Trade	Wichita, Kans.	280
WEAI	Cornell University	Ithaca, N.Y.	286
WEAJ	University of South Dakota	Vermilion, S. Dak.	283
WEAM	Borough of North Plainfield, Nth. Plainfield, N.J.		286
WEAN	Shepard Co.	Providence, R.I.	273
WEAO	Ohio State University	Columbus, Ohio	360
WEAP	Mobile Radio Co.	Mobile, Ala.	360
WEAR	Evening News Publishing Co.	Baltimore, Md.	261
WEAU	Davidson Bros. Co.	Sioux City, Iowa	360
WEAY	Iris Theatre	Houston, Tex.	360
WEB	Benwood Co.	St. Louis, Mo.	273
WEBE	Roy W. Waller	Cambridge, Ohio	360
WEBH	Edgewater Beach Hotel Co.	Chicago, Ill.	370
WEBK	Grand Rapids Radio Co.	Grand Rapids, Mich.	360
WEV	Hurlburt-Still Electrical Co.	Houston, Texas	263
WEW	St. Louis University	St. Louis, Mo.	280
WFAA	Dallas News and Dallas Journal	Dallas, Tex.	470
WFAB	Carl F. Woese	Syracuse, N.Y.	234
WFAM	Times Publishing Co.	St. Cloud, Minn.	273
WFAH	Electric Supply Co.	Port Arthur, Tex.	236
WFAN	Hutchinson Elec. Service Co., Hutchinson, Minn.		360
WFAV	University of Nebraska	Lincoln, Nebr.	275
WFBG	Robert B. Gable	Altoona, Pa.	360
WFBH	Hotel Majestic	New York City	273
WFI	Strawbridge & Clothier	Philadelphia, Pa.	395
WGAL	Lancaster Elec. Sup. & Const. Co., Lancaster, Pa.		248
WGAN	Cecil E. Lloyd	Pensacola, Fla.	360
WGAQ	W. G. Patterson	Shreveport, La.	252
WGAZ	South Bend Tribune	South Bend, Ind.	360
WGI	American Radio and Research Corporation,	Medford, Hillside Mass.	360
WGL	Thomas F. J. Howlet	Philadelphia, Pa.	360
WGR	Federal Tel. & Tel. Co.	Buffalo, N.Y.	319
WGY	General Electric Co.	Schenectady, N.Y.	380
WHA	University of Wisconsin	Madison, Wis.	360
WHAA	State University of Iowa	Iowa City, Iowa	484
WHAD	Marquette University	Milwaukee, Wis.	280

WHAG	University of Cincinnati.....Cincinnati, Ohio	222
WHAH	Hafer Supply Co.....Joplin, Mo.	283
WHAK	Roberts Hardware Co.....Clarksburg, W. Va.	258
WHAM	University of Rochester (Eastman School of Music), Rochester, N.Y.	283
WHAR	Seaside House.....Atlantic City, N.J.	275
WHAS	Courier-Journal and Louisville Times, Louisville Ky.	400
WHAV	Wilmington Elec. Spec. Co.....Wilmington, Del.	360
WHAZ	Rensselaer Polytechnic Institute.....Troy, N.Y.	380
WHB	Sweeney School Co.....Kansas City, Mo.	411
WHK	Radiovox Co.....Cleveland, Ohio	283
WHN	George Schubel.....New York, N.Y.	360
WIAB	Art A. Johnson's Garage.....Rockford, Ill.	252
WIAC	Galveston Tribune.....Galveston, Tex.	360
WIAD	Howard R. Miller.....Philadelphia, Pa.	254
WIAK	Journal-Stockman Co.....Omaha, Nebr.	278
WIAQ	Chronicle Publishing Co.....Marion, Ind.	226
WIAS	Home Electric Co.....Burlington, Iowa	283
WIK	K. & L. Electric Co.....McKeesport, Pa.	234
WIL	Continental Elec. Supply Co., Washington, D.C.	360
WIP	Gimbel Bros.....Philadelphia, Pa.	509
WJAD	Jackson's Radio Eng. Laboratories, Waco, Tex.	360
WJAG	Norfolk Dairy News.....Norfolk, Nebr.	283
WJAK	Clifford L. White.....Greentown, Ind.	254
WJAM	D. M. Perham.....Cedar Rapids, Iowa	263
WJAN	Peoria Star.....Peoria, Ill.	280
WJAQ	Capper Publications.....Topeka, Kans.	360
WJAR	The Outlet Co.....Providence, R. I.	360
WJAS	Pittsburgh Radio Supply House..Pittsburgh, Pa.	286
WJAX	Union Trust Co.....Cleveland, Ohio	390
WJD	Denison University.....Granville, Ohio	229
WJY	Radio Corporation of America, New York, N.Y.	405
WJZ	Radio Corporation of America....New York, N.Y.	455
WKAA	H. F. Paar.....Cedar Rapids, Iowa	278
WKAD	Charles Looff (Crescent Park) E. Providence R.I.	240
WKAF	W. S. Radio Supply Co.....Wichita Falls, Tex.	360
WKAN	United Battery Service Co.....Montgomery, Ala.	226
WKAQ	Radio Corporation of Porto Rico, San Juan, P.R.	360
WKAR	Michigan Agri. College....East Lansing, Mich.	280
WKAV	Laconia Radio Club.....Laconia, N.H.	254
WKY	WKY Radio Shop.....Oklahoma, Okla.	360
WLAG	Cutting & Washington Radio Corporation, Minneapolis, Minn.	417
WLAH	Samuel Woodworth.....Syracuse, N.Y.	234
WLAL	Naylor Electrical Co.....Tulsa, Okla.	360
WLAP	W. V. Jordon.....Louisville, Ky.	360
WLAQ	Arthur E. Schilling.....Kalamazoo, Mich.	283
WLAV	Electric Shop.....Pensacola, Fla.	254
WLAW	Police Dept., City of N.Y.....New York, N.Y.	360
WLAX	Putnam Electric Co.....Greencastle, Ind.	231
WLB	University of Minnesota.....Minneapolis, Minn.	360
WLBL	Wisconsin Dept. of Markets..Stevens Point, Wis.	278
WLW	Crosley Manufacturing Co.....Cincinnati, Ohio	423
WMAC	Clive B. Meredith.....Cazenovia, N.Y.	261
WMAF	Round Hills Radio Corp.....Dartmouth, Mass.	360
WMAH	General Supply Co.....Lincoln, Nebr.	254
WMAK	Lockport Board of Commerce....Lockport, N.Y.	273
WMAL	Trenton Hardware Co.....Trenton, N.J.	256
WMAQ	Chicago Daily News.....Chicago, Ill.	448
WMAV	Alabama Polytechnic Institute....Auburn, Ala.	250
WMAY	Kingshighway Presby. Church, St. Louis, Mo.	280
WMC	Commercial Appeal.....Memphis, Tenn.	500
WMU	Doubleday-Hill Electric Co., Washington, D.C.	261
WNAC	Shepard Stores.....Boston, Mass.	278
WNAD	University of Oklahoma.....Norman, Okla.	360
WNAL	R. J. Rockwell.....Omaha, Nebr.	266
WNAP	Wittenberg College..... Springfield, Ohio	275
WNAR	C. C. Rhodes.....Butler, Mo.	231
WNAT	Lenning Brothers Co.....Philadelphia, Pa.	360
WNAW	Henry Kunzman....Box 167, Fort Monroe, Va.	360
WNAX	Dakota Radio Apparatus Co., Yankton, S. Dak.	244
WNYC	Municipality of New York.....New York City	526
WOAC	Page Organ Co. (H. P. Maus).....Lima, Ohio	266
WOAE	Midland College.....Fremont, Nebr.	280
WOAF	Tyler Commercial College.....Tyler, Tex.	360

What is the Matter?

IT does not matter what kind of a radio set you have, if it is a valve detector, it will require upkeep. The first renewal will no doubt be your A battery, if it is of the dry cell type. The next will be the B battery and the last should be the valve.

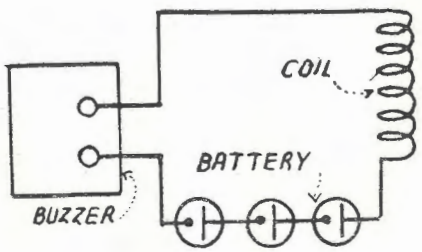
In a great many cases the valve is the first renewal, but this is due to burning the filament too bright and is your own fault. Standard valves are guaranteed to detect and amplify and when they do that, it is up to you to nurse them along for a long life.

As stated previously, these three items are all that should require renewing. The rest of your set may need some attention from time to time to tighten loose connections but as far as renewals are concerned, the valve and batteries are about all that wear out.

When you buy a manufactured set, your dealer ought to prove to you that it is in good working order. He can very easily do this in his shop and if it will work there and does not in your home, it is not the fault of the set. It is not advisable to start tearing a manufactured set apart just because it does not work. You probably have batteries incorrectly connected, or your aerial and ground system is faulty.

In a home-made set almost anything can be wrong. The wiring may be wrong. You may have defective parts, or like the manufactured set, batteries or aerial and ground may be faulty. There are times when brand new valves are defective, but if you have an up-to-date dealer, he will have a device for testing every valve he sells and when you buy of such a dealer, you are assured of a good valve.

Even though every part of your radio set is good, there is still the problem of tuning-in to the stations you want. If you have a single circuit set, the problem (if it may be called that) is easy, in fact, you may hear more than you want to at one time; if it is a two circuit set, you must tune both circuits to resonance for the desired signal; while if you have a neutrodyne set, you have three



circuits to adjust and if any of them are very much out, you do not hear anything but crackling noises. In the latter case there is nothing wrong with your set, the trouble is with you.

If any of your variable condensers fail to vary the adjustments of your set, that condenser is no doubt short circuited. It may be a strand of wire touching rotor and stator plates or it may be an accumulation of dust.

If you can hear the long wave stations and not the short ones, your aerial may be too long for your type of set and on the other hand if you cannot tune up to the long ones, it may be too short.

If the signals are not as strong as they formerly were (we do not mean fading) the B battery should be tested with a voltmeter. If they have dropped over 20 per cent. in voltage, a new one will give much better results. If you haven't a voltmeter handy, a 10 watt 110 volt incandescent lamp can be connected across the B battery terminals for in instant and the lamp should burn at a dull red. If it fails to do this on a 22½-volt battery, the battery is about done for.

Coils, whether they are tuning, transformer or tickler may have a poor connection or even be broken. These may be tested with a battery and buzzer, being connected in series with them as shown in the drawing. Telephones should not be used in place of buzzer.

NORTHBRIDGE RADIO CLUB.

THE club held the usual weekly meeting at the rooms, corner of Sailor Bay Road and Strathallen Avenue, Northbridge, at 7.30 p.m., Wednesday, December 3.

General business was quickly disposed of and that of the evening, which was a continuance of Mr. Beard's series of lectures dealing with Tuning, was then enjoyed.

The club's activities at present include a well-organised series of experiments under the direction of Mr. Beard. The club supplies all gear, etc., necessary to test various theories discussed during the evening, carrying reports of the results attained forward to the following meeting night for general discussion and comparison. Much very useful experimental work is being covered.

This procedure is to be continued and any person desiring to become a member of the club may obtain information from Mr. Cameron, Clanwilliam Street, Chatswood, or by attending the club rooms on Wednesday evenings at 7.30 p.m.

WOAG	Apollo Theatre	Belvidere, Ill.	273
WOAH	Palmetto Radio Corporation	Charleston, S.C.	360
WOAI	Southern Equipment Co.	San Antonio, Tex.	385
WOAN	James D. Vaughn	Lawrenceburg, Tenn.	360
WOAO	Lyradion Mfg. Co.	Mishawaka, Ind.	360
WOAT	Boyd M. Hamp	Wilmington, Del.	360
WOAV	Pennsylvania Nat. Guard, 112th Inf.	Erie, Pa.	242
WOAW	Woodmen of the World	Omaha, Nebr.	526
WOAX	Franklyn J. Wolff	Trenton, N.J.	240
WOC	Palmer School of Chiropractic	Davenport, Iowa	484
WOI	Iowa State College	Ames, Iowa	360
WOO	John Wanamaker	Philadelphia, Pa.	509
WOQ	Western Radio Co.	Kansas City, Mo.	360
WOR	L. Bamberger & Co.	Newark, N.J.	405
WOS	Missouri State Market'g Bu,	Jefferson City, Mo.	441
WPAB	Pennsylvania State College	State College, Pa.	283
WPAC	Donaldson Co.	Okmulgee, Okla.	330
WPAJ	Doolittle Radio Corp.	New Haven, Conn.	268
WPAK	North Dakota Agricultural College,	Agricultural College, N.D.	283
WPAL	Avery & Loeb Electric Co.	Columbus, Ohio	286
WPAM	Auerbach & Guettel	Topeka, Kans.	360
WPAU	Concordia College	Moorehead, Minn.	286
WPAZ	John R. Koch	Charleston, W. Va.	273
WQAA	Horace A. Beale, Jr.	Parkersburg, Pa.	360
WQAC	E. B. Gish	Amarillo, Texas	234
WQAE	Moore Radio News Station	Springfield, Vt.	275
WQAF	Sandusky Register	Sandusky, Ohio	240
WQAL	Coles' County Tele. & Teleg. Co.,	Mattoon, Ill.	258
WQAM	Electric Equipment Co	Miami, Fla.	283
WQAN	Scranton Times	Scranton, Pa.	280
WQAO	Calvary Baptist Church	New York, N.Y.	360
WQAQ	W. Texas Radio Co. (Abilene Dairy Reporter)	Abilene, Texas	360
WQAS	Prince-Walter Co.	Lowell, Mass.	266
WQAX	Radio Equipment Co.	Peoria, Ill.	248
WQJ	Calumet Rainbow Broadcasting Co.,	Chicago, Ill.	448
WRAF	The Radio Club	Laporte, Ind.	224
WRAL	Northern States Power Co., St.	Croix Falls, Wis.	248
WRAM	Lombard College	Galesburg, Ill.	244
WRAN	Black Hawk Electrical Co.	Waterloo, Iowa	236
WRAO	St. Louis Radio Service Co.	St. Louis, Mo.	360
WRAV	Antioch College	Yellow Springs, Ohio	242
WRAW	Avenue Radio Shop	Reading, Pa.	238
WRAX	Flexon's Garage	Gloucester City, N.J.	268
WRC	Radio Corporation of America,	Washington, D.C.	469
WRK	Doron Bros. Electrical Co.	Hamilton, Ohio	360
WRL	Union College	Schenectady, N.Y.	360
WRM	University of Illinois	Urbana, Ill.	360
WRR	City of Dallas, Police & Fire Signal Dept., Dallas,	Texas	360
WRW	Tarrytown Radio Res'ch Lab.,	Tarrytown, N.Y.	273
WSAB	Southeast Missouri State Teachers' College,	Cape Girardeau, Mo.	360
WSAC	Clemson Agricultural Col.,	Clemson College, S.C.	360
WSAD	J. A. Foster Co.	Providence, R.I.	261
WSAI	United States Playing Card Co.,	Cincinnati, O.	309
WSAJ	Grove City College	Grove City, Pa.	360
WSAN	Allentown Radio Club	Allentown, Pa.	229
WSAP	Seventh Day Adventist Temple	N.Y. City	263
WSAR	Doughty & Welch Elec. Co.,	Fall River, Mass.	254
WSAY	Port Chester Chamber of Commerce,	Port Chester, N.Y.	233
WSAZ	Chase Electric Shop	Pomeroy, Ohio	258
WSOE	School of Engineering	Milwaukee, Wisc.	246
WSB	Atlanta Journal	Atlanta, Ga.	429
WSL	J. & M. Electrical Co.	Utica, N.Y.	273
WSY	Alabama Power Co.	Birmingham, Ala.	360
	No call sign	Fall River, Mass.	360
WTAC	Penn Traffic Co.	Johnstown, Pa.	275
WTAF	Louis J. Gallo	New Orleans, La.	268
WTAG	Kern Music Co.	Providence, R.I.	258
WTAJ	The Radio Shop	Portland, Me.	236

(To be continued.)

Queries Answered

H. J. T. Q.: Using No. 40 gauge enamelled wire on ebonite tubes two inches long by ¾in. diameter, how many turns will be required on primary and secondary of a tuning transformer to get them in the right proportion? A.: If you will state the range of wave-lengths you wish to receive we will be pleased to assist you. Q.: How many turns are required on primary and secondary of audio frequency transformer? A.: For the primary, 10,000 turns No. 44 enamel and for the secondary, 40,000 turns on an iron wire core 3in. long and ½in. diameter.

B. B. N. (Annandale). Q.: Would circuit shown on p. 430, *Radio*, No. 42, give better results than a three-coil? A.: The article explains how to obtain increased range and selectivity with a two-coil circuit. Note the author states KGO has been picked up clearly in N.Z. KGO has frequently been heard by amateurs in this country using the same circuit. Q.: Would a 23 plate condenser be satisfactory in the secondary circuit? A.: Yes.

H. B. L. (Willoughby). Q.: Using 3-valve circuit (submitted), why is 2BL just audible while strong signals are received from 2FC? A.: You cannot be very far from the latter station; naturally, his signals are stronger. According to your circuit you have your primary condenser in parallel. Place this in series when receiving 2BL. Q.: Using the P1 can you suggest method of cutting out 2FC when receiving 2BL? A.: Use correct coils and an additional condenser across the plate coil shown on page 430, *Radio*, No. 42.

U. V. (Granville). Q.: Using P1 circuit, what is cause of unsatisfactory results and trouble with batteries (particulars submitted)? A.: Probably due to the following: Old cells when run down act as a series resistance in addition to generating a back E.M.F. due to internal chemical changes. When allowed to stand idle, the old cells recuperate slightly and the sudden overload on the filament may have reduced the thorium coating on this. Burn the filament at normal brilliancy for about an hour with H.T. switched off, as directed on the valve wrapper, this will restore vitality.

H. L. H. (Rockhampton). Q.: Is it necessary to have a chopper for I.C.W. transmission, or can this method of signalling be accomplished with rectified current (circuit submitted)? A.: An I.C.W. transmitter with a D.C. plate supply would require a chopper. With A.C. on the plate I.C.W. can also be obtained, as at Sydney Radio, which makes use of a 400 cycle supply. Buzzer modulation on the grid is practically equivalent to I.C.W. The position of your key is suitable for C.W. transmission. Q.: Give information for constructing a transformer to step up from 240 volts A.C. to about 600 volts A.C. A.: You will need a closed laminated core 1½in. x 1½in. in area, external dimensions 7in. x 7in. and internal 4in. x 4in. Primary 800 turns No. 20 D.C.C., secondary 2,000 turns No. 30 D.C.C. A ford coil cannot be used.

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 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.

J. G. A. (Rose Bay). Q.: Using circuit (submitted) and coils of correct value, should any difficulty be experienced in receiving Sydney amateurs? A.: No; you will, however, need smaller coils than for 2BL. Q.: Do you consider aerial in a bad position with regard to reception (sketch submitted)? A.: You will probably experience screening from stations in a direct line from Bellevue Hill and Rose Bay heights, particularly from the latter direction. This, however, will only apply to stations due east of your locality. The distance from your aerial and the former heights will be in your favour. Your aerial is otherwise O.K.

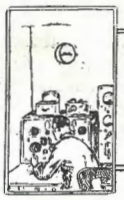
L. R. J. (Mosman). Q.: Using the P1 circuit, what is cause of difficulty in getting receiver to oscillate? A.: Suggest you carefully check up connections. Possibly valve is at fault. Replace this with another type, also try different size coils. Q.: Being deaf in one ear, would you advise disconnecting one ear-piece? A.: The best method would be to short the connections on the earpiece not required. No record of your previous letter.

V. F. B. (Clarence River). Q.: Can you advise who KGW and GE11 are? A.: KGW is *Portland Morning Oregonian*, Portland, Ore.: transmitting on a wavelength of 492 metres. No record of the latter. See this issue for list of American broadcasting stations. Your reception is excellent.

J. H. H. (Manly). Q.: Will a DER valve with a 30 ohm rheostat be suitable for low wave-lengths? A.: Yes. Q.: How many turns will be required on rotor and stator of variocoupler to receive on wavelengths from 90 to 200 metres? A.: You will get better results on these wavelengths using spiderweb or basket coils. Constructional data appeared in previous issues of *Radio*.

H. J. P. (Wodonga). Q.: Using a UV200 valve as a detector, is a grid leak necessary? A.: It is usual to use a grid leak of from ½ to two megohms, preferably variable. Q.: Are any fixed condensers necessary using circuit submitted, if so, where? A.: You will need a 'phone condenser which is usually a .001 m.f. fixed. Q.: Would a single wire aerial of about 120 feet long be more efficient than a two or four wire 50 feet long inverted L? A.: Yes, it would be advisable, however, to use aerial tuning condenser in series when receiving on short wave-lengths.

"A. B. C." (Glenelg). Q.: Can you recommend a simple circuit for receiving long distance on 80 to 100 metre wavelengths, also circuit to give good results on Morse, spark, C.W. and broadcasting from 600 to 2,500 metres? A.: Some excellent circuits are given in the *Amateurs' Book of Wireless Circuits* by Haynes, and include the one you require.



MOVEMENTS OF MARINE WIRELESS OFFICERS

NOVEMBER.

Mr. M. L. Robertson signed off s.s. *Gorgon* as senior operator at Fremantle, 21st, and signed on s.s. *Jervis Bay* as second operator at Fremantle, same date.

Mr. F. M. Basden signed on s.s. *Yarra* at Newcastle, 25th.

Mr. L. E. Ashby relieved Mr. J. Carew on s.s. *Cycle* at Sydney, 28th.

Mr. J. Carew relieved Mr. E. T. Prentice on s.s. *Echuca* at Sydney, 28th.

Mr. H. F. Hartley relieved Mr. S. G. Jones on s.s. *Wyreema* at Sydney, 28th.

Mr. R. S. Taylor rejoined s.s. *Maunganui* as senior operator at Wellington, 10th.

Mr. G. M. Whiteside signed off s.s. *Waihora* at Auckland, 8th, and relieved Mr. C. F. G. Taylor on s.s. *Ngaio* at Wellington, 20th.

Mr. C. Britcher signed on s.s. *Waihora* at Wellington, 20th.

Mr. T. J. O'Leary signed on s.s. *Ellaroo* at Melbourne, 21st.

Mr. S. G. Jones signed off s.s. *Wonganella* at Geelong, 25th.

Mr. J. S. McTavish relieved Mr. C. R. Waite on s.s. *Saros* at Melbourne, 27th.

DECEMBER.

Messrs. G. H. Hugman and R. B. Lowe signed off s.s. *Changsha* as senior and third operators, respectively, at Sydney, 1st.

Mr. W. C. Lucas signed off s.s. *Marsina* at Sydney, 2nd.

Mr. N. M. Leeder signed on s.s. *Tarcoola* at Sydney, 2nd.

Mr. W. C. Lucas relieved Mr. H. M. Watson on s.s. *Moira* at Sydney, 2nd.

Mr. A. E. Shepherd signed on s.s. *Marsina* at Sydney, 3rd.

Messrs. F. A. Cook and R. W. S. Bailey signed off s.s. *Jervis Bay* at Sydney, 3rd.

Messrs. V. M. Brooker and P. C. B. Holdsworth on s.s. *Jervis Bay* as senior and 3rd operator, respectively, at Sydney, 3rd.

WIRELESS SOCIETY OF NEWCASTLE.

ON Wednesday, December 3, at the Wireless Society of Newcastle's rooms, King Street, Newcastle, Mr. G. Seward, gave an instructive lecture to a large attendance of members on "Reflex Circuits," which was afterwards enthusiastically discussed by those present.

These lectures, which are arranged by the Technical Committee of the Society, are very popular with the members, who fully appreciate the effects of their knowledge obtained by actual experiments under local conditions, and which is far more interesting and instructive than that which can be obtained in the ordinary text book.

One new member was admitted.

Any persons interested in the activities of the club may obtain information on application to the Secretary, Mr. S. Childs, 55 Ridge Street, Merewether.

J. M. B. (Bondi). Q.: Can you advise how to receive from very short wave-lengths up to about 1800 metres using tuning coils and circuit submitted? A.: You will get better results on these wave-lengths if you use spiderweb coils for short wave reception and honeycomb coils for long wave-lengths. Your tapped inductance is not suitable for covering the wave-lengths mentioned.

A. L. S. (Rozelle). Q.: Is a double slide tuner any improvement on a single slide crystal set? A.: Yes; you will get finer tuning. Q.: Could the former be used in the loose coupler set described in *Radio*, No. 37? A.: Use the loose coupler described which is a great improvement on both the single and double slide tuner. Q.: Can the loose coupler referred to be used for receiving on wave-lengths below 200 metres? A.: You will not get satisfactory results owing to "dead end" losses. Use spiderweb coils for short wave reception.

J. D. (Peakhurst). Q.: Using basket coils, how many turns are required for receiving on wave-lengths from 100 to 300 metres? A.: Approximately 15 to 30 turns for the primary. The exact number of turns, however, depends upon the size of the aerial and will have to be found by experiment.

H. M. (Sydney). Q.: Using a Phillips BV1 four electrode valve should the extra grid be connected to the positive side of the B battery when using the P1 circuit? A.: We have no experience with this particular type of valve. This, however, is being used in America in what is known as the "Solodyne" circuit using an "A" battery only, the extra or inside grid being connected to the positive of the "A" battery. Should you desire, we will be pleased to forward you this circuit, which is claimed reproduces telephony with a clarity equalled only by the crystal.

A. B. C. (Streaky Bay). Q.: Would the two-valve receiver published on page 398, *Radio*, No. 41, be satisfactory for receiving broadcasting from Adelaide and Sydney? A.: This should give you satisfactory results on 'phones. If, however, you require to work a loud-speaker, you will need to add a stage of audio for receiving from Sydney.

G. L. (North Sydney). Q.: Can a vario-coupler be used instead of honeycomb coils in circuit (submitted), employing a four electrode valve? A.: Yes, your wave range, however, will be limited. K is a variable grid leak.

J. Y. (Black Mountain). Q.: On what wave-lengths are 2GQ, 2YA and 2HM transmitting? A.: 250, 250 and 245 metres respectively. Q.: Would a single wire aerial 150ft. long be better for receiving on a crystal than a two-wire of the same length? A.: If you wish to receive on the low amateur wavelengths, use a single wire about 100ft. long and as high as possible.

T. W. S. (Hunters Hill). Q.: Recommend a three-valve circuit comprising one stage radio, detector and audio, employing three honeycomb coils. A.: Use the circuit published on page 516, *Radio*, No. 44. Q.: Would you advise using honeycomb coils in a two-valve receiver instead of a vario-coupler? A.: Yes. Will enable you to cover a greater range of wave-lengths, which is limited with a vario-coupler. Q.: Can short and long wave-lengths be received with a fixed radio frequency transformer? A.: No, using the circuit referred to you will not need a radio transformer.

E. P. D. (Avondale). Q.: Why is the positive of the "A" battery connected to the negative of the "B" in some circuits, while in others a common negative is used? A.: Depends upon the type of valve and circuit used. Q.: What size coils are required for 2BL, using a two-wire aerial with a total length of 125ft., 30ft. high? A.: Primary 50, secondary 75, and reaction 50. The size of the primary, however, will depend upon the size of the aerial tuning condenser used, you may possibly only require a 35-turn coil. Q.: Would better results be obtained with a shorter but higher aerial, single wire? A.: Yes, preferably 100ft. horizontal.

W. A. D. (Westmere). Q.: Using four AR06 valves would better results be obtained using different type of dry cell valve? A.: These valves are not recommended as low frequency amplifiers. Use either DE3's or UV199's. Although dry cells for the former may be used for filament heating, it is advisable, if possible, to use a 4½ volt accumulator, which will give more regular discharge, while less adjustment of the filament rheostat is required. Q.: Can an extra stage of radio with plug-in transformers be used? A.: Yes. Q.: Can a one-volt valve be used with a three-volt valve? A.: Yes; you will require separate "A" battery for the former.

G. T. (Dungog). Q.: Using circuit shown on page 430, *Radio*, No. 42, what should be the capacity of the 'phone condenser, grid condenser and value of grid leak? A.: The usual capacity of the 'phone condenser is .001 m.f. fixed, and .0003 for the grid condenser, grid leak two megohms, preferably variable.

E. K. (Sydney). Q.: Using three-valve circuit (submitted) what is cause of difficulty in receiving 2FC, also howling? A.: Use the P1 circuit with two stages of audio amplification, published in *Radio*, No. 40, which should bring in all Australian and N.Z. broadcasting stations. For long distance work, use the three-valve receiver shown on p. 516, *Radio*, No. 44.

L. W. B. (Kairi, N. Q.). Q.: Using the 3-valve receiver published in *Radio*, No. 40, with a UV200 as detector and WD12's as amplifiers, with two separate "A" batteries, should the positives or negatives be connected together? A.: Connect the "A" batteries in series. Q. Is a grid leak required? A.: Although not shown, this may be used to advantage. Q.: The "A" and "B" batteries are not connected, is this correct? A.: Through an oversight, no connection is shown, this should be between the negative of the "B" and the positive of the "A."

B. P. (Mount Waverley). Q.: Is aerial 150ft., including down-lead, too long for receiving short waves using the "Low Loss Tuner" described in *Radio*, No. 32? A.: You will probably need to reduce this for receiving on wave-lengths below 200 metres. You will also require a .001 m.f. variable condenser in series. Q.: Is radio or audio frequency best for short wave receivers? A.: Either may be used; use radio for long distance work.

D. C. F. (Macedon Upper). Q.: What is wave-length range of the Autoplex circuit, using two Red Seal Manhattan Variometers? A.: This depends upon the amount of wire on the varios, we have no information regarding the particular type you mention. Q.: What should be the value of the grid leak? A.: This is usually about two megohms, preferably variable. Q.: Is circuit (submitted) correct? A.: Circuit quite O.K. You will get better results, however, using the P1, and honeycomb coils.

E. R. W. (Pymble). Q.: What plate voltage does a Marconi DER valve require? A.: Between 30 to 50 as a detector, and 60 to 80 as an amplifier. Q.: What is the filament voltage? A.: 1.5-1.8. Q.: Is a six-volt accumulator suitable for this valve? A.: No. Q.: How many valves can be worked off a six-volt accumulator? A.: This depends upon the ampere hour capacity of the accumulator, usually five or six. Every extra valve increases the load and cuts down the time the accumu-

lator can be used. Q.: What is cause of "whistling" in two-valve receiver (circuit submitted) when detector valve is not in circuit? A.: This is due to an open circuit in the primary of the audio transformer, no current flowing between the plate and filament when the latter is not heated.

F. A. W. (Northcote). Q.: Can you supply particulars for constructing a miniature crystal receiver? A. You will need to use flat inductances to get the receiver in the confined sapce you require which, however, will not give you results at the distance mentioned. You will require at least two valves for this purpose. Q.: Although signals from 3AR are satisfactory, why are signals on lower wave-lengths difficult to pick up? (Circuit of receiver and particulars of aerial submitted). A.: Your aerial is too large. Either reduce the length of this or use a condenser in series. See Efficient Crystal Receiving Circuits published in *Radio,* No. 34. Q.: Why is a buzzer necessary with a crystal set? A.: A buzzer is used to adjust the contact point on the crystal for best results, connections for this appear in the issue referred to. If you are close to the transmitting station the crystal may be adjusted by varying the point of contact, while the station is transmitting, in which case it will not be necessary to use a buzzer.

H. M. C. (Brunswick). Q.: Using the P1 circuit published in *Radio,* No. 36, what type of valve would you advise? A.: Any standard type, either dry cell or accumulator. The filament and plate voltage is usually given in the carton in which the valve is packed. Q.: Using this circuit, how would signal strength compare with the crystal receiver described in the same issue? A.: A valve being more sensitive than a crystal, you will get considerably stronger signals with a corresponding increase in range. Q.: Can a crystal be added to the above circuit? A.: No, use one of the "Crystal-Valve" circuits published in *Radio,* No. 39, full particulars are given.

K. A. (Moonee Ponds). Q.: Using circuit shown on page 380, *Radio,* No. 41, why are signals louder when positive of C battery is disconnected? A.: Connections are evidently wrong, as it would be impossible to hear signals using both valves. The negative is connected to the 1S of the transformer and the positive to the negative of the "A" battery. Q.: What is cause of interference from V.I.M. when receiving from 3LO? A.: Evidently using wrong size coils. These should be 150 and 250 for 3LO. Size of the primary depends upon the size of the aerial and condenser. This can be found by experiment. Q.: Can 30-ohm rheostats be used with UV201A valves? A.: Yes, these should be preferably 25 ohms. Q.: Are "Signal" transformers as good as "Federal' 'transformers? A.: We are unable to answer questions regarding the respective merits of various makes of apparatus.

K. R. C. (Chatswood). As pointed out in previous issues, through an oversight, no connection is shown between the "A" and "B" batteries in the three-valve circuit published in *Radio,* No. 40, this should be between the negative of the "B" and the positive of the "A," which will give a grid return from the first valve to the positive filament of the second. Although a variable grid leak is not shown, this may be used to advantage depending upon the type of valve used. Generally speaking, the resistance of a potentiometer, for the purpose used, should not be less than 300 ohms. The higher the value of the resistance, the less will be the current drawn from the L.T. battery. As the grid current necessary to prevent oscillation in an H.F. valve is generally a few micro-amperes, a current of one milliamp from the potentiometer resistance is sufficient to ensure a grid voltage proportional to the position of the potentiometer. The reason you are unable to hear 3LO or 6WF is probably due to using wrong size coils. You do not mention the sizes; try various combinations. We are unable to give you further assistance without more information such as ratio and type of transformers.

A section of the new Radio Showroom of Messrs. Harringtons, Ltd. (Sydney).

L. H. (East Maitland). Q.: Can you supply information for constructing a step-down transformer for various voltages? A.: This would take too much space to answer in these columns. Obtain a copy of *Wireless Valve Transmitters* by James.

R. W. H. (Annandale). Q.: Can you supply me with the name of any firm repairing WD12 valves? A.: No. Q.: Is circuit (submitted) suitable for a UV199 or 201A valve for short and long wave work? A.: Yes. You must, however, use the correct filament and plate voltages. For WD12's filament voltage 4.5, plate voltage 20 to 80, and for the UV201A, filament voltage 6, plate voltage 20 to 100. For long wave reception you will require one or two honeycomb coils, instead of your present tapped inductance.

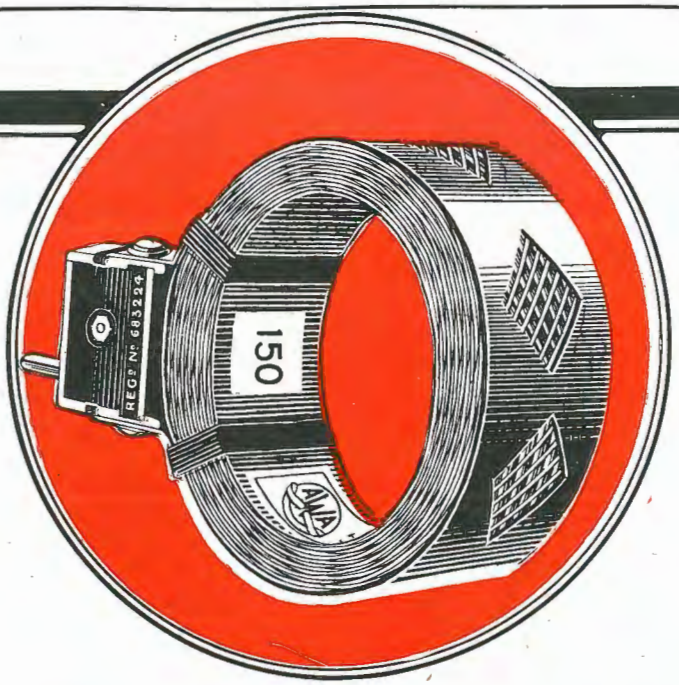
KGO HEARD IN JAPAN.

MILLIONS of people in the Orient may soon be sweeping the air for American radio programmes as a result of recent tests between KGO. the Pacific Coast General Electric station, and officials of the Japanese Ministry of Communications.

Confirming radiograms received, detailed reports by letter reached A. A. Isbell, manager of the Pacific Division of the Radio Corporation of America, from the Hon. Eitaro Yokoyama, Japanese Ministry of Communications, covering reception of the international test broadcast from KGO, August 30. After carefully checking the Japanese report with the KGO control room records, officials of the General Electric Company stated that no doubt existed but that Japanese listeners heard KGO's full two-hour broadcast.

Using a super-heterodyne receiver operators of the Hiraiso experimental station of the Electro Technical Laboratory, successfully picked up the KGO international programme and held it throughout. The Hiraiso station is situated about 500 miles northeast of Tokyo and commands the Pacific Ocean.

This is said to be the first time in history that a complete programme from an American radiophone station has been heard in Japan. Officials of the Japanese Ministry of Communications who received the broadcast are enthusiastic in their requests for more broadcasts from KGO, and that the DX radio fan will soon put in his appearance in the Orient is to be expected as a natural development.



TUNING-IN!

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20	50-260	6/9	2/-
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35	150-525	7/6	2/2
50	190-675	7/9	2/4
75	240-925	8/-	2/6
100	340-1340	8/3	2/9
150	500-1960	8/6	3/-
200	650-2675	9/-	3/6
250	725-3575	9/9	3/9
300	1050-4200	10/6	4/3
400	1600-6000	11/8	5/-
500	2000-7500	13/6	7/-
600	3000-9000	15/6	9/-
750	4000-11000	16/9	12/-
1000	4500-16000	£1/-/-	14/-
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1500	7635-22210	£1/8/-	18/-

AWA Honeycomb Coils

are mounted on Igranic Honeycomb coil plugs with a black celluloid diamond strip, and then the shoulders are specially bound with black-waved thread, which holds the coil rigidly in position.

AWA coils offer very low radio-frequency resistance, and self capacity is at a minimum. They may be used as tuning, loading, coupling, or wave-meter inductances, ensuring the highest degree of efficiency for your set.

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Lists and full particulars on application.

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