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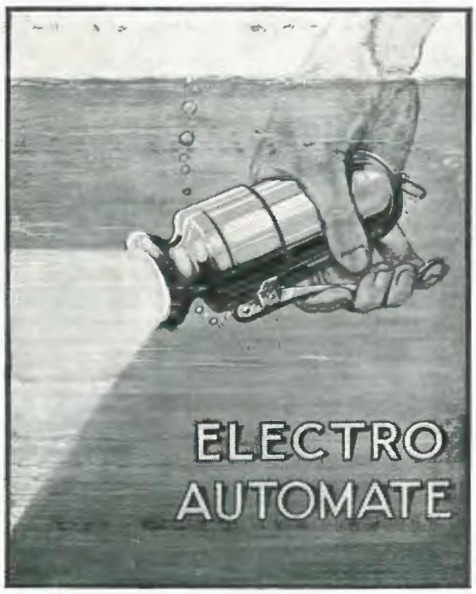

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IN AUSTRALIA & NEW ZEALAND
Incorporating "Sea, Land and Air"

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Short Wave, Low Power Wireless Telegraphy

AN examination of efficient present-day methods of wireless communication will immediately demonstrate that the possibilities of low-power short wave transmission are legion, but as yet hardly realised.

When we say short wave transmission we do not necessarily mean between 600 and 2,000 metres, but 100 metres and less. Senatore Marconi, who, without a doubt, is the greatest living authority on short wave low-power transmission, is at present, as far as is known, concentrating entirely on this phase of wireless communication.

IT is hardly necessary to state that the results he has achieved in this direction are those which go a long way to show that this is the path in which we must look for the ultimate perfection of long-distance radio transmission and reception.

Nor is Marconi by any means the only famous experimenter investigating this matter, for the foremost technical experts of Europe and America are also concentrating their faculties on the question.

To come nearer home, we have the well-known Sydney experimenter, Mr. C. D. Maclurcan, who, as a moment's recollection will show, has done some splendid work by the above means. To come right up to date, there are the recent feats of Messrs. Frank Bell and Ralph Slade, of New Zealand, who, with the aid of low power and short waves, succeeded in sustaining on several occasions two-way communication with England.

UNTIL recently such was the success achieved with long waves and high power; that is to say, the spectacular success and publicity which such efforts received, that momentarily and quite naturally the fact that less power and shorter waves may prove more successful was lost sight of.

AS Marconi says: "The progress subsequently made with the long wave system was so rapid, so comparatively easy and so spectacular that it diverted all research from the short waves. This, I think, was regrettable, for it has only recently been discovered that these waves, which alone can be in practice confined in beams with definite directions, are capable of results unobtainable by the use of lower frequency systems, which up to now have held the field for long distance radio communication."

IT is therefore apparent, when remarks of this nature come from the world's greatest wireless engineer, that they can be taken as Gospel, and it is, therefore, this Magazine's wish that Australian experimenters should turn their attention to this branch of work.

THERE is not the slightest doubt that if they apply the same concentration and application to its problems as they have to others of a radio nature in the past, they will meet with just as superlative a success and as far-reaching results.

IN fact, all those experimenters who are interested in DX work, and no experimenter worthy of the name is not, must apply themselves to this method of latest wireless communication, for practically all the most successful efforts so far put forward in attaining satisfactory communication over long distances have been made with apparatus of a kind advocated by Senatore Marconi and other authorities. The sooner this is realised the better it will be for Australasia generally and experimenters individually.

The Beam System

Results Achieved with It

Phenomenal Distances Bridged by Short Wave Directional Wireless Telegraphy

(Special to "Radio.")

LONG distance wireless communication of the future will be on a short wave directional basis. Of this there can be no doubt. One has only to consider the extraordinary results that have been secured during a period which can but yet only be considered an experimental one.

IN the early hours of the morning of June 2 last, Mr. E. T. Fisk was seated at a radio receiver at his experimental station in Sydney and heard the spoken word as it was transmitted from Poldhu, England. This transmission was effected on a power of 20 watts.

BUT a few days ago the world was electrified with the news that English and New Zealand amateurs had succeeded in both-ways radio transmission and reception on a power of about 100 watts and on wave-lengths of 90 and 140 metres.

THUS is it brought home to us the immense importance of short wave directional wireless communication, and in placing this first portion of Senator Marconi's Paper before our readers, we do so with the assurance that it will prove of absorbing interest and, in the days to come, of no little historical value.

THIS Paper, which was sent to us by Senator Marconi and is exclusive to "Radio," was read at a recent meeting of the Royal Society of Arts, London, of which the great inventor is himself a Vice-president, and was entitled, "Results obtained over very long distances by SHORT WAVE DIRECTIONAL WIRELESS TELEGRAPHY, more generally referred to as THE BEAM SYSTEM."

A STUDY of short electrical waves dates from the time of the discovery of electric waves themselves, that is, from the time of the classical experiments of Hertz and his contemporaries, over thirty-five years ago; for Hertz used short electric waves in all his experiments when he conclusively proved that these waves obeyed the same laws as the waves of light in regard to speed of propagation, reflection, refraction and defraction.

I might also, perhaps, recall the fact that when I first came to Englang, over 28 years ago, I was able to show to the late Sir William Preece, then Engineer-in-Chief of the Post Office, the transmission and reception of intelligible signals over a distance of 1¾ miles of a beam system employing short waves and reflectors, whilst, curiously enough, by means of the antenna or elevated wire system I could only get signals, at that time, over a distance of half a mile.

Many years afterwards, through the courtesy of the Post Office, I was favoured with a copy of the Official

Senator Guglielmo Marconi, G.C.V.O., LL.D., D.Sc.

Report of those early tests, which, from an historical point of view and in regard also to latest developments, makes now most interesting reading.

The progress subsequently made with the long wave system was, however, so rapid, so comparatively easy and so spectacular that it diverted all research from the short waves, and this, I think, was regrettable, for it has only recently been discovered that these waves, which alone can be in practice confined in beams to definite directions, are capable of results unobtainable by the use of the lower frequency system which, up to now, has held the field for long distance radio communication.

The late Sir William Preece described my early tests at a meeting of the British Association for the Advancement of Science, in September, 1896, and also at a lecture he delivered before the Royal Institution in London on June 4, 1897.

On March 3, 1899, I went into the matter more fully in a Paper I read before the Institution of Electrical Engineers, to which Paper I would recall your attention as being of some historical interest.

At that lecture I was able to show that it was possible, by means of short waves and reflectors, to project the rays in a beam in one direction only, instead of allowing them to spread all around, in such a way that they could not affect any receiver which happened to be out of the angle of propagation of the beam, and I described tests carried out before the Post Office Engineers at Salisbury Plains, pointing out the possibilities of such a system if applied to lighthouses and lightships, in enabling ves-

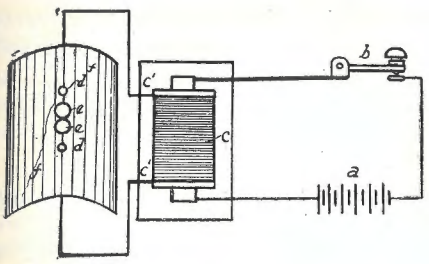


Fig. 1.—Spark Transmitter and Sheet Metal Reflector, 1896.

sels in foggy weather to locate dangerous points around the coasts.

I also showed results obtained by a reflected beam of waves projected across the lecture room, and how a telegraphic receiver could be actuated or a bell rung only when the aperture of the sending reflector was directed towards the receiver.

Since those early tests of over twenty-five years ago, and for a very long period of years afterwards, so far as I can ascertain, practically no research work was carried out, or at least published, in regard to the application of very short waves to radio communication.

Research along these lines did not appear easy or promising; the use of reflectors of reasonable dimensions implied the use of waves of only a few metres in length which with the means then at our disposal were difficult to produce, and up to a comparatively recent time the power that could be radiated by them was small. This, and the supposed high attenuation of the waves over any distance of land or sea, gave results which appeared to be rather disappointing.

Some years ago, during the War, I could not help feeling that we had, perhaps, got into a rut by confining practically all our researches and tests to what may be termed long waves, that is, waves of some thousands of feet in length, especially as I remembered that during my early experiments, in 1895 and 1896, I had obtained promising results over short distances with waves not more than a few inches long.

The investigation of the subject was therefore again taken up by me in Italy early in 1916, with the idea of utilising beams of reflected waves for certain war purposes, as I was greatly impressed with the advantages which such a system would afford in minimising tapping or interception by the enemy, besides greatly reducing the possibility of interference with our own stations.

At subsequent tests during that year and afterwards I was most valuably assisted by Mr. C. S. Franklin.

The Royal Italian Navy also gave me all possible facilities for the carrying out of my tests in Italy.

Mr. Franklin since then followed up the subject with great thoroughness, and results of his investigations were described by him in an admirable paper read before the Institution of Electrical Engineers on April 3, 1922.

At a lecture delivered by me before a joint meeting of the American Institute of Electrical Engineers and the Institute of Radio Engineers in New York, on June 20, 1922, in which I described the results obtained up to that time by Mr. Franklin and myself, I felt I could not but express the opinion that it was most regrettable that the study of the characteristics and properties of short waves and their adaptability to directive methods had been so sadly neglected, and pointed out that very many important problems in radio transmission could only be solved by the use of the short wave directional system.

The reflectors now used for this system are not composed of solid sheets of metal, such as those employed in the early tests of 1896, but of a comparatively small number of wires placed parallel to the antenna and spaced around it on a parabolic curve of which the transmitting or receiving antenna constitutes the focal line (Fig. 3), as it was soon ascertained that this was a much more practical arrangement, and that, moreover, much better results could be achieved.

Suggestions for using reflectors of this kind were made by Brown, in 1901, and by De Forest, in 1902, but many essential conditions necessary for efficiency were apparently not realised by these workers at that time, which probably explains why no application of their arrangements was made for practical purposes.

Since 1916 various patents have been taken out by myself and Mr. C. S. Franklin, and in the latest of these Mr. Franklin describes an arrangement in which the antennae and reflective wires are arranged so as to constitute grids parallel to each other, the aerials or antennae being energised simultaneously from the transmitter at a number of feeding points through a special feeding system, so as to ensure that the phase of the oscillations in all the wires is the same. It has been proved by calculations confirmed by experiments that the directional effect of such an arrangement is a function of its dimensions relative to the wave-length employed.

During my tests of 1916 I used a coupled spark transmitter and the receiver was a crystal receiver. The reflectors employed were made of a number of wires tuned to the wave used, arranged on a cylindrical parabolic curve with the aerial in the focal line.

Reflectors with apertures up to $3\frac{1}{2}$ wave-lengths were tested, and the measured polar curves agreed very well indeed with the calculated values.

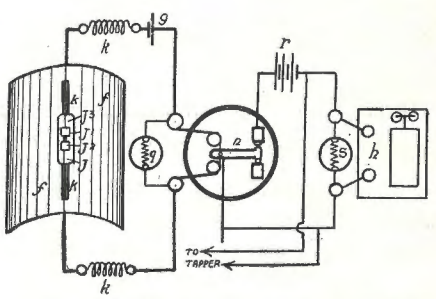


Fig. 2.—Coherer Receiver and Sheet Metal Reflector, 1898.

The Italian experiments showed that good directional working could always be obtained with reflectors properly proportioned in respect to the wave-length employed, and with the apparatus then available the range obtained was six miles.

The tests were continued in Wales at Carnarvon during 1917, and through the introduction of further improvements, with a wave-length of three metres, a range of over 20 miles was readily obtained when using a reflector at the transmitting end only.

In 1919 further experiments were commenced in which Mr. Franklin succeeded in using electron tubes or valves for the generation of very short waves, the object then being to

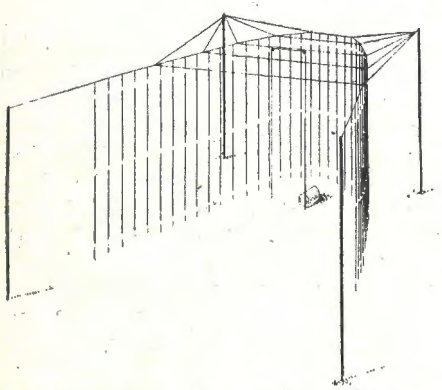


Fig. 3.—Parabolic Vertical Wire Reflector, 1923.

evolve a directional radio-telephonic system.

During further tests, and by utilising a 15 metre wave, clear and strong speech was received in Kingston Harbour, at a distance of 78 miles from Carnarvon.

At a later date these tests were repeated over a land range of 97 miles btween Hendon and Birmingham. The power supplied to the valves was approximately 700 watts, and the speech received was strong and of good quality.

The great value of the reflectors was demonstrated by average measurements made, which showed that the value of the energy received when both reflectors were used was 200 times that of the energy that could be received without reflectors.

In April, May and June of last year a series of long distance tests was carried out under my direction between a small experimental transmitting station at Poldhu, in Cornwall, and a receiver installed on the S.Y. *Elettra*.

Mr. C. S. Franklin was responsible for most of the design and operation of the transmitting arrangements at Poldhu, and Mr. G. A. Mathieu was in charge of the receiving apparatus on the yacht, where I also was present during the whole of these tests. Mr. Mathieu was able to make some valuable calculations based on the observed results, especially in regard to the absorption or attenuation of the waves brought about by sunlight.

The principal objectives of these tests were:—

(1) To ascertain the reliability of signals transmitted on approximately a 100-metre wave over considerable distances with or without the use of a transmitting reflector.

(2) To investigate the conditions which affect the propagation of short waves, and to ascertain the maximum reliable ranges obtainable by day and by night in respect to the power and wave-length employed at the sending station.

(3) To investigate and determine the angle or spread of the beam of radiation when employing a transmitting reflector, especially with regard to the possibility of establishing long distance directional wireless services.

During the tests carried out on the S.Y. *Elettra*, no receiving reflector could be employed, and it will therefore appear obvious that the strength of the received signals and the ranges covered must have been considerably less than could have been obtained had it been possible to use a fixed receiving station equipped with a suitable reflector.

(3) That any considerable amount of intervening land or mountains very seriously reduces the distance at which it is possible to communicate.

The tests carried out between Poldhu and the *Elettra* proved by the definite results obtained that the abovementioned impressions or conclusions must be erroneous, at least in so far as they may concern waves of about 100 metres long, for we observed:—

(1) That the day ranges proved to be reliable and not inconsiderable.

(2) That the night ranges were much greater than anyone, myself included, had anticipated, and no doubt very considerably exceeded the maximum distance to which I was able to proceed with the *Elettra*.

(3) That intervening land and large portions of continents, do not present any serious obstacle to the propagation of these waves.

In carrying out these tests we discovered that it is by no means correct in dealing with these waves to refer to distances covered during daylight as day-ranges, as the strength of the signals which can be received during the hours of daylight varies definitely and regularly in accordance with the mean altitude of the sun over the space or region intervening between the two stations.

This discovery, based on the observed results, makes it safe to infer that

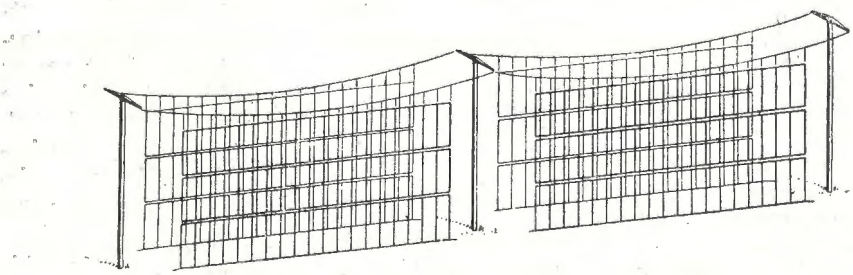


Fig. 4.—Vertical Wire Flat Transmitting Aerial and Reflector, 1924.

Up to the present time the general impression prevailing amongst most technical experts in regard to the behaviour of short waves is:—

(1) That their range during the day time is variable and short.

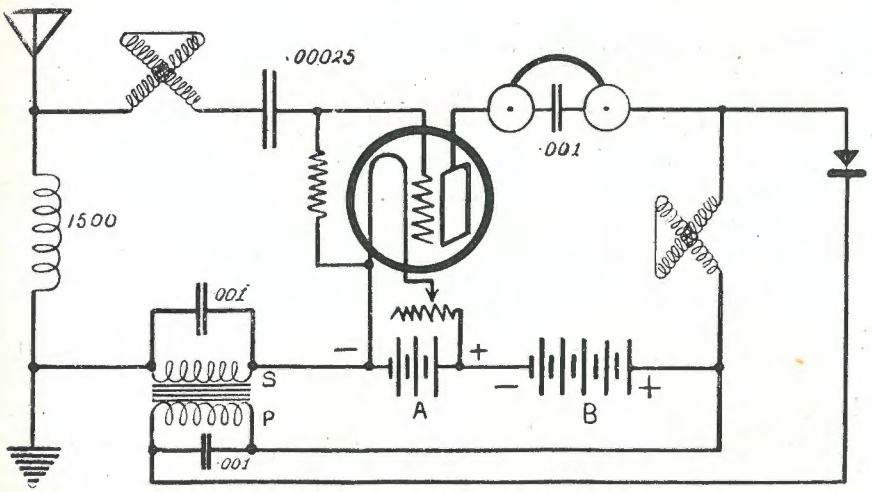
(2) That the night ranges are exceedingly variable and freaky, and altogether too unreliable to allow of the carrying out of commercial work.

our tests, which took place mainly during the months of May and June, and partly within the tropics, were carried out at the most unfavourable time of the year for daylight transmission (as the sun reaches its maximum altitudes during June in the Northern Hemisphere) and over what is a most difficult region.

(To be continued.)

Reflexing the Auto-plex

IT has been found that reflexing the autoplex circuit adds considerably to its good qualities. The parts necessary for this change are, an audio frequency amplifying transformer, two .001 microfarad fixed condensers and a crystal detector.



No changes have to be made in your regular hookup, that is, the parts you now have are not moved around. The audio frequency amplifying transformer is placed in the grid return lead between the 1500 turn coil and the negative A battery, and the crystal detector is connected in series with the primary of the audio frequency amplifying transformer and the plate variometer, as shown in the drawing. The secondary of the audio frequency transformer is in the grid return lead.

There is nothing startling in this hookup but it does increase both the range and volume of the original set without adding any more valves, and this is a desirable feature.

A long aerial may be used with the hookup as it will be found to tune quite sharply. By long aerial is meant one of about 150 feet. The long aerial will pick up quite a lot of energy and that is desirable if the set is not broadly tuned.

This outfit will work with the WD type of valves, the UV199 (making it portable) or the 201A and 301A valves The latter two giving better volume, but they should be used with a storage battery unless the installation is not to be permanent. The latter type of valves does not draw any more current than the WD valves, but does require four times the filament voltage, which makes its operation on dry cells quite expensive. If you have a car the six-volt battery in it could be used if you wished to take it with you on trips. An aerial consisting of 100 or 150 feet of wire could be used and thrown over the limb of a tree, so as to get elevation.

All three of the .001 microfarad fixed condensers should be of mica dielectric and not the paper type.

KGO's Log

EVERY minute KGO is on the air, a record or "log" is kept of each programme number and change of apparatus, giving the exact time for each. In the control room, on the second floor of the studio building, an operator tunes in on a receiver like anyone of the many in the invisible audience. It is his business to enter in the "log" the name of each number on the programme, with the time, also any changes in the equipment wth the time. A quarter of a mile away from this place, in the power house, where most of the transmitting machinery is located, a similar "log" is also kept. After each performance, these records are indexed and filed away for quick reference. From them, interesting and valuable information is secured by radio engineers seeking performance records of certain pieces of apparatus under known conditions. Without a "log" the studio manager would find it difficult to answer questions asked him by radio listeners reporting reception. Many long detailed lists are received daily at KGO, giving the numbers heard with the time. Such lists are checked carefully against the control room "log," and if they compare favourably a verification is at once sent out by letter. Listeners in distant places frequently hear speech and song and report that they were unable to distinguish the call letters of the station distinctly. When the time, musical numbers, or the exact words spoken are mentioned, it is often possible to determine to the satisfaction of the listener that it was KGO which he heard. "Logs" are found to act as a stimulus to the technical and studio staffs of KGO to improve transmission. Any sound made in the studio rooms, or even in the building, which is picked up by super-sensitive microphones, is, of course, broadcast and mentioned in the "log." This is the way responsibility is definitely fixed upon each KGO operator and the announcers for the efficient performance of their duties. Besides the control room and power house "logs," another is kept by a licensed operator, also in the control room listening continuously to ship transmission on 600 metres. This "log" shows call letters of each ship and land stations heard on 600 metres during the KGO broadcast.

From the Ends of the Earth

An Epoch in the History of Wireless Communication

How Frank Bell, N.Z., spoke to Mill Hill School, England

IN its existence RADIO has published many enthralling stories of great wireless performances, but it is to be doubted if there ever was such a one as it now places before its readers. The performances of Messrs. Bell and Slade, the New Zealand amateurs, who effected two-way communication with the young experimenters of Mill Hill School, London, have electrified the world and the relation of the story of their manner of doing this must stand as one of the most weirdly wonderful reports which has ever been set down in black and white.

(Special to "Radio.")

(By Frank Bell.)

DURING the last two months N.Z. amateurs have set the world new standards in long distance communication, using low powers on short waves from 80 to 120 metres. In October, Mr. R. J. Orbell sailed in the *Port Curtis* for England, via Cape Horn, taking a small transmitter employing an input power of 60 watts, and an efficient short wave receiver, both being of his own manufacture. Every night until he anchored in Montevideo Harbour, Mr. Orbell, who used the call x3AA, was in touch with Mr. Ivan O'Meara, 2AC, Gisborne, N.Z. From then on communication with 3AA became patchy. However, this is the most remarkable achievement in reliable amateur communication yet done, since conditions for long distance work were seldom good and often very bad indeed. 3AA also worked other amateurs in Australia and N.Z. all the way over. At 4,600 miles he exchanged messages with Mr. Dawson, 3AL, Ashburton, N.Z., while Mr. Dawson was using only twelve watts input—easily a world's record for the power. He also worked Mr. Davis, 2DS, Sydney, at 4,750 miles, whose power input was only 25 watts. The writer was the last to work him at about 7,000 miles, two days' sail out of Montevideo, but it was difficult to read his signals through very bad atmospherics.

From then on we in New Zealand were able to keep in touch with 3AA for about a week through two Argentinian amateurs, Senor Braggio, CB8, and Doctor Cattaneo, DB2. Messrs. O'Meara, 2AC, and Slade, 4AG, Dunedin, established reliable working schedules with these two men, who relayed messages to and from Mr. Orbell. Meantime, I had got into two-way communication with 6BCP and 6CGW in California on three different nights, this being the first time Australasia had got into two-way radio communication with North America.

There was then rather a slackening off in the making of world's records until this last week, owing to the very severe static which entirely blotted out all faint signals. Last Monday, October 13, Mr. O'Meara opened the ball by getting in touch with uISF, right over on the Atlantic Coast of U.S.A., which easily beat all existing records in long distance two-way communication. On Thursday, Mr. O'Meara "clicked" with c5GO, in Vancouver, B.C., this being the first communication between Australasia and Canada. The same night, Mr. Slade was heard in England, while he was calling two American amateurs and received a cable giving details of the reception next day. He was heard at 6 p.m., New Zealand time, and achieved the honour of being the first amateur to circumnavigate the globe by radio. Twenty-four hours later, at 5.30 p.m. on Friday, 17th, I logged g2OD, Mr. Simmonds, Buckinghamshire, England. I gave him a call but got no reply. Mr. Slade kept up the good work by getting in touch with u3BHV, Washington, U.S.A., and working him for about an hour.

Saturday, October 18, goes down as a red-letter day in wireless history, for on that date the first Trans-world Radio communication was accomplished. At 6.10 p.m., N.Z. time, or 5.40 a.m. Greenwich time, I heard g2SZ, the amateur station of Mill Hill School, London, call Amerian 1XAV, and say that he could not hear the American but would listen again for him on about 80 metres wave-length. My transmitter was set on 90 metres, but I thought it worth while to give him a call on chance. I must confess that I nearly threw a fit when he replied at once:—

"4AA zg 2SZ RRR QRK. If u r really z4AA cable." After that all was plain sailing, and I sent the first direct message from Australasia to Europe.

"To the Radio Society of Great Britain:

Greetings from New Zealand.

(Signed) Bell, z4AA."

He replied that he had got it correctly and sent this message:—

"To New Zealand:

Greetings from us.

(Signed) g2SZ."

We then exchanged cable addresses. I told him my power was 150 watts and radiation 1.1 amperes. It was then dusk here, but he said it was daylight there and his signals began to get weaker. He said, "Can't re-

alize u r in N.Z.," and I believe stated that his power was 200 watts. We arranged to listen for each other the following day. At 6.45 p.m. N.Z. time, his signals began to get very weak. I then sent a message to Mr. Orbell, x3AA, but was unable to read his reply, so am not sure that he copied it correctly.

I immediately cabled my congratulations, and the following day (Sunday) received the reply:—

"Bell, Waihemo, New Zealand:
Congratulations confirming first Trans-world communication to-day.
Brown, Mill Hill School."

Although Mr. Brown is the licensee of Station g2SZ, I believe Mr. C. W. Goyder was the operator at the time. Theirs is one of the finest amateur stations in England, and was one of the first to communicate with America.

z4AA employss a 50 watt (output rating) radiotron valve in a four-coil Meissner circuit, the maximum input being 150 watts, and the radiation on 90 metres being 1.1 ampere into a 90 foot vertical cage aerial, which is used in conjunction with a small counterpoise. All short wave receiving is done with a "1BGF" low loss tuner with one stage of audio frequency amplification. The transmitter has been heard all over Australasia and in several Islands in the Pacific, including Hawaii. Also off Cape Horn and at Montevideo, Uruguay, by Mr. Orbell; many times in U.S.A. and Argentina; once in Canada, and once in Alaska. My only regret is that it is impossible to get any farther than England!

Photographs of Mr. Goyder and his apparatus appear in May *Radio News* and February *Wireless World*. The gear is entirely home-made and almost as disreputable-looking as my own. I may state here that there is not a dial nor a panel in my whole transmitter. Condensers and wires sprawl all over the place, and I am always altering circuits and constants. The very day I worked 2SZ I had completely altered the aerial system, and his was the first report on my signals since the change!

Last night, Sunday, I called g2SZ at 5.45 p.m. N.Z. time and at once received a reply from g2KF, Mr. Partridge, Wimbledon, London. His signals were, if anything, louder than g2SZ, but not so steady. g2NM, Mr. Marcuse, Surrey, and g2OD, Mr. Simmonds, Bucks, also called me. z4AG, Mr. Slade, Dunedin, got into communication with g2NM, and g5LF was heard calling z4AK, Mr. Shiel, Dunedin, but, unfortunately, they did not get into satisfactory communication. After he had finished with g2NM, Mr. Slade turned round and worked u6CGO, California!

Meanwhile, I took a message of congratulation from the Radio Society of Great Britain to my Radio Society, which was forwarded to the Otago Radio Association. I then sent the compliments of the Prime Minister of New Zealand to be forwarded to g2SZ, and followed it with a message of greeting to Sir James Allen, High Commissioner for N.Z. Mr. Partridge replied by telling N.Z. amateurs that he would be listening every day for them at the same time and on the same wave. All this traffic had passed without much difficulty, but he then faded out suddenly at 6.50 p.m. our time.

On Monday, 20th, I listened in at 5.45 p.m., our time, and heard g2NM, g2OD, g2SZ, and Italian ACD, all going strong, most of them calling me. I answered g2SZ and took a message from the Headmaster of Mill Hill School to Mr. Massey, the Prime Minister. He reported my signals fainter than usual, and static very troublesome over there, and passed me on to g2SH, Mr. Hogg, of Highgate, London, who told me to listen for him at 5.30 a.m., N.Z. time. I then exchanged signals with g2KF, and finally worked g2OD until "fade out," which occurred at about 6.50 p.m. I then called "CQ" and was answered by u5DW, Greenville, Texas, U.S.A., and worked him until static became too severe to read him.

All this seems to prove that wavelengths of 100 metres and below are easily the best for long distance work. The optimum wave band is yet to be found, but we do know that American amateurs on their new wavelengths of 40 and 75 metres are much stronger and steadier than they ever were up in the region of 200 metres. Also it is only since a few of us over here shifted down below 100 metres with our receivers and transmitters that we have been so successful in our DX work. I am now trying to arrange a test between Australian and English amateurs, and I have no doubt that you will QSO England with very little trouble, provided you work on low waves. You in Australia can pick a time you have a path of complete darkness for your signals all the way over, for a period of at least an hour every day, and in this you have a big advantage, besides being a thousand miles or so nearer. We in the Dominion happen to be as far away from Britain as is possible in this small planet, and what is more awkward, we can never pick a time when there is a path of complete darkness between the two countries, since when it is dusk here it is always dawning in England.

On Tuesday, 21st, I was again in touch with British 2SZ, where Mr. R. J. Orbell, x3AA and late z3AA, who had just landed in England from the s.s. *Port Curtis*, was standing by to talk to his old friends in New Zealand. We had a long and interesting conversation—so interesting, in fact, that I quite forgot that I had three messages to send until about ten minutes before signals were due to fade out. The three messages were then put through and each one acknowledged in exactly eight minutes. This will give some idea of the ease of communication between the two countries. I think Mr. Orbell was operating, and, believe me, he wasted no time.

I also arranged that Australian amateurs should call England at 4 a.m., Melbourne time, every morning on 100 metres and g2SZ agreed to get English amateurs to listen for them.

The writer feels that the successes of the last two months have ushered in a new era of World Wireless, and feels very proud indeed that New Zealand amateurs have been so largely instrumental in bringing this about. It seems to him that when people in countries thousands of miles apart are able to chat together as if they were next door neighbours, it will do more to break down racial prejudices than all the highbrow leagues and treaties ever formulated.

An Oscillating Crystal Receiver

Transmits and Receives

(By courtesy, "Radio News.")

WE are happy to present to our readers this month an epoch-making radio invention that will be of the very greatest importance within the next few years. The young Russian inventor, Mr. O. V. Lossev, has given this invention to the world, he having taken out no patents on it.

IT is now possible to do anything and everything with a crystal that can be done with a vacuum tube. The crystal now not only detects but oscillates and can, therefore, be used for amplifying purposes in both radio and audio frequency circuits. It has already been used to transmit C.W.

THE oscillating crystal opens up an entirely new avenue to the radio experimenter.

WHILE we do not look forward to having the crystal displace the vacuum tube, nevertheless, it will become a very powerful competitor of the tube. We predict great things for the new invention.

THE diagrams, as well as a good deal of the information printed in this article, were published in "Radio News," in conjunction with "Radio Revue" of Paris.

THE term "Crystodyne" has been trade-marked by "Radio News" in the United States, as well as in Europe. Manufacturers and the trade are cautioned not to use it on any merchandise without the consent of "Radio News."

EDITOR, "Radio News."

SEVERAL experimenters have observed that some contacts such as crystal and carbon generally employed as detectors may produce un-damped oscillations of any frequency, exactly as the vacuum tube oscillator. The same contact may also be utilised as an amplifier. Oscillating crystals are not new since they were investigated as far back as 1906 by well-known engineers, but it was not until laterly that a Russian engineer, Mr. O. V. Lossev, succeeded in finding some interesting uses for oscillating crystals. The construction of the apparatus by means of which oscillations may be produced with crystal as a generator seems quite simple and should be of great interest to our readers.

Among the numerous contacts studied are pyrite carbon, chalcopyrite-zinc, galena-carbon, or zincite-carbon. The zincite-carbon and zincite-steel contacts seem to be the best producers of strong oscillations. The construction of the contact is similar to an ordinary crystal detector in which a springy piece of wire rests on a crystal. One may use as the catwhisker, a piece of carbon taken from a broken incandescent lamp, the carbon being a piece of the filament; an ordinary piece of steel wire is also suitable.

The zincite crystals may be selected but it has been proved by experiment that even a poor crystal is made much better if it is fused in an arc, and scraped to remove the outside black layer, which is not a good conductor. One may also break the crystal and use the inside surface. It is necessary to fuse the crystal in binoxide or peroxide of manganese.

To find the best conditions in which to use the crystal, one may trace its characteristic curves showing that when submitted to a certain voltage the contact acts as a negative resistance. This negative resistance explains why the crystal may be used to produce oscillations. These curves are generally similar to that of an arc or a dynatron tube. However, it is simpler to try the contact as in an ordinary detector until it functions as an audio frequency oscillator, furnishing a musical note which is heard directly in the 'phones. Once the crystal oscillates at audio frequency, it is easy to replace the audio frequency circuit by one of radio frequency, so as to have the contact functioning in the ordinary heterodyne manner.

BATTERY FURNISHES POWER.

Fig. 1 shows the connection of a circuit which is made to oscillate by the energy produced from a crystal connected to a battery. The battery may be composed of dry cells such as a "B" battery, provided its inside resistance is not too great. The voltage to apply on the contact is generally between 5 and 30 volts, depending upon the quality of the crystal. In the circuit of Fig. 1, the constants are as follows:—R is a rheostat of about 3,000 ohms resistance with variable contact. L2C2 is the audio frequency oscillating circuit, while L1C1 is the radio frequency circuit. By means of a switch K, either of these may be connected to the crystal. L2 may be a 1-henry inductance; C2, a 2-mfd. condenser; C1, a .01 mfd. condenser; and L1, a 5-millihenry variable inductance. It is preferable to use 'phones of about 300 ohms resistance in this circuit. By connecting the circuit L2C2, and by varying the tension of the battery, and the value of the resistance R, audio frequency oscillations are produced in the circuit. In order to start the radio frequency oscillations in the circuit L1C1, it is necessary to have an extra switch-point not connected to the circuit between the

two extreme ones. It is also necessary to have the high frequency resistance of the circuit L1C1 lower than that of L2C2; it is further necessary that the ratio of the co-efficients of self-inductance in the two circuits be equal to the ratio of their respective capacities. It is possible to keep the proper value of inductance and capacity at all times by using a variometer for the inductance L1, and by mounting on the same shaft the variable condenser C1, so that both are tuned at the same time, making the ratio between L1 and C1 about constant for any setting.

With the circuit of Fig. 2, it has been found possible to produce oscillations of very high frequency, the shortest wave-length obtained being 25 metres. The resistance R has a value of 2,300 ohms. The coil L1 is 2¼ inches in diameter and is composed of seven turns of No. 12 copper wire. The variable condenser C1 has a value of .003 mfd. and L3 and L4 are choke coils used to prevent the high frequency oscillations flowing through the battery circuit. To measure the wave-length, a special wave-meter was used, composed of a coil L2, which is 2¼ inches in diameter and consists of a single turn of No. 12 copper wire shunted by a variable air condenser C2 of .006 mfd. capacity.

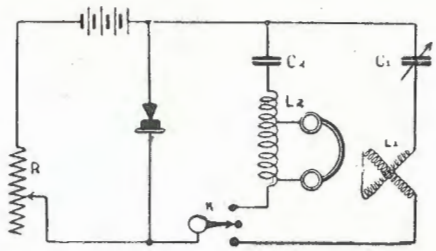


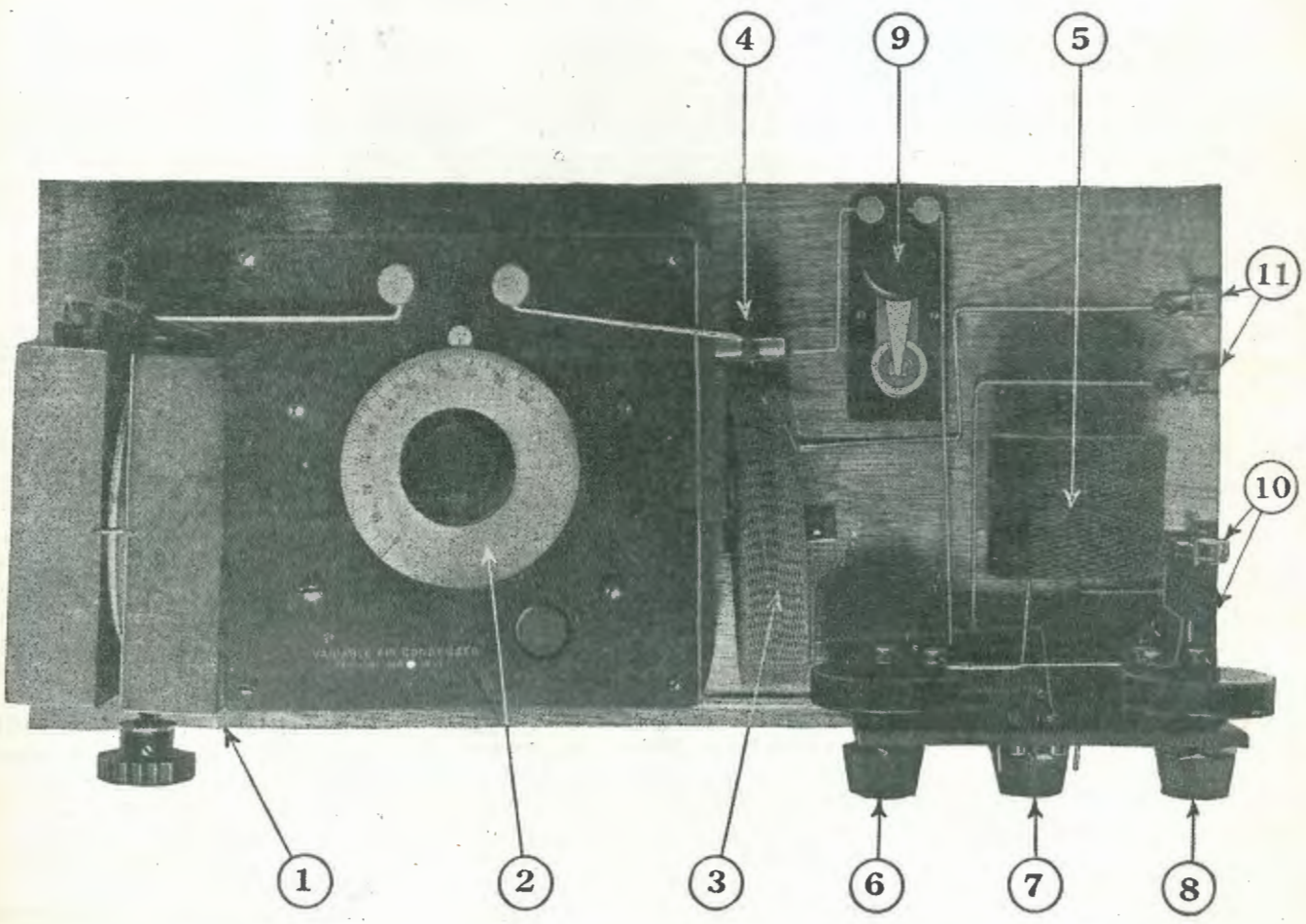
FIG. 1.
Diagram of the Oscillating Crystal Circuit. As may be seen, the hookup is similar to that of an arc transmitter.

A galena crystal detector is connected in series with a micro-ammeter, with a scale of zero to 100, allowing the operator to find the resonance point.

However, the production of short wave-lengths even with this arrangement is rather difficult, although oscillations of lower frequency may readily be produced with the same circuit.

GALENA WEAK OSCILLATOR.

Some crystals, such as galena, do not produce strong oscillations, although they may sometimes oscillate sufficiently even without any battery in the circuit to produce a beat note when continuous wave signals or a carrier wave are received. This phenomenon, which has been observed several times, explains why some amateurs using only a crystal detector, are sometimes able to receive continuous waves without an outside oscillator. It also explains how it is



Top view of the experimental panel built in the "Radio News" laboratories to produce oscillations with a crystal detector. In the picture the numbers refer to the following parts:—1, Variometer; 2, Variable Condenser; 3, Honeycomb Coil; 4, .005 Mf. Condenser; 5, Choke Coils; 6, Potentiometer; 7, Switch; 8, Resistance; 9, Zincite Steel Crystal Detector; 10, 'Phone Clips; 11, Battery Clips.

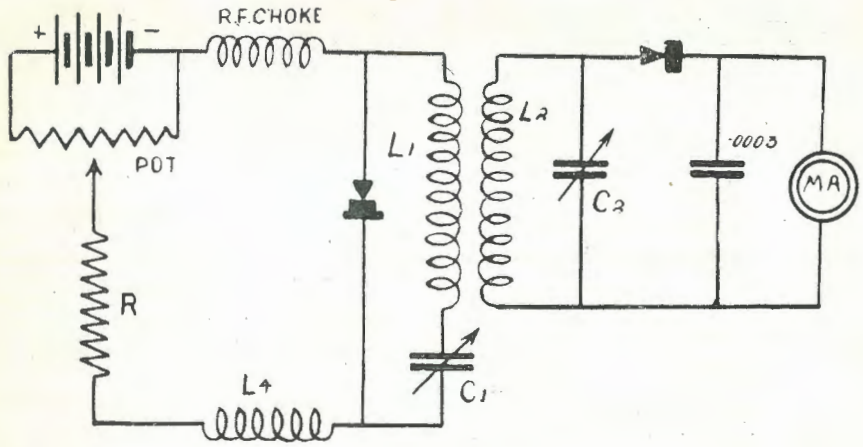
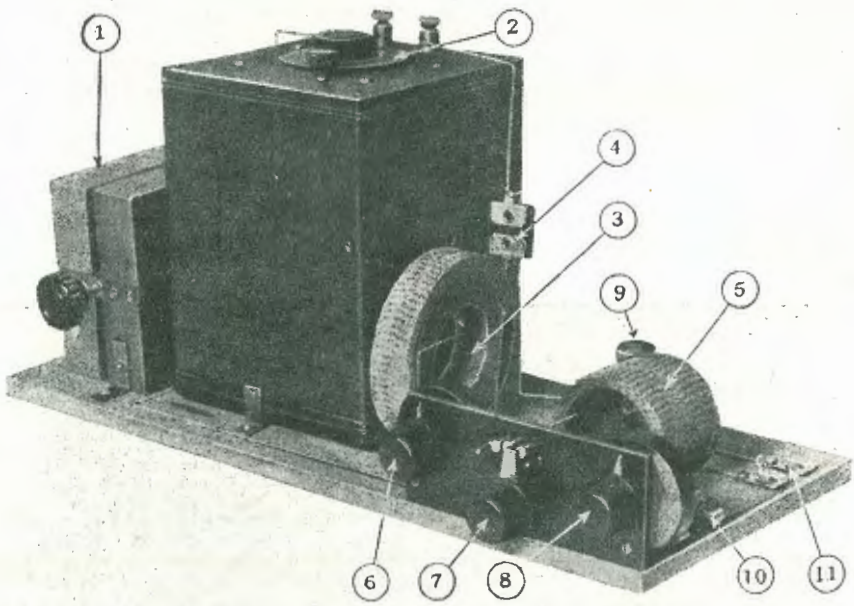


Fig. 2.—The amount of energy produced by the Oscillating Crystal may be measured with a micro-ammeter, as shown in this diagram.

tic curve; that is, the wave-length decreases if the negative resistance increases. For short wave-length, it is recommended to use a fixed condenser of .003 or .004 mfd. across the detector. This arrangement was used by Fuller, who connected fixed condensers across his arcs to improve the efficiency and stability of the circuit.

It is possible to obtain regeneration with this system by adjusting the potentiometer until the detector starts to oscillate. It is found that a strong increase of the signal strength may be obtained just below the oscillating point exactly as in a regenerative circuit. Mr. Lossev also

sometimes possible to pick up very distant broadcast stations on a crystal set installed in such a location that no radiating receivers or re-radiating structures reinforce the signal. Fig. 3 shows a practical circuit for the reception of short wave C.W. signals with an oscillating crystal similar to the one described above. The crystal may be made to oscillate first by the method explained previously; that is, by listening in the 'phones when it oscillates at audio frequency, then by means of switches the circuit of Fig. 3 may be connected to the crystal.. It should be noted that the potentiometer acts as a vernier when adjusted, because the natural period of the crystal depends upon the bend on the negative part of the characteris-



Another view of the Oscillating Crystal Set. The numbers denote the same parts as shown in the previous illustration.

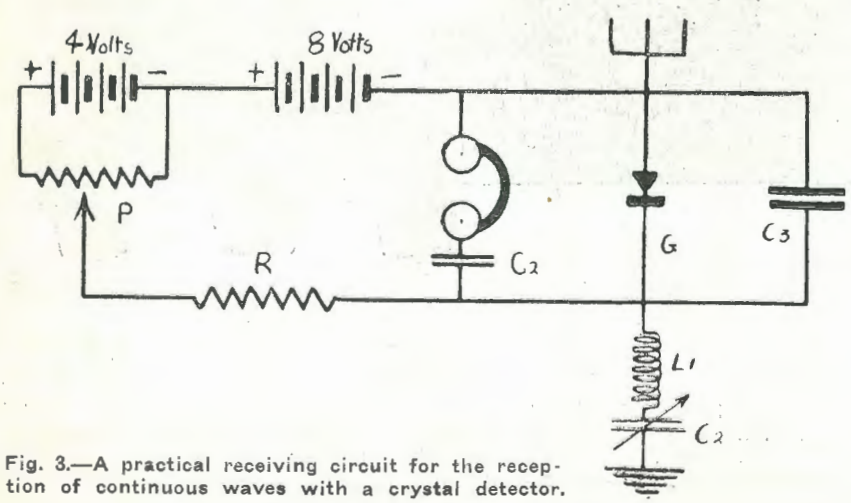


Fig. 3.—A practical receiving circuit for the reception of continuous waves with a crystal detector.

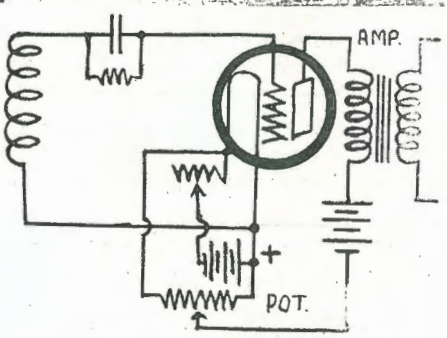
constructed a small transmitter with such crystal contacts and since he gave the information regarding the circuit to a few amateurs in Russia, they have been communicating over short distances by means of oscillating crystal transmitters. The reception is made by means of oscillating crystals connected as in Fig. 3.

The circuits shown herewith are very simple ones which may, of course, by improved upon by experimenters interested in this subject, and we shall welcome any report of results obtained by our readers with oscillating crystals.

Potentiometer Connections

THE question of whether a potentiometer being connected across the A battery would drain your battery or not, may have bothered you. In the case of storage batteries, the drain is so slight that it need not be taken into consideration unless the set is to be left idle for long periods; but where dry cell A batteries are used, some precaution should be taken to disconnect the potentiometer from the A battery.

The most common method is to have a battery switch, but this means another part in your set and while better than no means of disconnecting the potentiometer, a much simpler method is shown in the drawing. Instead of the potentiometer being connected directly across the storage battery used for filament lighting, one side of it is connected to the battery and the other to the filament. In this way, when the filament rheostat is turned off, it opens the circuit of the potentiometer as well as the filament, thus eliminating any drain on the A battery. If your set is connected in the old way it may very easily be changed by disconnecting the wire that goes from the potentiometer to negative A battery and connecting it to the socket connection of the filament, or anywhere between that point



and the rheostat. If it is connected between the rheostat and the A battery it will still be shunted around the battery.

The drawing shows a potentiometer on the detector but the same arrangement may be used on radio frequency amplifiers.

The average radio enthusiast does not realize the value of a potentiometer in his set. When used on the detector it gives a critical plate current adjustment or grid control depending which circuit it is inserted in. When used for radio frequency amplifiers it controls the grid bias and prevents these valves from howling and squealing. Their adjustment is not critical but the results obtained warrant their use in most circuits.

Occasionally you will find a receiving set that is very unstable. This can be remedied with slight loss in signal strength by inserting a potentiometer in the lead-in. That is, in series with it. While this adds considerable resistance to that circuit it will overcome the objections mentioned.

A potentiometer may be placed in series with the plate circuit to control the plate potential but a higher variable resistance would give better results.

New Zealanders' World's Record

Details of Apparatus Used

Receivers of the Low Loss Type

By R. Slade (4AG, N.Z.).
(Special to "Radio.")

HEREWITH we append details of the apparatus, etc., used at 4AA and 4AG, together with the log extending from October 16 to October 21, which, although incomplete, represents one of the most wonderful and highly interesting records of Wireless communication so far compiled.

NOWADAYS, New Zealand is known the whole world over, chiefly for two reasons: the All Blacks and the amateur transmitters. During October, 1924, the world was startled and thrilled by the great achievements accomplished by a few experimenters in instantaneously linking the furthermost portion of the British Empire with the Motherland. There never has been such a progressive period in amateur radio. Events have followed events. Records have been made one night only to be broken the next, until now there seems scarcely any further long distance records to be made.

It was a great night in N.Z. when z2AC succeeded in establishing communication with rCB8, and from that night we all commenced to look ahead. Events were very considerably speeded up by the news that z3AA ex-z1AX) was going to England on the *Port Curtis* with call x3AA, and that he would endeavour to take a transmitting and receiving station with him.

Oct. 16.—4AG's signals heard in England.
Oct. 17.—g2OD heard by z4AA, 6 p.m.
4AG worked u3BHV, 9.43—11.5 p.m.
Oct. 18.—z4AA worked g2SZ from 6.10—6.50 p.m.
z4AG and z2AC worked u1KC.
Oct. 19.—z4AA worked g2SZ, 5.50 to —— p.m.
z4AG worked g2NM, 6.28—6.45 p.m.
g2NM and g2OD were heard calling z4AA, and g5LF was heard calling z4AK.
z4AG worked u6CGO, 7.46—8.55 p.m. (QRM spark coil.)
z4AA also worked g2KF and sent a msg. to Sir James Allen from Mr. Massey, Prime Minister.
Oct. 20.—g2NM heard and called z4AG, but could not work—due to QRM, 5.58 and 6.13 p.m.
g2OD heard calling z4AA, 6.10.
g2SH heard calling z4AA, 6.15.
g2SH heard calling z4AG, 4AA, 4AK, 6.37.
g2SZ heard calling z4AK, 6.43.
g2SZ worked z4AG, 6.45—6.55. (QRM spark coil.)
z4AA worked u5DW, 7.6 to ——
Oct. 21.—g5NN called z4AG and z4AA, 6.13.
g2NM called z4AK, 6.17, 6.25, 6.29.
g2SZ called z4AA, 6.30, and they worked O.K. Mr. Orbell was on the key at g2SZ and a friendly chat ensued until the Englishman's signals faded out.
g2OD called 4AG, 6.40—6.55, and worked for few minutes but QRM too bad.
(The above log is not complete and does not register all the calls which were probably being transmitted.)

Well we all know how successful many were in maintaining communication with Mr. Orbell. (Here we may specially mention a2DS, Mr. Davis, who worked x3AA at 4,900 m.) Even after the *Port Curtis* rounded Cape Horn, we were still able to communicate. After we had lost direct contact with him, we made rCB8 (Mr. C. Braggio's, Argentine), a midway relay station and were thus enabled to keep in touch with x3AA till he was north of Pernambuco. 2AC is to be congratulated for working x3AA on fone at a distance of 5.700 miles (and 4AG on fone at a distance of 5,000 m.) Taking into consideration the late happenings it is probable that he heard our signals as far as England. In the meantime, z4AA was fortunate in being the first New Zealander to work an American. To date, z4AA, 2AC, 4AG, have several times worked several different U.S.A. stations, and, strange to relate, the easiest Americans to work seem those on the East Coast.

All previous DX records sank into oblivion when z4AG received a cable from "Wireless World, Radionic, London," on October 18, 1924, stating: "Heard you eighty metres 0630 calling u5MI u6ARB. Confirm." The cable was sent from London on October 16 and the log of z4AG checks entirely to the time and calls given in the cable. z4AA was immediately communicated with and the same night (October 18) z4AA knocked to ——?? z4AG's world's record. (Records do not last long nowadays, hi!)

Since that epoch-making night of October 18, z4AA, 4AK and 4AG have all been copied in England. z4AA and 4AG have shot across several messages and collected quite a few. 4AA has ideal conditions, being over 30 miles from any interference; but z4AK and 4AG being in the town of Dunedin have considerable difficulty in copying the English signals through power leaks, howling valves, and *maliciously operated spark coils.* The English signals are QSA on one valve but it is becoming more and

(*Continued on page* 479.)

BE LOGICAL!

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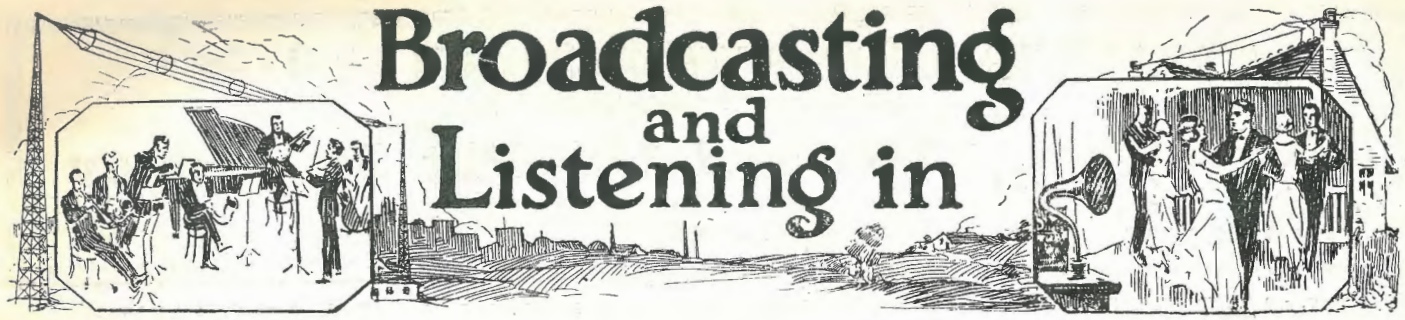


NO longer will those N.S.W. experimenters and listeners who use a sewer ventilating shaft as an aerial mast be allowed to do so. The Water Board has decided to prohibit their use as such for reasons of safety.

2FC

BROADCASTING TIMES.

Sydney Mean Time.
Wave Length: 1100 metres.

Midday Session:
12.55 Tune in to the Studio Chimes.
12.58 Time Signals from Farmer's Master Clock (Sydney Observatory Time), Stock Exchange Intelligence, Weather News, "Sydney Morning Herald" news and cable service, "Evening News" midday news bulletin.
1.15 Close down.

Afternoon Session:
3.30 Studio Chimes.
3.33 Musical programme by Farmer's Orchestra broadcast direct from Farmer's Oak Luncheon Hall. Numbers will be played at intervals to 4.45.
4.45 Stock Exchange, weather, afternoon news.
5.0 Close down.

Early Evening Session:
6.30 Studio Chimes.
6.33 Children's Hour.
7.0 Dalgety's Market Reports, Fruit and Vegetable Markets, Stock Exchange, Shipping News, Sussex Street Markets, Late News.
Late News.
7.15 Close down.

Night Session:
8.0 to 10.0 — Entertainment. See list hereunder.

EVENING ENTERTAINMENT.

As far as possible the following schedule is adhered to:—

Monday:	Theatre Night.
Tuesday:	Popular Concert
Wednesday:	Studio Concert.
Thursday:	Studio Concert.
Friday:	Classical Night.
Saturday:	Jazz Night.
Sunday:	Semi-Sacred Concert (7.30 to 9.30 p.m.).

A MELBOURNE movie theatre recently installed a loud-speaker in front of the box-office. Passers-by could then hear the actual music as it was being played inside. It is said that the police worked overtime keeping the crowds back.

THE latest make-shift loud-speaker has taken the form of a violin. A delicate receiver is connected to the bridge just underneath the strings, and when tuned and amplified the music heard is delightfully sweet and free from all harshness.

SOME weeks back, says a Melbourne paper, a city barber started to sell radio goods and partitioned off half his window for their display. That was his bright idea. Others have followed it and receiving sets, condensers, loud-speakers and head-'phones are thrusting their way into spaces that have long been sacred to capstans, French pipes and shaving brushes. Does their presence there mean that the retailing of radio goods is to grow into one of the normal activities of barbers? Is the barber of to-day to be the radio dealer of to-morrow?

RECENTLY, for the first time in Victoria, church services were broadcast from St. Paul's Cathedral and Wesley Church. There were large congregations at both places of worship and the incident was regarded as unique.

IN Paris, at the moment, there is a shortage of choir-boys and so it has been suggested that the situation could be relieved by putting the other churches in wireless communication with Notre Dame and by concentrating in the cathedral a large choir, the voices and music could then be broadcast to such churches in other parts of the country which had no choir of their own.

A COMPREHENSIVE scheme for the instruction of school children in wireless is now being considered by the Queensland Education Department.

SPEAKING in the New South Wales Legislative Assembly the other day, the Minister for Education said that wireless apparatus had been installed in 72 schools.

6WF

BROADCASTING TIMES.

Perth Mean Time.
Wave Length: 1250 metres.

Midday Session:
12.30 Tune in to Sonora.
12.35 Market Reports of The Westralian Farmers, Limited.
12.42 News Service.
12.55 Weather Report.
1.0 Time Signal.
1.1 to 1.30 — Sonora and Pianola.
1.31 Close down.

Afternoon Session:
3.0 Tune in to Piano Player (Duo-Art).
3.5 to 4.0 — Special programme, comprising talks, Sonora and Pianola.
4.1 Close down.

Early Evening Session:
7.0 Tune in to Sonora.
7.5 Bedtime Stories.
7.45 Market Reports.
7.55 Weather Reports.
8.0 Time Signal.
8.2 News Cables.

Night Sessions:

NIGHT SESSIONS.

Monday:	8.10, A Lecture; 8.45, Music, Pianolo and Sonora.
Tuesday:	8.10, Professional Concert.
Wednesday:	8.10, Concert Evening.
Thursday:	8.10, Professional Concert.
Friday:	8.10, Talk on Wireless to Amateurs by a Representative of the Affiliated Radio Society; 8.45, Concert Evening.
Saturday:	No Saturday afternoon, only from 12 to 1, and again at 7.0. 8.10, The Wesfarmers Studio Cabaret Jazz Orchestra, under the direction of Irwin Lawrence.
Sunday:	7.30, Mr. C. H. Coff's Choir. Close down at 9 p.m.

With the exception of Saturday, when the station closes down at 10.30 p.m., all other evening sessions conclude at 10 p.m.

AN enterprising radio dealer at King's Cross, Sydney, has a bright slogan prominently displayed in his window. It reads: "You've Stopped; You've Looked—Now come in and Listen!"

THROUGH the medium of wireless telephony President Coolidge was recently enabled to broadcast a message of hope for the future peace of the world to, it is computed, 25,000,000 United States citizens.

"I CANNOT understand why anyone should object to a preacher's message being heard by 5000 or more rather than 50," the Rev. J. E. James, of Melbourne, is reported to have said. "The broadcasting does not affect the service in the church at all. Indeed a preacher forgets all about the microphone when he really gets going. It simply adds a great unseen audience to the group worshipping in the church and that unseen audience can be just as reverent as the folks in church. There are plenty of good Christian folk who are shut up or unable to attend service. The radio brings the service to them. It is the Gospel going out to the ends of the world and I am thankful that this great opportunity is now given us."

STEPS are being taken by the authorities, so that within the next few months all the lighthouses on the coast of Great Britain will be equipped with transmitting sets with skilled operators in charge, in addition to the usual staff concerned in the operation of the beacon lights. Already experiments have been carried out in several lighthouses, and these have proved so satisfactory that the decision has been arrived at that the remainder shall be fitted out in the same manner.

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.

IN England, one of the latest positions captured by wireless receiving sets has been in the mental hospitals, and now in several of these institutions radio apparatus has been installed with loud-speaking apparatus for the benefit of the unfortunate inmates.

SEVERAL wireless exhibitions have been arranged to take place during the next six months, both in England and on the Continent. Two British exhibitions have been already held, one at Manchester and an "All-British" exhibition in London. Then there is the World's Radio Fair, to be held in New York. Sweden has the distinction of holding the first exhibition this "season," namely, the one held at Gothenburg recently in connection with the Great Swedish Fair.

An Aerial Mast for £8-12s.

A STRONG, efficient, and inexpensive wireless mast may quite easily be erected if the instructions given in the following article are carried out.

The gear required comprises three lengths, about seventeen feet each, of galvanised water or steam piping, the lower section being of 1½in. piping, the middle section 1in., and the top section ¾in. These lengths are connected by the necessary sockets.

A tee arm is fitted to the top section by means of a "T" socket ¾in. to the mast and ½in. through, two 24in. lengths of piping forming the "T" arms. A pulley is attached to the end of either arm to take the halyards for hoisting and lowering the aerials.

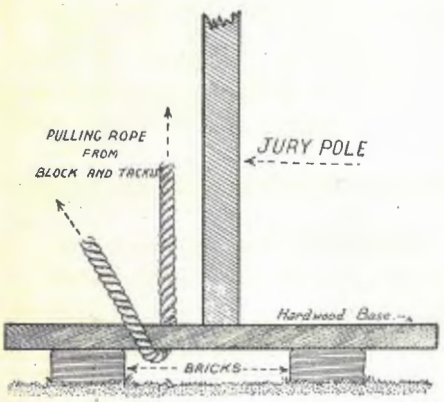


Fig. 1.—Showing how to erect the jury pole.

The mast rests on a white porcelain insulator (petticoat type). This insulator is let into a block of hardwood well soaked in paraffin wax, and the whole set in concrete. This method thoroughly insulates the metal mast from the earth.

Stranded wire guys are fastened to the mast by means of four-point mast bands, obtainable at any ship-chandlers, and these bands may be bolted or screwed to the mast, or in the case of the two lower bands allowed to rest on the reducing sockets. The guy wires are attached to the masts by means of shackles.

Stranded galvanised wire of the ordinary clothes line variety is ideal for guys. It is strong, is easily spliced and does not rust. Three sets of four guys each, totalling twelve guys, are required, one set at the joint of the bottom and middle sections, one at the joint of the middle and top sections, and one six feet from the top. Strain insulators are inserted every sixteen feet. Guys are anchored to "dead-men" set in concrete, or should rock be available, eye bolts may be cemented into it.

The distance from the base of the mast to anchor should be half the height of the mast, but if this amount of ground is not available an 18 feet base is quite sufficient.

Wire strainers or turn bucklers are placed at the joint of the attachment of guys and the "dead-men" anchors, for the final adjustment and tightening of guy wires.

The enthusiast who desires to erect such a mast, after having planned out the ground, should make the concrete base and guy anchors and allow them one week to set.

In the meantime the guys may be cut and spliced to the right length. When all these have been prepared and the insulators spliced in their right places, a block and tackle and a jury pole about twenty five feet high, should be obtained and guyed temporarily a few inches away from the intended base of the mast, the block and tackle having been first attached to the top. The middle and top sections should then be screwed together, the top section being completed with the "T" arm and pulley, and with the halyards attached.

When the guys are attached to the mast bands, the completed sections should, with the aid of a few assistants, be hoisted upright against the jury pole. Assistants should then be placed at each of the four opposite points where the guys are to be anchored. The block should be attached and a start made to hoist. As the sections lift the assistants should pay out the guys, though still keeping enough strain on them to keep the sections upright. The top sections will thus be hoisted high enough to allow the bottom section to be placed upright underneath and screwed into place. The whole should then be lowered on to the insulator, the guys made fast, and the jury mast dismantled. In erecting the jury pole it is a good plan to place the base on a stout piece of wood across two bricks, as shown in Fig. 1. The pulling rope of the block and tackle is given a turn round the piece of wood shown in the diagram, thus taking the strain off the rope during each lift.

The pole described in this article was designed with a view to its use as

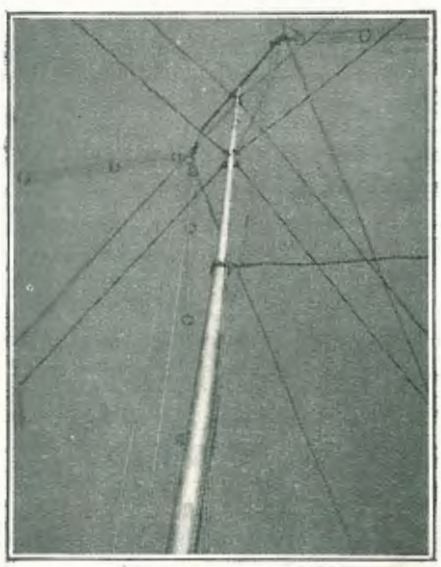


Fig 2.—Here the pole is shown as a support for a transmitting aerial.

Fig. 3.—The base of the mast rests on a white porcelain (petticoat type) insulator, which is let into a block of hardwood.

a support for a transmitting aerial. The following list will give the reader an idea of materials required and the itemised costs. It will be noted that the total cost is most reasonable.

MATERIAL REQUIRED.

	£	s.	d.
3 17 ft. lengths of piping ..	1	18	0
2 Reducing sockets	0	3	6
1 "T" ¾in.—½in. through	0	1	6
2 24in. lengths of ½in. piping	0	2	10
3 Brass, 4 point mast bands	0	14	0
12 Brass or galvanised buckles	1	16	0
36 Thibles and shackles ...	1	2	0
2 Brass pulleys combined with coach screw	0	7	0
500 feet galvanised clothes line	0	12	6
200 feet 3/8 rope	0	7	0
4 eyebolts	0	8	0
2 Doz. porcelain strain insulators	0	16	0
1 large insulator for base ..	0	1	8
Cement	0	2	0
TOTAL COST £8	12	0	

PRESENTATION TO MR. S. E. TATHAM.

A LARGE number of the members of the various departments of Amalgamated Wireless (Australasia) Limited were present one day last month on the occasion of a farewell presentation to Mr. S. E. Tatham, who resigned the positions of Manager of The Wireless Press and Managing Editor of *Radio*. The tokens of regard took the form of a handsome gold dress-watch and chain, together with a silver matchbox.

In making the presentation, Mr. E. T. Fisk, Managing Director, enumerated many of Mr. Tatham's fine qualities and, in referring to the fact of the splendid manner in which he had risen in the Company's service, wished him the very greatest success in his new sphere.

Mr. Tatham suitably responded.

ANOTHER "BURGINPHONE" SUCCESS.

IN a letter to the Burgin Electric Company, Sydney, the Principal of the West Maitland (N.S.W.) High School, where is installed a Burginphone receiver, writes:—I know that you will be pleased to hear that I picked up Melbourne last night. We heard the whole of the opera on the loud-speaker—we could easily distinguish the individual singers—and Melba was beautiful.

HIS SISTER'S VOICE.

ONE of Hobart's keenest experimenters is Mr. Cyril Monks, of "Lenna," Battery Pt. He was "sparks" on the H.M.A.S. *Australia* and *Huon* during the war period and had many thrilling adventures with enemy submarines and cruisers. The other day Mr. Monks had an uncommon experience when, with his brother, he listened-in to 2BL and heard his sister, Miss Bertha Monks, singing for Sydney Broadcasters. "Down in the Forest," and "Songs My Mother Taught Me" were among the pieces picked up, every word being heard perfectly.

Crystals

(By an Officer of the Sydney Mining Museum.)

BEFORE the electric waves utilised in Wireless Telephony can affect a telephone receiver the alternating current from the transmitting station must be converted to direct current. Certain minerals have the poperty of producing this effect (it is not known how), and are used very extensively in the simpler forms of wireless receivers. These are known as "crystals."

There are important points of difference between the minerals in common use, and as several factors have to be considered, it is not possible to say definitely that one should be tested for suitability, and the seller should give a guarantee to that effect. Pieces from the same specimen will be found to vary both in the abundance of sensitive "points," and in the strength of the signals obtained.

Until lately, all crystals used have been imported; but it has been the object of the Museum to substitute for these minerals obtained locally, and considerable success has been attained. In the case of three of these, material equal to or better than that imported can now be procured regularly from Australian mines, and is now on sale. It is therefore "up to us" to demand local crystals and thus keep money in the country.

GALENA (Sulphide of lead): A soft mineral, varying much in appearance. It is easily damaged by rough handling or by heat. The surface of even the best crystal is not uniformly sensitive, and search must be made for suitable "points." The appearance of galena is no guide whatever to its suitability. Equally good results may be obtained from pieces varying greatly in appearance, and, on the other hand, of two identical pieces one may be good, the other useless.

At present, suitable galena can be obtained from two mines in New South Wales, and some excellent material from West Australia and Tasmania has been sold.

Some of the imported crystals sold under various trade names are really nothing but galena. Some of these are what is known as synthetic galena, and consist of sulphur and lead melted together with suitable precautions.

PYRITE (iron pyrites; sulphide of iron): Unlike galena, pyrite is hard and not easily damaged. Like galena, it is not sensitive all over. Most pyrite is granular in structure, and seems to be quite useless. Present indications are that the more nearly broken surface resembles polished brass, the better the crystal. None the less, every piece should be tested and sold under guarantee. Excellent pyrites equal to that imported is procurable from one locality in the State.

MOLYBDENITE (sulphide of molybdenum): A very soft, cleavable mineral, the usefulness of which, however, is not impaired by splitting. It is not so well-known as galena and pyrite, but has much to recommend it. Most pieces will give good results, and it is sensitive practically all over. A strip of silver or aluminium can be used instead of a catwhisker, and such a connection is not easily dislodged. It is "foolproof," as it were. Excellent molybdenite from a New South Wales mine is obtainable readily.

PERIKON DETECTORS: As generally understood these involve the use of zincite (oxide or zinc), working with bornite or copper pyrites (sulphides of copper and iron) instead of a catwhisker. Zincite is procurable only from one locality in the world, and its discovery in Australia is unlikely. Bornite and copper pyrites that give excellent results are known here, but so far no adequate supply is available. For the present, therefore, we must rely on importation for perikon, but it is expected that an excellent local bornite will be available shortly.

It is well to remember crystals should not be touched with the fingers, and it may be necessary to clean them occasionally to remove films of grease.

At present, three brands of New South Wales crystals are known to be on the market, namely, "Sacrystal," "Molesworth Standardised" and "Neibeck."

CALL LETTERS AND WAVE-LENGTHS OF AMATEURS TRANSMITTING IN OTAGO, N.Z.

			W/L.			Power in watts
*	4AA	Bell, F. D., Waihemo, Palmerston South	155	165	175	50
*	4AB	Otago Radio Association	100	300	(Spl.)	50
*	4AC	Robinson, R. E., Dundas Street, Dunedin	155	165	175	50
*	4AD	Jordan, A. E., 17 Biggar Street, Invercargill	155	165	175	50
†	4AG	Slade, R., 15 Harbour Terrace, Dunedin		140		5
†	4AJ	McGeorge, C. N. D., 131 Eglinton Rd., Mornington, D'n.		140		5
†	4AH	McDonald, I. S., 21 Melrose Street, Roslyn, Dunedin		140		5
†	4AK	Shiel, W. L., 103 Macandrew Road, South Dunedin		140		5
†	4AL	Grubb, A. H. M., 53 Sligo Terrace, Roslyn, Dunedin		140		5
†	4AM	Crockett, W. M., 18 Chambers St., N.E. Valley, Dunedin		140		3.5
†	4AO	Scott, T. E., 639 Cumberland Street, Dunedin		140		5
*	4AP	Reed, G. J., Esk Street, Invercargill	160	170	180	15
*	4AQ	Arundel, N., 26 Moray Place, Dunedin	160	170	180	50
†	4AR	Wilkinson, W. G., 21 Melrose Street, Roslyn, Dunedin		140		5
Ex.	4XO	University of Otago, Dunedin (Experimental)		395		500
B	4YA	O'Neill, F. J., 219 Moray Place, Dunedin (Broadcast)		370		500
B	4YO	Radio Supply Co., 26 Moray Place, Dunedin		370		500

* Signifies a Grade I. Amateur Transmitting Station.
† Signifies a Grade II. Amateur Transmitting Station.
Ex. Signifies an Experimental Station.
B Signifies a Broadcasting Station.

4YO The Radio Supply Co. closed down some time ago.

4AB Transmit children's stories and nursery rhymes from 7.30 to 8 p.m. every Tuesday and Thursday evenings, and from 8 to 10 p.m., a programme suitable for adults.

DX Notes—and Other Things

By Chas. Maclurcan (2CM).

We have pleasure in placing before our readers another batch of "DX Notes—and Other Things"—particularly the "Other Things"—from the Puck-ish pen of Mr. C. D. Maclurcan.

Below will be found a photograph of the audibility metres used at 2CM, and our reason for publishing it is to make it serve as a kind of advance notice, for it is Mr. Maclurcan's and our ambition to see at least one in every State of the Commonwealth. In order, then, to assist towards this, Mr. Maclurcan is writing a constructional article on how to make it, which will appear in an early issue of "Radio."

THE question of the month is, "Is it?—or are we?" No, the answer is not, "I don't suppose so—so they tell me," nor is the answer "a lemon."

What prompts this question is the latest record put over by Frank Bell, Z4AA. Oh, no! Nothing much, just worked a couple of "hams" in England, whilst waiting for Sister Bell to ring the Bell for tea. And, like the

Mr. C. D. Maclurcan.

man who took on the bet that he could drink a bucket of beer, first drinking one bucket on the quiet, just too see if he could do it, Frank repeated the dose next night, just to see if it could be done. I understand that Frank then put the other N.Z. ether-busters on to "London—where the King lives" and that several others (I think, 2AC and 4AG) also "clicked."

Now, "Is it" due to the position of New Zealand? Is it due to the extra 1½ hours darkness they have? "Is it" due to absence of Q.R.N. or "is it" due to the way they part their hair?

"Or are we" Aussies "dud" operators, working "dud" stations?

Now, you get a gum-drop for the correct answer!

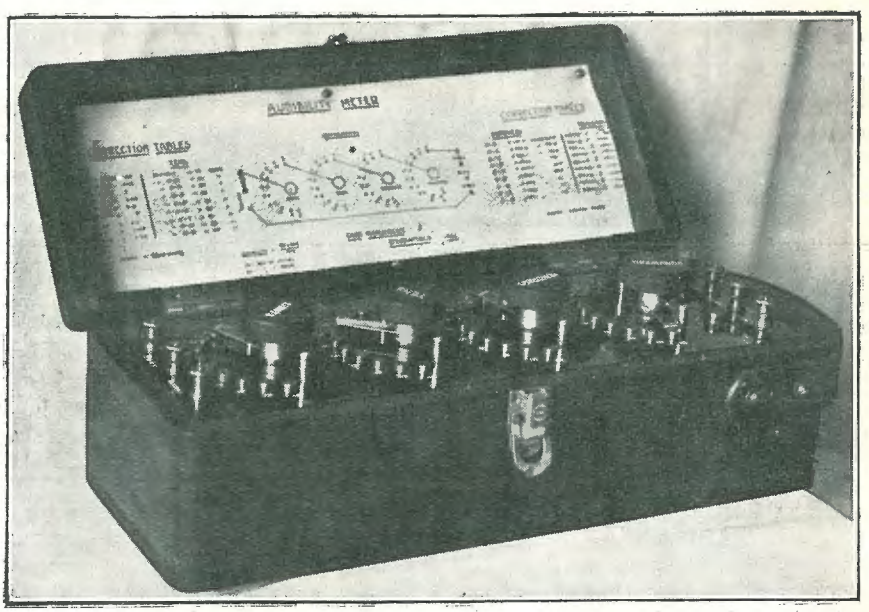
We know they certainly have it all over us on the reception side, for—as I mentioned in my last "DX Notes"—2DS and I had "been there and 'ad sum."

But what about our transmitters? You, 3BD and 3BQ, 2LO and "lil" 2CM. We are told that we put out quite a signal but seems to me it must be a relapse before travelling too far. Only last night 6CGW called 2CM. I replied straight away—like a "puffick gentleman." But, alas! he did not get me. Is there anybody with five bob that would like a splendid little wireless station, guaranteed to work 100 miles night time, yes, and an audibility meter chucked in, too?

The silent hours agreed upon by N.S.W. experimenters seem to be working well. The B.C.L.'s haven't much to growl about now.

3BQ has increased his signal strength tremendously of late. He is a bit unstable at times, though. He says it is due to increasing the number of rectifier jars in his set—anyway, it is all to the good.

Talking of chemical rectifiers—2DS has also increased his radiation and strength by using electrolytics and Kenotrons in the diamond form of connection. It raised his voltage considerably as witness the decease of a 5-watter soon after.



One form of Audibility Meter used at 2CM. This is simply a resistance box, variable in steps of one ohm up to 40,000 ohms. The telephone receivers are shunted by this instrument and the resistance reduced until the signal is just audible.

2BK has been off the air lately—making a new transmitter, using spider web coils. Worked him for a short while on Sunday morning—and his 'fone seems very good.

Wireless Weekly transmitting tests have just been concluded, and results are not yet to hand. These tests lasted a week and the following stations took part in them:—2CM, 2JM, 2DS, 2BF, 2YI, 2BB, 2DK, 2CS, 2DE.

Starting at 10 p.m., each station transmitted for 10 minutes, sending C.W., I.C.W., and 'phone. Listeners in the country had been supplied with log sheets to make full notes of all reception, and some interesting results are expected.

A2YI has had a try with the shorter waves. He worked 3BQ in daylight on about 140 metres and is highly delighted.

2LO has been off the air for some time—I believe he is away from home.

2DE, Phil Renshaw, has just returned from Brisbane, where he has been pouring oil (dinkum) on Institute troubled waters. 2DE has a new transmitter and two perfectly good 60 ft. masts, so its no wonder he started off by working S.A. and 4AN, Queensland.

2ED and 2CI have been off the air for some time now, so also has 2ZG.

2JM perks up as usual and is getting fine results.

Now, folks, above are some audibilities and notes. You want to notice particularly the dates and times, so that you may refer to your log and see why.

Date.	Time.	Call.	W/L.	Audibility.	Notes.
Sun. Sept. 28	8.50 p.m.	Z4AA	122	250	
„ „		Z1AO		250	
Tue. Sept. 31	7.5 p.m.	Z4AG		94	
„ „	7.15 p.m.	Z4AA		64	
Thur. Oct. 2	6.30 p.m.	Z4AA		120	
Fri. Oct. 3		Z1AO		58	
Fri. Oct. 3	9.15 p.m.	Z3AD		22	
Sat. Oct. 4	6.10 p.m.	Z4AG		64	
„ „	6.10 p.m.	Z2AG		58	
„ „	7.10 p.m.	A3BD		650	
„ „		3AL		18	
Sun. Oct. 5	5.50 p.m.	Z4AA		22	
„ „		Z4AK	96	46	
„ „	6.20 p.m.	A3BD	125	94	Has reduced W/L. not as good as before. Note higher but has bad ripple and is confused with a second note.
Sun. Oct. 5	6.20 p.m.	A3BD	125	94	
„ „	6.30 p.m.	A3BQ	112	300	High, clear note but wavery and unstable.
„ „		A3XF		7	Note like a duck quacking.
„ „	7.20 p.m.	Z4AK	95	36	Calls CQ too long before signing.
„ „		Z4AG		150	Note rough and slightly unstable.
„ „	7.35 p.m.	Z2AG		36	
„ „	8.30 p.m.	Z2AG		250	
„ „	9.10 p.m.	A3BQ		500-1500	Very unstable and fading strength without Aerial 94. Strength without Aerial or Earth 22.
„ „	10.40 p.m.	A3BD			On 200 λ fone very good and clear.
Thur. Oct. 9	5.35 p.m.	Z4AG			Note improved—now like 4AA's.
Fri. Oct. 10	8.10 p.m.	2AC		300	
Sat. Oct. 11	5.30 p.m.	Z4AA		29	Note bad.
„ „	7.35 p.m.	3JH		46	He called CQ. I answered but N.D.
Mon. Oct. 13		Z2AC	80	94	Nicely readable without aerial.
„ „		Z4AK	94	74	
„ „	7.30 p.m.	Z4AG	97	400	Str. 7 without aerial. Note very good—best from 4AG.
Fri. Oct. 17	9.40 p.m.	Z4AG		150	Note bad again.
Sun. Oct. 19	9.45 p.m.	Z4AA	100	500	Note good now.
„ „		Z2AC		300	Very unsteady to-night.

BROADCASTERS FOR TASMANIA.

EXPERIMENTERS and others will be pleased to hear that at last two applications have been received by the authorities on the part of prominent Tasmanian business organizations for the establishment of "A" class broadcasting stations in this State. The news will come as a great surprise to Tasmanian radio people, in particular, who have been told that a "B" class station is the best they can expect. It has not yet been made public who are the enterprising people connected with the new scheme but it has been suggested that a well-known cinema theatre in Hobart is associationg itself with the idea. If a Tasmanian "A" station comes to pass it should be possible for Mainland listeners-in to pick up his transmissions quite easily.

New Zealanders' World's Record

(*Continued from page* 470.)

more difficult to read them through the ever-increasing interference.

The receivers at z4AA, 4AK, 4AG are of the low loss type, three coil, *a la QST*. 4AA and 4AK both use one stage audio, while 4AG uses the detector alone.

The aerials at 4AA and 4AK are vertical cages 95 and 84 ft. respectively. At 4AG the aerial is a three-wire inverted L, flat top, 16 feet speaders, 75 feet high at free end, and 45 feet at the lead-in end, with a flat top of 40 feet and a cage lead-in of 30 feet. Counterpoises are used in all three stations. The circuit used for transmitting at 4AK and 4AG is the four-coil Meissner. 4AA had a Colpitt's circuit, but changed it lately to the former type. Both 4AA and 4AK use 50 Radiotron valves, while 4AG uses a Philips type Z4. The H.T. supply at 4AA is derived from a motor generator set (two generators in series), giving a voltage of 1,500 volts, while the filament of the valve is heated by batteries.

Both 4AK and 4AG use rectified A.C. The former has a 1Kw. transformer, with taps which will give any voltage up to 3,500 on each side of the centre tap. (He made it himself.) He has also a motor generator set ¼ Kw. of 1,500 volts and sometimes runs the generator, together with 450 volts from accumulator B batteries, in series with the R.A.C. The R.A.C. is choked by a 30 Henry Choke and filtered by a bank of glass plate condensers. 4AG has a ½ Kw., which delivers 2,500 volts. After being rectified, the voltage drops to 2,000. There is neither a choke nor filter condensers at this station. (All condensers tried so far have simply gone "pop.") 4AK operates his tube with the key in the grid leak, while 4AG keys in the centre tap of the filament transformer. The choke is left out of the H.T., so as to stop key thumps.

The rectifier at 4AK consists of 120 jam jars (1 lb.) in each leg of the transformer. 4AG has no centre tap on his transformer and uses 84 two lb. jam jars in a bridge with 21 jars in each leg. In both stations the electrodes of the rectifiers are of lead and aluminium. The electrolyte being a saturated solution of borax, a little ammonia being added.

The successes we have attained during the last few weeks cannot be put down to exceptionally good atmospheric conditions. On the contrary, the conditions have been rather bad at times. Static has been fairly severe all the time and what with power leaks, etc., life is anything but pleasant when working under these conditions. However, there is sure to be an improvement sooner or later, and when there is, there will be many more Zedders, and Aussies, too, we hope, to work England. The chief thing is that you *must* get down below 100 metres or freeze, hi!

Good luck to those who are successful in the future.

IN guying your aerial it is best to put an insulator in each guy.

A GOOD aerial and good receiver is a fine combination. Try to have both if you want distance.

WHEN signals are too weak to operate a loud-speaker, they are strong enough for several pairs of telephones.

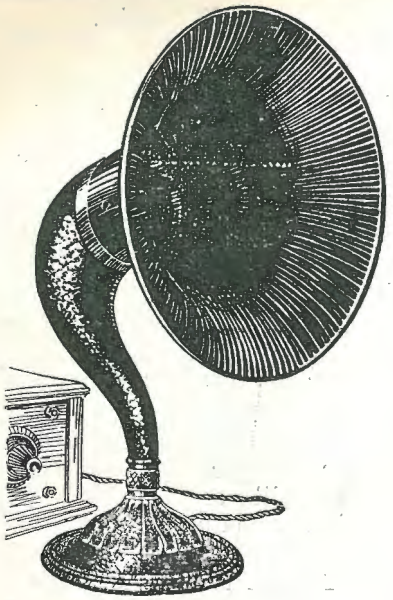
KEEP the top of your battery clean and fully charged for best results.

A LITTLE sealing wax dropped on the edges of a coil will prevent the turns from slipping.

RUBBER tape is better than friction tape for aerial work.

MISS WALLACE SPEAKS FROM KGO.

THE Western Electric Company (Australia), Limited, write that their agents, Messrs. Sexton and Green, of Tenterfield, while listening-in to KGO on Wednesday, October 8, with their standard 5-valve Western Electric receiving set, heard Miss Wallace, of the Royal Arcade, Sydney, speaking from KGO. Mr. Green informs them that after hearing several musical items from the Hotel St. Francis, KGO announced the following at 6.40 p.m.: "KGO, Oakland, California. Miss Wallace, an electrical engineer from Australia, will now talk from the studio." Mr. Green states that Miss Wallace said she was speaking for the benefit of experimenters in Australia. Her remarks, however, were chiefly confined to her impressions of American business methods. One item which he particularly remembered was that she compared the tramway system to that of Sydney and remarked how different the trams in San Francisco were to those of our own. Mr. Green, not realising that Miss Wallace was a well-known personality in local radio circles, did not appreciate the importance of the reception of this particular item, or otherwise he would have notified the company much earlier.



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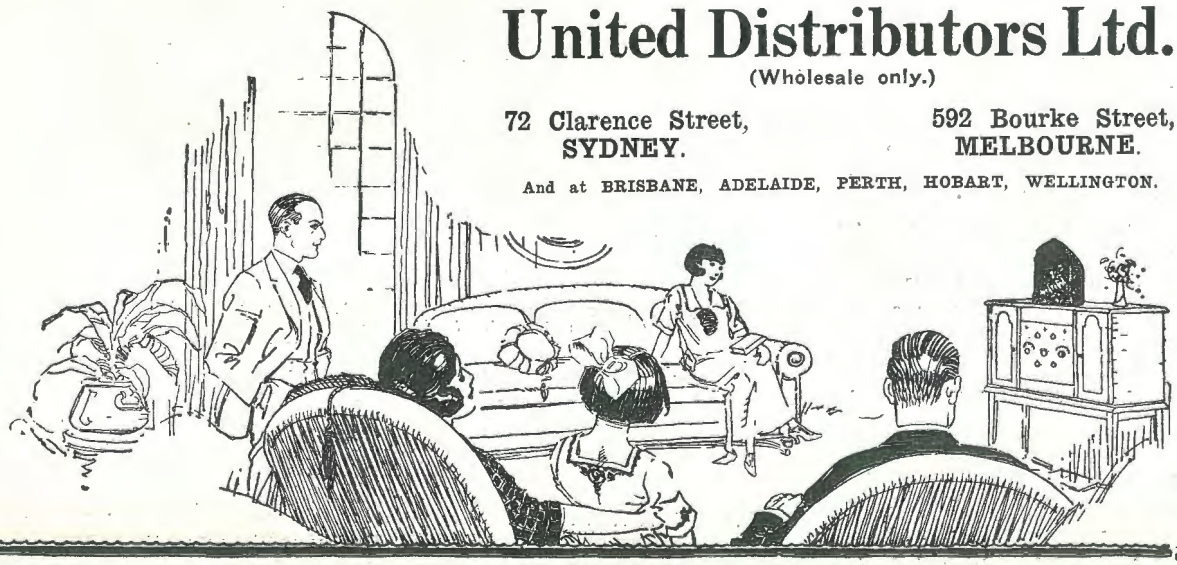


Microphonic Noises in Your Set

HAVE you noticed the gong-like sounds of your set when someone walked across the room, or jarred the cabinet, or even touched one or the valves with their fingers? It interrupted the programmes you were listening to and you may have wondered what caused it. It was the valves and is more noticeable in the small ones.

If you have ever looked into a manufactured set using these small

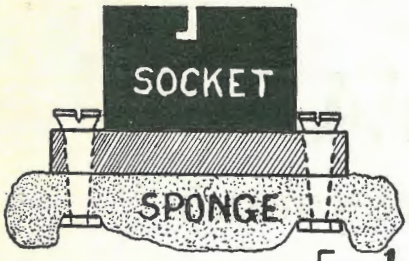


FIG. 1

valves you have seen that these were either suspended or mountd on soft rubber bases. With them thus mounted microphonic noises are never heard.

You can do the same thing with your new set or your old one, but you may be required to put in some flexible connections to the sockets to take the place of your bus bar wiring. If flexible wire is not used the sockets will be held firm and the microphonic noises will still bother you.

Soft rubber sponges may be purchased very cheaply and one of them may do for two or three valves depending on what type of valves you use. The 199 having very small sockets require less sponge, while the WD type require as much as a large tube.

Where soft rubber sponges are to be used they should first be secured to the socket through the screw holes in the sockets, through which machine screws can be passed, and the nuts screwed up until they go at least a half inch up in the rubber sponge. The rubber sponge can then be secured to the base of the set by putting a wood screw down in the centre of the socket between the prongs. It is advisable to slip a fibre washer over the wood screw to prevent it from passing through the sponge without taking hold. This is shown in Fig. 1.

Another sponge arrangement is that using the sponges under your radio cabinet. This will require four of the sponges, one for each corner. While this is not as good as putting them under the sockets, it is much easier and will give you a good idea of the possibilities of cushioning.

Another scheme is to support the sockets half way up the cabinet on strong rubber supports similar to the old style sleeve holders worn by men. This type also requires flexible connections to the sockets and on account of being suspended is even better than the soft sponge under the sockets, but the arrangement is more difficult.

Fig. 2

We have seen sets whose microphonic noises were so bad that you could not touch any control at all on the set without the familiar gong-like sound being heard and this precluded the possibility of tuning the set at all except on very strong signals. By placing soft rubber sponges under the cabinet a great deal of these noises were stopped. This arrangement is shown in Figure 2.

Valves: An Explanation (?)

THIS explanation of the principle of the vacuum tube, which the Western Electric News attributes to Professor Von Orfle Garbler, is as lucid and sane as some more sober efforts elicited by radio:

If you don't know anything else about valves you anyhow know what it is shaped and priced. Now a lot of scientists, real and self-anointed ones have at different times tried to explain it, how it works and why. It seems to me, however, that there explanations were about as intrickate and obtruse, however, as too the principle and true inward operation of the major acutalites as the things they preported to elucidade themselves. I am abcessed therefore from the conviction that if we are to arrive at anything it desolves upon me to supply a simple explanation just for the benefit of the large number of the un-understanding majority.

The valve as at present was involved from the automatic theory. Starting from the prespesition that the whole is the equivalent to all of its parts put together, physicists undertook to assertain how many parts of a given thing were demanded to make up any given whole and so to accomplish this endeavoar they divided the given whole into as many parts as were diviseable and these parts were again divided and so on ad infantum. The result finally simmered itself down to the regrestration of the autom which is the smallest indiviseable part of anything after it has been divided up as many times as it is possible to divide anything up and it can't be divided any farther, but this autom is, it was proven itself, made up of still smaller particels which cannot be divided or separated one from each other. These are known as electrons and morons. Now the morons, it seems have an infinnity for the electrons but the electrons have an abborrence for the morons. As, however, these cannot be divided apart a force is therefore engenerated which is non-stimatable. So much for the principal.

The valve, itself, is a piece of empty glass out of which all air has been substracted and after that is done, three devises are injectured in it known as the griddle, the plate and the fillament.

Swinging Signals

AT this time of the year and frequently during the last few weeks, you have been bothered a great deal by signals from broadcasting stations getting weak and then later coming back strong again. Was it fading or swinging?

You have read a great deal about the reduced range of broadcasting stations during the hot weather, and it is true; but when signals get weaker it is not always due to fading. It is

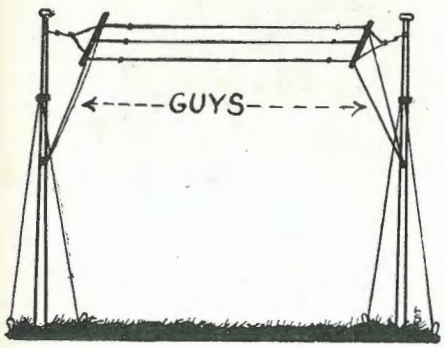


Fig. 1.

sometimes what we call swinging. Fading and swinging are different in that one can be corrected sometimes and the other cannot.

For example: Fading is what we say is happening when the signals from a station gradually die out and later, without touching your receiving set, the signals come in just as strong as ever. The cause of fading has never been actually determined; radio engineers and scientists are making a good guess at it, but nothing definite has been established. For that reason, fading cannot be combatted successfully.

Swinging signals resemble fading somewhat except that you can tune the station in again by a slight adjustment of your set. The swinging may be at your own station, or it may be at the transmitting station—more likely at yours, though.

Swinging can be caused by a slack aerial at either station, which affects the capacity of the aerial-ground circuit, and this changes the wave-

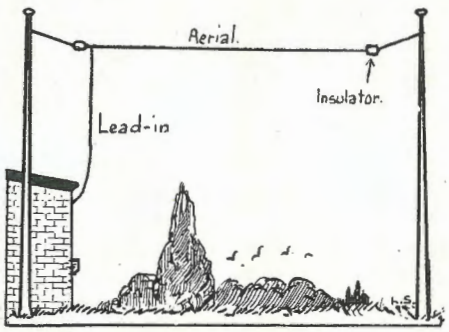


Fig. 2.

length. This is particularly true of single circuit sets but is not so noticeable on loose coupled sets, owing to the fact that the detector circuit is not affected by small changes in the aerial-ground circuit.

The best type of aerial to use, from the view point of swinging signals, is the one wire type. This may easily be stretched taut and swinging practically eliminated. If you have a two, or more wire aerial, it is necessary to have a "spreader" to keep the wires separated at each end. Unless this spreader is guyed as shown in Figure 1 it is practically impossible to stop it from swinging back and forth in any kind of a breeze. A one-wire aerial is shown in Figures 2 and 3. The slack one will always be bothered

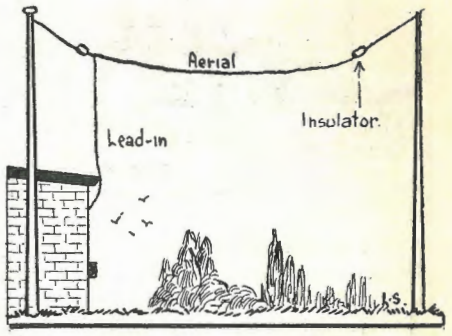


Fig. 3.

by swinging unless it is pulled taut as in Figure 2.

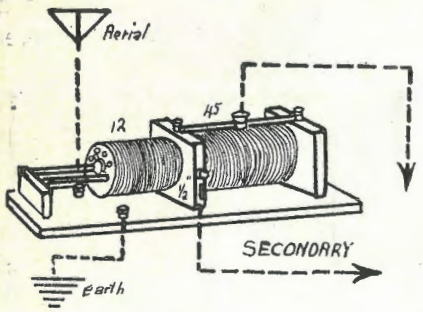
Where swinging originiates at the transmitting station, there is only one thing you can do to try and correct it. That is, to notify such station their signals are swinging. Swinging is seldom encountered from big stations, as they have someone listening in all the time to check on them, but you will no doubt find swinging frequent from small stations.

A Good Joke

HUMOUR in radio (as in golf) is a sure sign that it has become a part of our everyday life. Here is the account of a practical joke played upon an innocent youth in Hobart recently, who is reputed to have a highly developed imagination—especially in listening-in. A fake studio was rigged up in a back room of a citizen's residence at New Town and lead-ins connected to the aerial conveyed the "music" to a large receiving apparatus installed in another room where a small audience had gathered to listen-in. Another wireless man, played the part of "announcer" and "put over" the well-known, "KGO calling, the General Electric Company's broadcasting station, Oakland, Calif." with all the finish of a true Yank. A small button microphone was employed in the "studio" and the result was amazingly realistic. After the "concert," the innocent one announced to all his friends that he had heard KGO fifty feet away from the loud-talker. "It was wonderful," he said. "I heard every word. And there were about forty saxaphones going, too." As a matter of fact he had heard a first-class gramophone playing the latest jazz hits!

Good and Bad Coupling

COUPLING has a great deal to do with the selectivity of your set, that is, speaking of a loose coupler receiving set. The coupling, or distance the primary winding is from the secondary, has a great deal to do with your ability to tune this or that station out. The number of turns of the primary coil that are in inductive relation to the secondary coil also

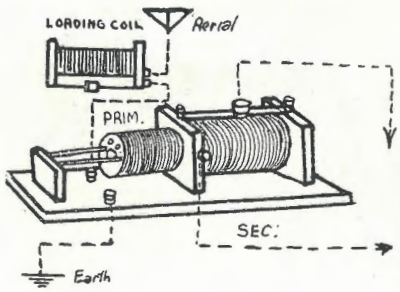


affects it. For example: You may have a fixed primary and secondary, such as used in so-called single control three-circuit sets, where the primary and secondary coils are separated about half an inch and the primary has 12 turns and the secondary 45. This will give fairly loose coupling; whereas if there were 30 turns on the primary, the coupling would be close and tuning would be broad.

Where more turns are necessary on the primary coil and loose coupling is desired, it is better to use the extra turns in the form of a loading coil, that is not in inductive relation to the secondary coil. Both types are shown in the drawings.

Those of you who have used a vario-coupler or a loose-coupler in a two-circuit set have no doubt found that having the secondary in various positions relative to the primary coil, greatly affected the tuning and the selectivity of the set. You have found that with close coupling (the coils close to each other), you could easily tune in different stations but that you probably heard two or more at the same time. By rotating the secondary of the vario-coupler, or sliding the secondary out of the loose coupler, you found that stations' signals became weaker but on turning the secondary variable condenser, the strength of the signals became strong or even stronger than before and you did not hear the interfering stations. In other words, loose coupling brings selectivity. In some cases a slight decrease in signal strength, but this is compensated for by a lack of interference.

In single circuit regenerative sets using either a vario-coupler, spider web or honeycomb coils or other means of having a tickler coil; coupling between the tickler coil and the primary coil controls regeneration. When the tickler coil is close to the primary coil it is known as close coupling and the energy from the tickler coil is easily transferred to the primary. When the tickler coil is drawn away from the primary, it re-



quires the filament to be burned brighter. You will also find that there will be one spot in the radius of the tickler coil where regeneration is best for a certain filament temperature.

In neutroformers used in neutrodyne sets, the coupling between the primary and secondary coils is very loose, there being but a few turns on the primary compared to the secondary coil.

And Still They Come!

This is what a Randwick (N.S.W.) reader thinks of "RADIO." He writes:—

"In taking this opportunity of writing I wish to compliment you on the very evident zeal which goes to the making-up of your paper.

"If I have read each copy of "RADIO" once I have read it ten times; this includes advertisements.

"Since I first purchased "RADIO" I have been in a fever of impatience while waiting for the next issue."

"I HAVE to thank Mr. Fagan, 2RJ, for a good hour's music last Sunday week," writes 3MS, late 3LO. "I also had him during the afternoon testing with 2JR and Mr. Barlow. He gets across very well. On last Sunday evening (21st), I thought there were big things doing when I heard 4AA calling 6CGW, also 4AG at him. 3AD was in with CB and 3EN trying to click with 3AD, New Zealand. 2CM did not say much, but I have a hunch that his log would be very interesting. The Victorian tests, so far as my station is concerned, do not show any fading; the signals coming at maximum strength. My experience is that the fading is more pronounced during the summer months and we should this summer, be in a position to verify it. Static has been troublesome for the past fortnight; local storms having a lot to do with this."

IT is seldom that an Albury wireless enthusiast has had the pleasure of getting in touch with W.A., but this unique experience was accorded Mr. Arthur Pearsall, of Macauley Street, Albury, last evening, states a recent issue of *The Border Morning Mail*. Mr. Pearsall was listening in on his home-made five valve set when he picked up 6WF (Western Australian Farmers, Ltd., Perth). Using the loudspeaker, Mr. Pearsall was able to hear several piano solos, recitations, and vocal items.

FOLLOWING is the latest list of stations heard on 'phone by Mr. L. Boggs, Mansfield Street, Inverell, N.S.W.:—N.S.W.: 2BL, 2FC, 2RJ, 2GR, 2BK, 2GF, 2HM, 2CF, 2YR, 2ME, 2BF. Vic.: 3AR, 3XF. S.A.: 6DN.

PICKING up KGO became such a habit with Mr. H. Gotting, Braemar, N.S.W., that it began to develop into a bad habit, with the result that he tried to break it off. His efforts were quickly rewarded, for on the night of October 13 he picked up station KHJ, Los Angeles, California. He heard music, which was weak at times, and although static was bad—"Station KHJ, California, testing. Stand by." The rest of the speech was drowned by static. Music followed again after this and the station was held for about 30 minutes in all. A detector and two audio were used.

MR. J. H. L. Waterhouse, of Roviana, British Solomon Islands, states in a letter that Farmer's have been heard at the local station RA. Chimes, a broadcasted query as to the vicinity of an outbreak of fire by the Fire Brigade and information given in reply by Mr. Cannon, of Boomerang Street, were heard. "We are now crossing over to the Wentworth Cafe," stated the speaker. The following music could also be heard, despite a good deal of traffic and atmospherics, and the voice was very clear. This occurred on the night of September 6.

ON the evening of October 23 at 8.40 p.m., Mr. C. Davies, of 33 Gypsam Street, Railway Town, Broken Hill, was listening in and heard as part of a concert a man singing "Bells of St. Mary's" while accompanying this was what sounded like

a violin or flute, together with a banjo. Mr. Davies would be glad to learn the identity of the sender. Continuing his letter, Mr. Davies says, "If he is an amateur I think he is to be commended on a very good concert. The above song came through perfectly."

WE have received an interesting letter from Mr. Ivan P. McEachern, Peakhurst, at present attending the Sydney High School. During the last Michaelmas vacation he bought a single valve regenerative set and took it home with him to Couraghia, near Tumbarumba. His knowledge of wireless was rather limited, he says, but having had some previous experience with a regenerative set he soon got it going. He slung up an aerial, one end of which was connected to the chimney, the other to a gum tree about 100 feet away from the house, the average height of the wires being about 25 feet.

INTERSTATE TESTS.

"LOUD SPEAKER" would arrange a series of Interstate tests. N.S.W. amateur transmitters—especially 2RJ—are heard regularly in Tasmania and reports in "Radio" show that the Tasmanian stations 7AA and 7AB are often picked up in N.S.W. There are a number of small difficulties to be overcome before communication between the two States is entirely satisfactory, so such tests undoubtedly would be beneficial to wireless generally. Readers of "Radio" who are interested in this scheme are invited to communicate with "Loud Speaker" through this journal.

The "earth" presented a problem, but this was eventually overcome by digging a trench half-way round the house and burying a wire in it. This done, he connected up the set, turned on the "juice," and soon the familiar voice of 2FC was heard, although with not very great volume. The next day, however, he fixed up a more efficient aerial and earth, connected the latter to the earth wire of the telephone and that evening 2FC "came in with a roar," and other members of the family declared they could hear the music with the 'phones on the table. Later on 2BL was heard but not quite as plainly as 2FC. Several amateurs were then logged to be followed by 3AR and excellent items were listened to from the Melbourne station. Mr. McEachern, having done so well, then decided to try and do a little better. He had been receiving a faint whistle about 6WF's wave-length after 10 p.m., but had not attempted to receive them, thinking it out of the question, but on this evening, it being calm and with very little static about, he attempted to do so. After ten minutes tuning he heard faint strains of music which soon became quite plain. A few minutes later he heard the words "6WF, Perth," and still again later "6WF" and then "Westralian Farmer's." At 11 p.m. this station was still transmitting. A list of calls heard by Mr. MacEachern during his few days in the vicinity included:—6WF, 5DN, 5HR, 3AR, 2BF, 2BK, 2BL, 2CI, 2CR, 2CS, 2FC, 2GR, 2HM, 2LF, 2LO, 2RA, 2RJ, Riverina Wireless Supplies, 2YI, 2ZF and 2ZN. All these were received on telephony, but as this experimenter has not yet learnt the Morse code he thinks that doubtless several more calls would have been added to the list. Of the amateurs 2CR, 2GR, 2HM, 2RA, 2RJ, and 2ZN came in on very good strength, particularly 2RA and 2RJ. These two were quite as loud as 2BL. The valve used was a Phillips D.1 with 27 volts on the plate. When he logged 6WF he was using a 150 turn basket coil as a tuner, and a 100 turn for the reaction coil. The air-line distance from Perth to Tumbarumba is about 1,00 miles.

HEREWITH we have pleasure in appending the many calls heard by Mr. Thos. R. Anthony, of Auburn, during the last two months. These results were secured with a low loss tuner and a single detector valve with no amplifier of any description. KGO has been heard about 30 times, using one valve and on quite readable strength. During the course of his letter, Mr. Anthony says he would like to thank any experimenters who have been good enough to answer his Q.S.L.'s with their signals. Particularly would he like to thank 3CB (Mr. F. W. Sievers) who conducted a low-power test with him. His C.W. signals were Q.S.A., although only using 30 volts on the plate of his oscillator. Mr. Anthony was also grateful to z4AD (Mr. A. E. Jordan), for the very valuable details of a low loss receiver which he sent him. Using the low loss tuner and one valve on the evening of October 19, 3BD and 3BQ were logged quite clearly on C.W. and 'phone, using absolutely no aerial or earth connection. Another startling feature of this reception is the fact that the aerial was earthed at the time. This constitutes reception over 500 miles, and as Mr. Anthony says, "Is not too bad." With aerial and "earth" on, the above stations were readable 10ft. from the 'phones. We hope to have the pleasure of shortly publishing some photographs of Mr. Anthony's station. Calls heard are as follow:—N.S.W.: 2CR, 2HM, 2GQ, 2YA, 2SO, 2CS, 2RJ (fone and C.W.), 2SS (C.W. only). Vic.: 3EM, 3BM, 3CB, 3BD, 3XF, 3EN, 3QW, 3XN, 3UX, 3UY, 3JU, 3TM, 3XO, 3BC, 3BQ, 3LM, 3OT, 3WL, 3JM, 3DM, 3EF, 3LS, 3JH, 3GQ, 3ER, 3DD, 3GB, 3BL, 3SQ, 3SX, 3ZL, 3EW, 3FA, 3EF. Qld.: 4EG, 4CM, 4CK. Unknown stations: 3XX, 2XF, 2HJ, 2ZM. S.A.: 5DN, 5BG, 5DO, 5BF, 5WJ, SA1, SBK, JDA, 5BQ, 5DH (all on fone), 5CM, 5LO (C.W. only). N.Z.: 1AC, 1AA, 1AO, 1YD, 1YA, 2AC, 2AA, 2BH, 2BA, 2AQ, 2AP, 4AA, 3AA, 3AL, 3CA, 3AD, 3AF, 4AD, 4AG, 4AR, 4AK, 4YA, 3AB (mainly all fone and C.W.). Tas.: 7BK, 7BH. U.S.A.: 6CGW, 6BCP.

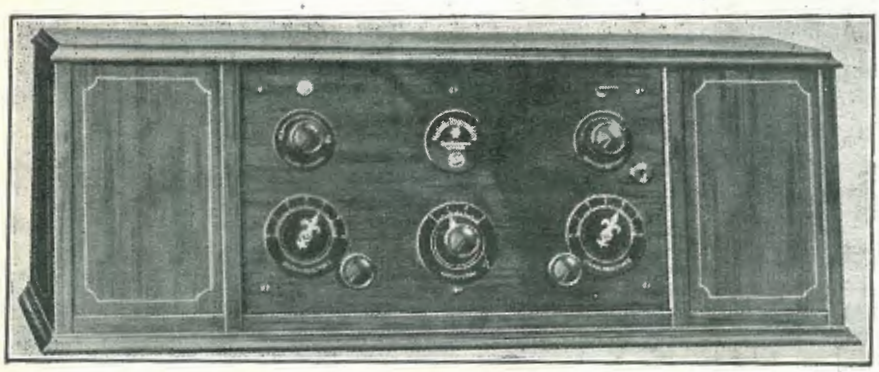
Highlights of Radio Broadcasting

Quietening the Receiver Neighbourhood

By Dr. ALFRED N. GOLDSMITH, B.S., Phd., Fellow I.R.E.,
Chief Broadcast Engineer, Radio Corporation of America

(Special to "Radio.")

WHEN the last notes of a delightful broadcast song die out, silence should follow. The charm of the selection and the satisfaction of the listeners will both be reduced if, in the ensuing pause, there are heard undesired signals of any sort. Some of the causes of such unwelcome interruptions are man-made, and even find their source in near-by receivers. It may seem odd, at first, that other local receivers should be rightly blamed for some radio interference, yet such is the case. There are conditions when certain types of radio receiver are also feeble transmitters, and may cause such interference. A study of this effect and of its complete and successful remedy is therefore of real interest to every broadcast listener.



The Radiola Regenoflex, using the new Regenoflex circuit.

The type of receiver to which reference is made is known as the regenerative receiver and is very widely used. Its distinguishing characteristic is the presence of a "tickler" or "intensity" control handle, or the equivalent, whereby the signals become louder and louder as the tickler coupling or setting is increased until, finally, there is distortion of quality and then a howling or squealing note. If, when the tickler handle is so adjusted that this squealing or twittering note is produced from some station, the notes heard go up and down the scale in a curious way. First a high note is heard and, as the tuning handle is slowly rotated, this drops gradually to a low tone and then fades into silence. Continuing to turn the tuning handle then brings in a low note which then rises continually in pitch as the tuning handle is rotated until it is too high and shrill to be heard. When this effect is produced, the receiver is said to be in an "oscillating condition," and is, in fact, a feeble transmitter. All regenerative receivers have this same characteristic, whether they are of the so-called single-circuit or of the two-circuit type. The difference between these types, so far as interference production in everyday use by the average listener is concerned, is not worth consideration. Either one may be worse than the other type, depending upon the detail design of certain parts of each. The only type of regenerative receiver which, under no circumstances, causes interference with neighbouring receivers is one which is guaranteed to be "non-radiating" by a reliable manufacturer. The internal adjustments of such receivers, as obtained from the factory, should not be disturbed by the listener.

It might therefore be asked: Why do we use regenerative receivers? There are three excellent reasons:—

1. Regeneration (or control of loudness by means of a "tickler" coil) is a very simple and extremely effective method of getting enormous amplifications inexpensively. It is also a ready method of controlling the loudness of the signal. The valve economy thus realised is also advantageous.

2. A regenerative receiver used on an antenna of appropriate size, and with the tickler coupling well up the scale, is very selective and reduces interference from other stations.

3. The pick-up of unknown stations is much simplified in regenerative receivers because all one has to do is to turn the tickler of intensity handle up its scale past the point where one hears the faint click (which indicates that the set is in oscillating condition), and then rotate the tuning handle or handles. Every broadcasting station will then become audible, even if no speech or music is being transmitted, as a twittering note or "birdie," as it is popularly called. This is a great convenience. In fact, it is so tempting a convenience that it gives rise to most of the trouble in connection with regenerative receivers. For it is just in this oscillating condition that the receiver acts as a transmitter and interferes with the neighbour except for guaranteed "non-radiating" receivers. Otherwise stated, every time one hears the "birdie" which tells him he has picked up a station, the chances are that he is causing the same "birdie" in all his neighbours' sets, and thus interfering with their enjoyment. This undesired interference is particularly

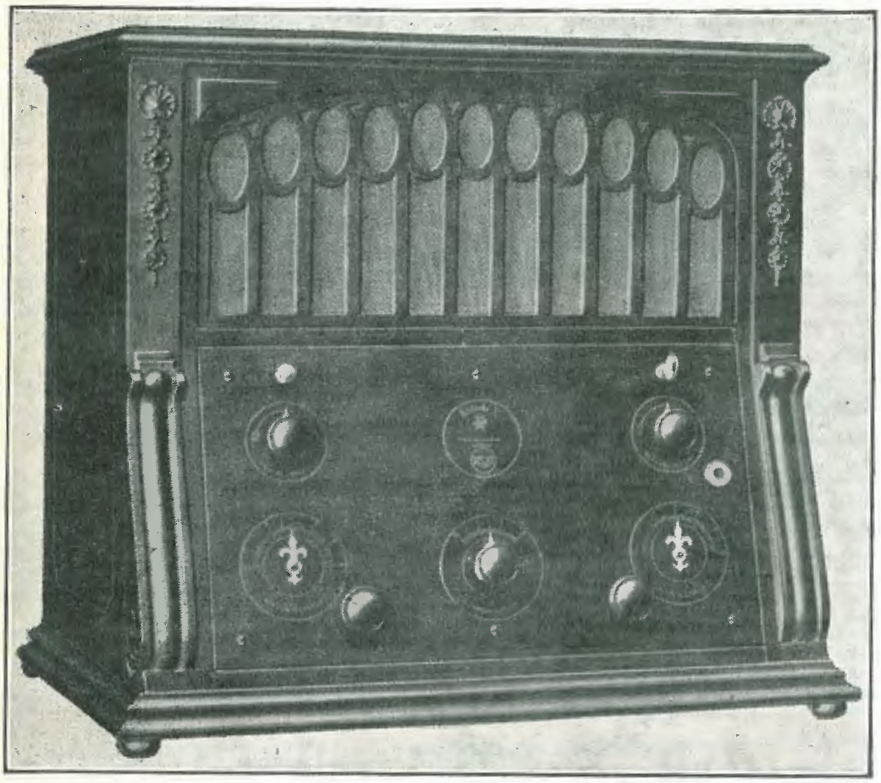
bad when the listener is working with signals which are weak and which sometimes fade out. Every time the signals fade, every one with a radiating regenerative receiver tends to bring the tickler coupler up a little further and thus accidentally gets his set into the objectionable oscillating condition. The resulting noise in the sets from the interference of all sets in the neighbourhood sounds like a bird shop at feeding time and spoils the broadcast concert.

To those who will continue to use radiating forms of regenerative receivers, the following suggestions are to be commended:

1. Do not try to squeeze the last ounce of signal out of your set by bringing the tickler up to so critical and unstable an adjustment that it is liable at any moment to "spill over" into the oscillating condition, thus causing the squeals which interfere with others. Be content with a reasonable signal with the tickler below the critical point.

2. Do not use regenerative receivers on very large antennae; and in congested city neighbourhoods use the smallest possible antenna, which will give local signals satisfactorily. Run your antenna as far away from all others as possible; and, where it crosses other antennae, let it do so at right angles.

3. Get out of the habit of "fishing" for unknown signals all the evening with the set in the oscillating condition. This may amuse you to some extent, but it spoils the enjoyment of everyone else and is not fair. If possible, pick up all signals with the tickler below the critical point at which the faint click or a squeal shows you that the set is oscillating. (When using a non-radiating regenerative receiver, this rule may be disregarded safely.)



The Radiola X—the Golden Rule Receiver.

For years, radio engineers have been working at the problem of producing a harmless regenerative receiver; that is, a receiver which would have all the great advantages of a usual regenerative receiver, and yet could not interfere with the neighbours and was, if possible, even more selective than the best of the previous one—or two—circuit regenerative receivers. In other words, they wanted to retain the tremendous amplification which the tickler or intensity control can give; they wanted to get very high selectivity enabling the complete separation of signals from local stations and the possibility of reading some distant stations through local broadcasting; they demanded the desirable ease in picking up unknown stations by means of the "birdie" or twittering note; and they insisted that the neighbouring receivers should not be interfered with, no matter what the user of such a set did with his controls. All these very difficult requirements have been fully complied with at last in the new receiver, Radiola X, which is shown in the accompanying photographs, and which employs a circuit which has been appropriately termed "regenoflex."

The way in which the problem of avoiding interference has been solved in the regenoflex circuit is by the use of a "barrier radiotron" between the antenna circuit and the circuit which contains the tickler adjustment and which might, therefore, cause feeble transmission from the set. This barrier tube acts as a practically perfect trap. It permits the incoming signals to pass from the antenna through it to the tickler-containing (or secondary) circuit, but it will not permit anything to pass through it in the reverse direction from the tickler-containing circuit back to the antenna. Thus, no matter what is done in this latter secondary circuit, the antenna circuit remains unaffected, there is no radiation from the receiver, and the enjoyment of the neighbours is not troubled. This is accordingly a "Golden Rule receiver" in every sense. By careful design of the regenoflex circuit and full utilization of each of the radiotrons, this receiver becomes more sensitive, much more selective, and just as convenient as the usual regenerative receiver, but without any possibility of causing local interference. Signals can be picked up by the twittering note with the secondary circuit in the oscillating condition, but without the danger of troubling anyone, so that for the first time all the convenience and powerful amplification of the usual regenerative receiver can be fully used by the listener without the risk of bothering people.

Broadcasting depends, for its full usefulness, on freedom from interference caused by other receivers.

QUERIES ANSWERED. COUPON.

"RADIO in Australia & New Zealand."

(November 12, 1924.)

AMATEUR BROADCASTER.

IF QSL cards are an indication of quality, then Mr. T. Watkins' transmissions from his experimental station, 7AA, at West Hobart must be of a very high order of merit indeed. 7AA has received cards from all over Australia and N.Z., and the esteem with which he is held amongst Tasmanian listeners-in is remarkable. It is Mr. Watkins' intention to shortly take out a B class broadcasting licence so that he can more fully get into his stride. Meanwhile banjo solos, lectures, and gramophone records are transmitted and listeners-in declare the modulation and articulation to be perfect.

RADIO POPULAR IN AUCKLAND.

MANY of the local amateurs are reporting excellent reception of KGO and 2FC, and so great has been the demand for coils suitable for Farmer's wave-length that at present it is impossible to purchase 150 or 200 turn coils from any of the local wireless dealers. Things generally in the wireless trade are fairly brisk and the post office is kept busy receiving applications for receiving and transmitting licenses.

HINTS.

AERIALS on the same roof will make it difficult to tune in stations

IF you use three stages of audio and are troubled with squeals, try a fixed condenser or leak across the last transformer.

EVERY connection of your aerial, if soldered, will help to increase your receiving range.

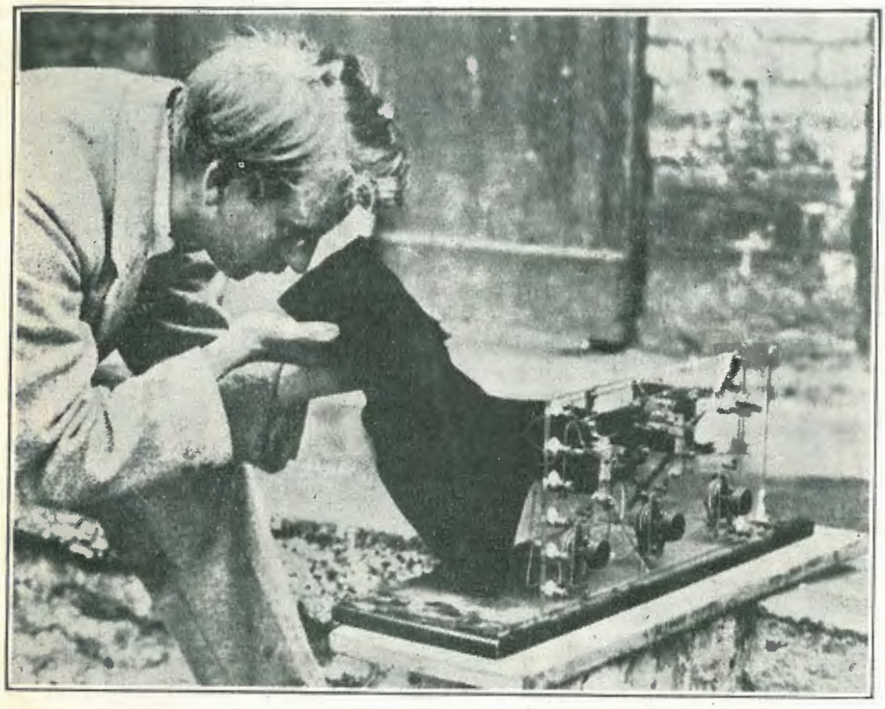
Highlights of Radio Broadcasting

(Continued from preceding page.)

This is particularly important where receiving stations are crowded closely together. It also requires very sensitive, highly selective, and conveniently operated receivers which will give high quality of reproduction. Consequently a receiver such as the Radiola X, using the regenoflex circuit, is a real step forward, and is truly a valuable contribution to the orderly organization and rapid growth of broadcast reception.

Checking Wave-lengths by Earth's Rotation

THERE are now several hundred radio broadcasting stations in the United States. With the range of each station constantly increasing through the improvements in receiving sets, what is to prevent the programmes from getting hopelessly mixed up? The Department of Commerce has assigned definite wave-lengths to the various stations—but then there remains the problem of setting up a practical standard of wave-length and holding the transmitter to it.



Here is W. L. Baird, of Hastings, England, with his specially-made radio apparatus, which he claims can "see." He has demonstrated that one can see distant views with his new invention.

[It should be understood that "Radio" does not endorse nor does it desire to detract in any way from the authenticity of this report. The Photograph is published merely as an item of interest.]

Now "wave length" was a convenient unit in the old spark telegraph days but in these modern times of close and careful design "frequency" has been found better. The two are connected by a simple rule: speed of light ÷ wave-length = frequency. Wave-length is given in metres; the speed of light is approximately 300,000,000 metres per second, and so for a 400 metre broadcasting station the frequency of the alternating current generated by the oscillator tubes is practically 750,000 cycles per second. This current is called the "carrier," and on it is impressed the "voice" current. The voice current is really made up of a great many currents having frequencies ranging from 100 cycles to 5,000 cycles, and when it is impressed or modulated on the carrier, the result is a group of currents covering the range from 745,000 to 755,000 cycles.

The Department of Commerce has assigned to the Class B stations carrier frequencies 10,000 cycles apart. As each station uses substantially this full range, there must be some accurate and reliable standard with which to check the frequency of the transmitting circuit. Otherwise, the programme of two stations might overlap, or the carriers of the two stations would 'heterodyne" in receiving sets and cause a constant and annoying whistle.

In their search for such a standard, engineers of the Bell System determined to go back to the most nearly constant thing we know, the rotation of the earth upon its axis. But this has a frequency of one cycle per 24 hours; how could it be used to check up electric currents having frequencies around 1,000,000 cycles per second?

To solve the problem, the engineers decided to start at the middle and work out. If they could produce an alternating current of, say, 100 cycles per second, they could make it drive a clock and by comparing the clock's performance with the Arlington time signals they could determine accurately this frequency. Then by electrical means they could compare it with successively higher frequencies up to the desired amount.

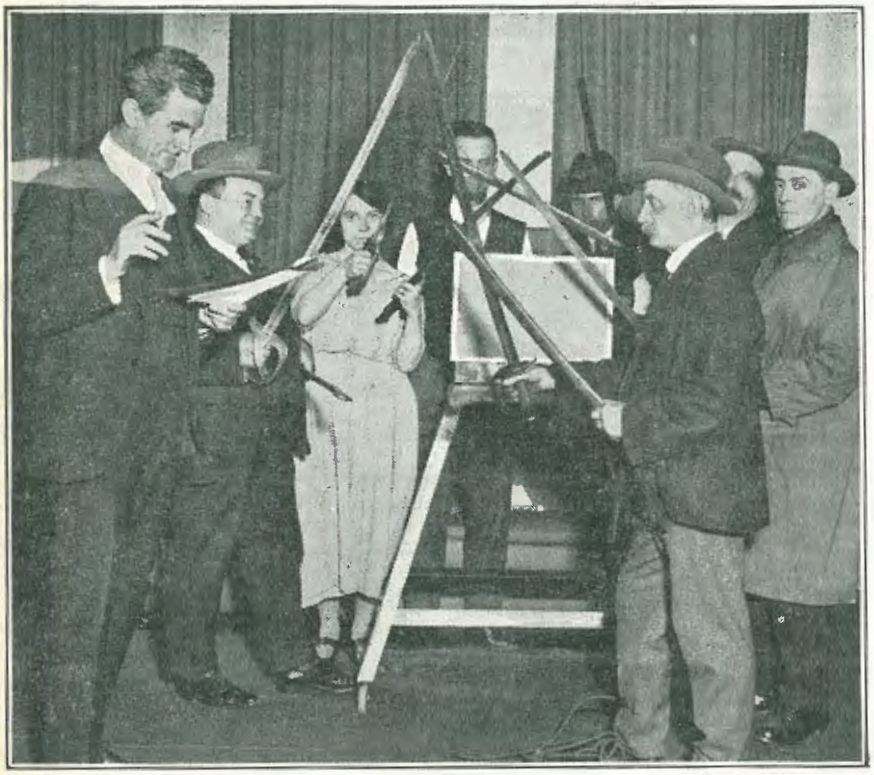
The apparatus devised by the engineers to produce electric currents of known and constant frequency depends for its action upon the old familiar tuning fork. An alternating current of any desired frequency can be produced from a direct current by means of any device which will vary the direct current regularly. Because of the regularity of its action, a tuning fork was selected for the controlling device.

The tuning fork used has a frequency of 100 cycles a second, and is kept in motion electrically. A high impedance telephone receiver is clamped close to each prong of the fork, but without touching it, so that the motion of the prong will affect the magnetism through the receiver coils. Thus the fork can sing into the electrical system. A pair of electromagnets are fastened near the top of the fork (again without touching it) in such a way that each prong in its vibration will pass through the "lines of force" between the poles of one of the electromagnets.

Start the fork vibrating by tapping one of the prongs. The vibration of the prongs will set up an alternating current in the receivers, whose frequency is exactly equal to the frequency of the vibrations of the fork. This current, amplified by a two-stage vacuum tube amplifier, is then passed through the windings of the driving electromagnets. The current is so timed by the amplifier circuit that each time the prongs of the fork pass between the poles of the electromagnets they are given a slight magnetic "pull" and so kept in motion. It is apparent then that we have a tuning

fork kept in motion as long as desired by the magnetic affect of an alternating current whose frequency is determined by the rate of the fork's own vibration. Since none of the apparatus touches the fork, changes in its rate will only be caused by changes in temperature or variations in the characteristics of the electric circuit. It is comparatively easy to keep such changes so small that their effect upon the fork will be negligible.

To compare the frequency of the fork with that of the earth's rotation, it is necessary to count the number of cycles of the fork per day. A valve amplifier is controlled by the driving circuit of the fork, and the output of this amplifier operates a synchronous motor designed to rotate once to every five vibrations of the fork. The motor in turn, through a reduction gear and commutator, closes a circuit once a second, thus driving an electric clock. If the fork makes exactly 100 vibrations every second, this clock will keep correct time. To check its accuracy, the fork-driven clock was compared directly with time signals received from Arlington by radio. Records over a typical month show that the clock gained at a uniform rate of ¼ second per day for the first half of the month. It was then readjusted, and lost at the same rate until the end of the month, when it was again in exact synchronism with the U.S. Naval Observatory clock. A gain or loss of a quarter of a second a day means that the clock is accurate to four parts in a million —an accuracy exceeded only by the finest chronometers and astronomical clocks. Remember that these instruments have been developed during several centuries, and you will feel an added respect for the technique of scientific research.



This was how added realism was given to the telling of the story of the taking of the Bastille during the French Revolution in an address transmitted from a a British broadcasting station.

The frequencies used in radio are very high—and for purpases of comparison it is necessary to provide means to obtain currents of correspondingly high frequency from the standard source. This is done by a system of circuits controlled by the amplifier coupled to the fork. In general, the system consists of a combination of "harmonic generators," fixed and variable tuned circuits, and amplifiers. The design of the "harmonic generator" is based on the principle that if the energy of any periodic wave is liberated during a small fraction of its cycle the wave will contain a large number of "harmonics" or currents with frequencies 2, 3, 4 or more times the frequency of the original, so when a current is brought from the tuning fork amplifier to such a harmonic generator, the simple wave form of 100 cycles produces a large number of harmonics. By properly tuning the receiving circuit, the 1000 cycle harmonic is selected, amplified, and again built up into harmonics. This process may be repeated a number of times, until the desired frequency is reached. To transmit a standard frequency by wire or radio, this current is compared with that generated by a power oscillator, and the latter adjusted until the frequencies are the same.

This system, based upon the mechanical vibration of a tuning fork, is much more dependable than any which might be based upon the electrical constants of a circuit, such as capacity, inductance and resistance as the latter, in their present form at least, are considerably more affected by temperature changes, aging, etc.

Such frequency standards have a very interesting and important property—that of absolute portability, by means of wire or radio. Currents obtained from harmonics of the tuning fork at the laboratories of the Western Electric Company have been transmitted to various points throughout North America, for checking the calibration of such secondary standards as were being used in the adjustment of communication apparatus. During the installation of the Havana-Key West cable the calibrations of oscillators in Cuba were frequently checked directly against the frequency of the fork in New York.

MELBOURNE ON HIGH POWER.

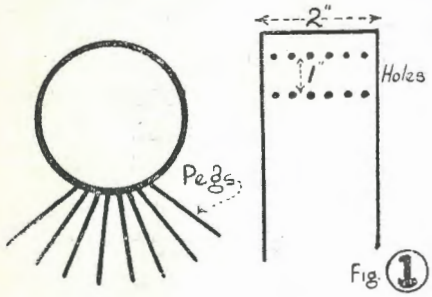
NOW that the Braybrook system is up on power, Tasmanian radio men are getting something of a treat in the way of broadcast programmes. Previously they have had to content ourselves with Farmer's and Sydney Broadcasters, too far removed from Tasmania to be of any purpose other than with expensive apparatus. The wireless trade in Tasmania is enjoying a big boom.

Honey-Comb Coils: How to Make and Use Them

(By M. McC.)

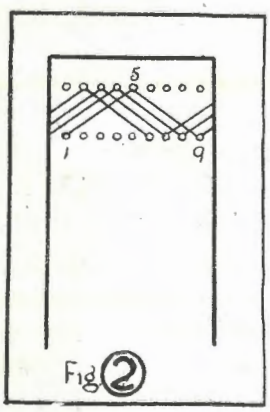
THE honeycomb coil is, perhaps, one of the neatest and most efficient tuners for general use, as it has very low ebb capacity and no "dead-end" effect.

Honeycomb coils can be used in a variety of ways, one of the most popular being as primary, secondary and tickler in the three-coil holder. One honeycomb coil in the aerial circuit and one in the plate circuit in a a two-coil holder, with the third for reaction, is ideal for a tuned anode set.



A few words, then, on the construction of honeycomb coils, which, after all, is very simple, may not, perhaps, be out of place here.

The coils are wound round a cylinder of wood, or other material having

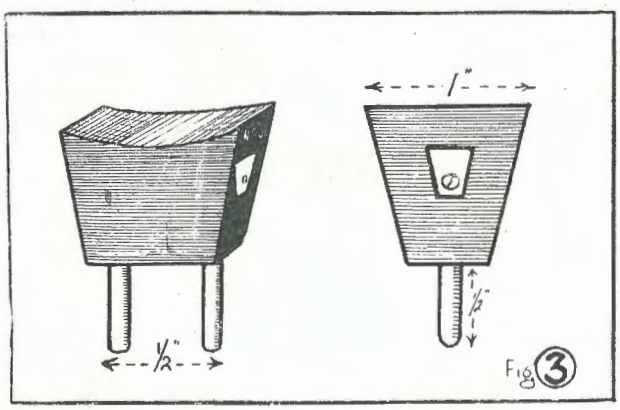


a number of pegs fixed round the periphery as in Fig. 1. The number of pegs used is not important, but for ease in winding and saving of time pushing in and withdrawing the pegs 17 is a convenient number.

There are two sets of these pegs (making 34 in all) spaced one inch apart. To mark out the positions for the pegs, wrap a narrow strip of paper round the cylinder and mark off the point where the paper exactly encircles it. The paper should then be straightened out and divided off into 17 equal divisions which can then be reproduced on the wood by again carefully wrapping the paper around.

If a wood block is used, nails can be driven firmly in at each division, and removed with the pliers. The former is then ready for use, and a light tap should secure each nail in its place.

When winding, No. 26 D.S.C. wire is very suitable for 25-100 turn coils, but finer wire is advisable for larger coils, in order to avoid undue bulkiness. Before starting to wind on the wire, a strip of thin, flexible cardboard ½in. wide should be wrapped round between the nails so as to facilitate the removal of the coil when finished.



To commence winding, secure the end of the wire to any nail which we will call No. 1. Then cross over to the other side and pass the wire round the fifth peg, then back again to the first side, and round the ninth peg, and so on to the thirteenth and seventeenth pegs, when the winding will quickly proceed, keeping each wire parallel to the last.

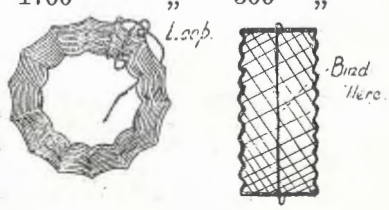
When the starting place is again reached, one layer is complete and as each layer counts as eight turns, a 50-turn coil would consist of about six layers.

When the winding is completed, cut the wire and twist it round the last peg. A very little shellac will serve to keep the turns together while the nails are pulled straight out, when the wire should be bound round the centre with fine thread and gently slipped from the former. The coil should then be painted with good shellac which, incidentally, turns the silk covering on the wire to a rather pleasing golden hue.

Some amateurs sew their coils as in Fig. 4, making a loop where the turns cross and then carry it on to the next crossing. This prevents any turns from loosening.

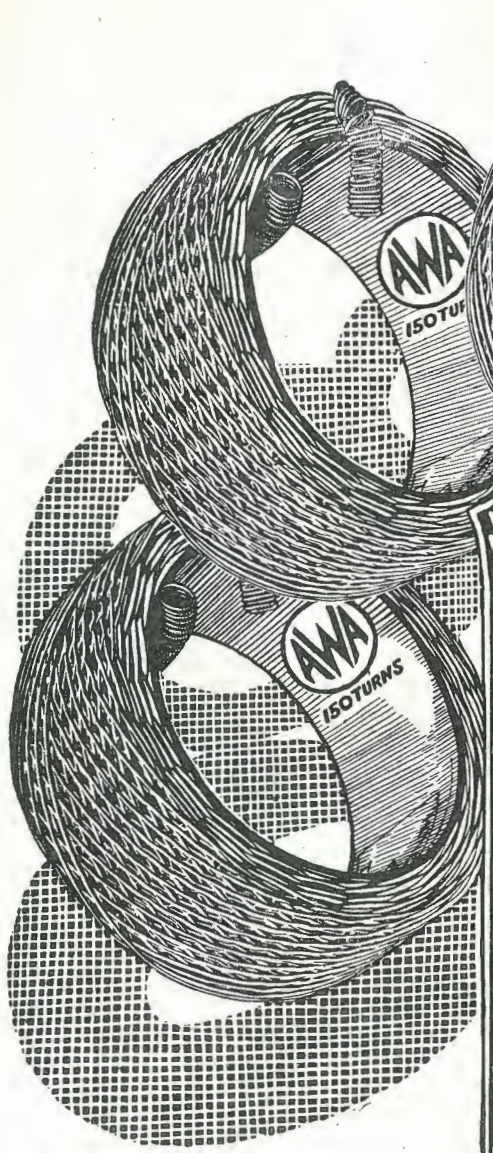
Roughly, the number of turns for the various wave-lengths, using a .0005 condenser in series are as follows:—

50-100	metres	25 turns
100-200	„	30 „
200-300	metres	45 turns
300-400	„	55 „
400-500	„	70 „
500-600	„	100 „
1100	„	200 „
1700	„	300 „



These figures give the minimum range of wave-lengths so as to allow for various aerial lengths, etc., and a large number of coils will, of course, give better tuning.

(Continued on page 498.)



Concentrated Inductance

A.W.A. Honeycomb Coils are wound with a precision which, combined as it is with high conductivity and effective insulation between turns, gives the utmost efficiency. Their self capacity is at a minimum, and in addition, they offer very low radio-frequency resistance.

In equipping your receiver with A.W.A. Honeycomb Coils, which may be used as tuning, loading or wave-meter inductances, you secure maximum all-round efficiency

Each Coil is attractively boxed, a wave-length table being printed on every carton.

Procurable from all Radio Dealers

Amalgamated Wireless (Australasia) Ltd.

97 Clarence Street, Sydney
"Collins House," Collins St., Melbourne

AWA
PRODUCTS

Shielding

SOME receiving sets squeal and howl when the hands are brought near them to make the various adjustments, and after the adjustments have been made and the stations brought in so as to be understood, the signals disappear when the hands are taken away from the set. This is known as hand capacity, and is due to the capacity of the hands affecting your set.

In a well designed and properly constructed set this does not happen. If you will look inside a set that is bothered with body capacity, you will invariably find that tuning parts of the set, such as vario-coupler, variable condenser or variometers are mounted close to the front panel. The remedy is to move them farther back, or place a metal shield on the panel and ground it.

On some sets the valve can be made to squeal by pushing the hand near the panel and pulling it away again. In most cases this is due to having the grid or plate leads close to the panel. They should never be run to the front, but always to the rear. The grid leak and condenser should not be on the panel for the same reason.

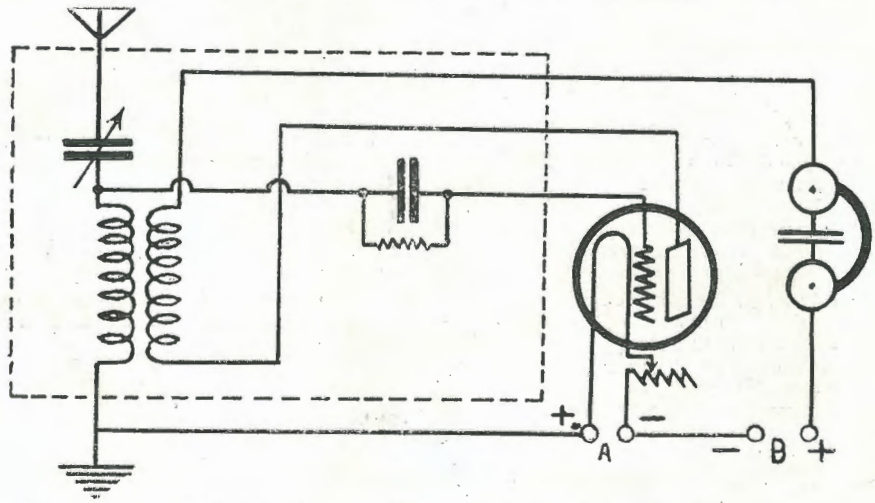
The most simple form of shielding to use on your set is sheet copper, brass, etc. It is only necessary to put it between the front of the panel and any of the parts of the tuner that would be affected by your hands, such as the vario-coupler and variable condenser. Copper gauze can also be used, but whichever form of shielding is used, it should be grounded.

No matter what form of shielding is used, none of the parts of the set such as taps, shafts of variable condenser or variometer, rheostats, etc., should come in contact with the shield. To do so, will ground these parts and if more than one of them touch the shield, would form a short circuit.

It is a mistaken idea that the more shielding the better. Too much shielding will develop losses in your set and where shielding can be dispensed with, your set will work better. A properly designed regenerative set does not require shielding of any kind if attention is paid to the layout of parts and proper connections made to the variable condensers.

Very few real amateurs resort to radio frequency amplification to work from one end of the continent to the other. This type of set is well constructed, having low loss inductances and condensers. In some sets, they even do away with sockets and solder connections to the prongs of the valves.

The dotted lines in the diagram show the parts of a single circuit regenerative set that should be shielded.



The dotted lines in the diagram show how a single circuit regenerative set should be shielded.

Honeycomb Coils

(*Continued from page* 488.)

In a tuned anode set a similar coil to the aerial one, with a .00025 condenser in parallel and a rather smaller one for the reaction should be used.

If the ready-made mounts are used all that has to be done is to secure the coil by means of cardboard or fibre stripping, fixing the ends of the wire to the terminals and its coil is ready for use. For the economical amateur, the mounts could be made as in Fig. 3 from 1in. thick ebonite.

WIRELESS AND THE GRANVILLE BROTHERHOOD

AT the request of the pres. and sec, Mr. E. T. Fisk, Managing Director of Amalgamated Wireless Ltd., lectured on a recent Sunday afternoon to the Granville Brotherhood on the subject of Wireless Communication. The lecturer described the fundamental principles of wireless and referred them to well-known physical analogies. This was followed by a description of the many and varied application of wireless. The lecture was well attended and was considered to be one of the most interesting addresses that have been made to the Granville Brotherhood.

ADDRESS WANTED.

IF "J.M.W.," author of an article entitled, "How to Increase Range and Selectivity," which appeared in *Radio,* No. 42, will write to this office giving his address, payment will be made for the accepted MSS.

W.C.N. OPENS UP.

NORTHERN representatives of the Burgin Electric Company, Sydney, the Wireless Company of Newcastle, recently opened a specialty radio store at 59 Hunter Street, Newcastle, where many fine examples of the now famous Burginphone receiving set may be inspected and where also copies of this magazine may be secured.

Queries Answered

"CAR WHO" (Chatswood). Q.: What is cause of difficulty in receiving 2BL, although 2FC and ship stations are picked up quite easily (diagram of receiver submitted)? A.: The coils you are using are too large, and, furthermore, you have your aerial condenser in parallel, which should be placed directly in the aerial circuit in conjunction with a series-parallel switch.

L. T. W. (Parramatta). Q.: What size honeycomb coils should be used for 2FC and 2BL, using crystal-valve circuit No. 2 published in *Radio*, No. 39? A.: 150 and 50 respectively. Q.: Will aerial of two wires, 60 feet long, 30 feet high, at one end and 28 feet at the other, with 7/20 lead-in be O.K.? A.: Yes, but you would get better results if height were increased.

J. C. (Paddington) Q.: Would any of the crystal-valve receivers published in *Radio*, No. 39, give as good results as a straight-out three-valve regenerative set? A.: No. Q.: How would the former compare in price with the latter? A.: The cost of the crystal-valve outfit would be considerably less.

J. G. S. (Epping). Q.: Can you recommend a simple three-valve circuit? A.: We suggest you use the P1 with two stages of audio frequency amplification published in *Radio*, No. 40. Q.: Would it be possible to use both loop and outside aerial? A.: You will only be able to receive the local stations satisfactory on a loop. Q.: Can you recommend a circuit for tuning out Pennant Hills? A.: By using a coupled aerial circuit and fine tuning you should be able to cut down interference from this station to a minimum.

N. B. (Ilfracombe). Q.: What is the best wire with which to wire up a two-valve set? A.: The wire generally used for this purpose is No. 16 copper. Q.: What are the wave-length limits of a Navy loose coupler? A.: The "Randwick" type has a tuning range from 300 to 2,500 metres.

"*Ray Dio*" (Liverpool). Q.: Does Mr. Maclurcan, of Strathfield, broadcast, and, if so, what is his wave-length? A.: Mr. Maclurcan has no regular times of transmission. His wave-length is 132 metres. Q.: What stations could I pick up with a loose coupler set? A.: See article on "How to Make a Loose Coupler," published in *Radio*, No. 37. This will tune between 200 and 2,000 metres, and will pick up most of the local amateurs, commercial stations and Farmer's Q.: My aerial is 90 feet long and about 50 feet high, if I added another 10 feet would I get better results? A.: Adding another 10 feet to the length and height of your aerial will give you better results for crystal reception.

L. R. J. (West Devonport). Q.: What is the natural wave-length of an aerial of the following dimensions:—Three-wire (No. 16 copper) "T" type, length 60 feet, height 60 feet, lead-in 60 feet, ground lead six feet? A.: About 120 metres. Q.: Is reception of 2FC on a crystal set practically every night good work? A.: Yes. Excellent, considering your distance from Sydney. Q.: What are the distances of the following stations:—VIP, VIO, VII, VIT, VIB, VLA, VLW and VPD? A.: VIP, 1,800; VIO, 2,000; VII, 2,300; VIT, 1,600; VIB, 1,100; VLA, 1,500; VLW, 1,400; and VPD, 2,500. Q.: What time do the following stations send weather reports:—VIO, VII, VIT, VPD, VID and CGI? A.: These stations have no regular times for transmitting weather reports, but are sent out at intervals. Q.: Would an aerial 20 feet above an iron roof 40 feet above the ground be satisfactory? A.: Yes. The roof would act as a counterpoise and reduce aerial losses. Your previous letter evidently went astray. We will be pleased to receive a description of your set. Thanks for complimentary remarks re *Radio*.

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.

W. J. (Croydon Park). Q.: What is the inductance value of basket coils? A.: Basket coils are generally used for short wave-lengths. Q.: Can they be used instead of honeycombs in the valve-crystal sets described in *Radio*, No. 39, and the P1 receiver described in issue No. 36? A.: Yes. Q.: On what wave-length does 2BF transmit? A.: 350 metres.

H. W. (Balmain). Q.: Can you give me data for winding coils for use with the P1 received published in *Radio*, No. 36? A.: It would take too much space to give you this information in these columns. Q.: What make and voltage would you recommend for the A and B battery? A.: This depends upon the particular valve you use. Dry cell valves such as the WD12 require 1.5 volts for the filament and 20 to 100 volts for the B battery.

K. E. (Haberfield). Q.: What are the relative merits of a variometer, variocoupler and Honeycomb type of coils? A.: A variometer is used to vary inductance. A variocoupler to vary coupling and a honeycomb coil is used as fixed inductance. Q.: Can you give me a four-valve regenerative circuit with one stage radio, detector and two stages of audio frequency amplification? A.: Circuit posted.

A. W. S. (Townsville). Q.: Which would be the best aerial for receiving 2FC and 2BL (particulars submitted)? A.: Either the inverted L or T type would be most suitable. Q.: What is the best wire for rheostats and how much would be required for one of 30 ohms? A.: Use 7 to 8 feet No. 30 S.W.G. Nichrome.

W. T. C. (Stanthorpe). Q.: How can howling be overcome? A.: Probably the resistance of your grid leak is too high, or you are using too large a coil for reaction. Q.: Why it is 2FC cannot be tuned in with the series-parallel switch in parallel? A.: You are evidently using too large a coil in the primary circuit. Check up the connections of your switch as shown in diagram published in *Radio*, No. 38.

M. H. (Rockdale). Q.: Are there any valves available which can be used from 240 volt A.C. current, if so, will it be necessary to break down the current by a transformer? A.: Yes. The A.P. double filament valve can be used for receiving using

the A.C. lighting current in conjunction with a "Bell" transformer stepping down to 6 volts .25 amps.

C. W. (Woollahra). Q.: What are the approximate distances between centres of honeycomb coils, using circuit shown in Fig. 1, "Crystal-valve Receivers," published in *Radio,* No. 39? A.: These can be used in the standard three-coil mounting. Q.: Which circuit would give the best results? A.: For selectivity, use circuit as per Fig. 4. Q.: Would a receiver comprising one radio, crystal and one audio frequency amplification give better results? A.: Yes. Why not use the three-valve receiver employing the Pl cricuit as detector with two stages of audio frequency amplification published in *Radio,* No. 40? Q.: Would you advise the use of American, English, or Dutch valves? A.: You will experience no trouble with any of the English or American standard type of valve.

W. H. S. (Waverley). Q.: Using the one-valve amplifier in conjunction with a variometer crystal set would signals be decently audible in a room, say, 14ft. x 16ft.? A.: We do not think you will be able to obtain results in a room of the dimensions you state. Q.: Would this be possible by placing the 'phones at the narrow end of a gramophone horn? A.: Yes, providing the signals in the 'phones are strong, but it would not give you the same result as a small loud-speaker. Q.: Where should present 'phone terminals be connected using the one-valve amplifier, and where would the earth wire be connected? A.: Connect the 'phone terminals to the primary of the audio frequency transformer, the earth lead should remain in its present position. Q.: What are the voltages of the A and B batteries? A.: This depends upon the particular valve you use. Particulars giving filament and plate voltages for the various types of valves have been published in previous issues of *Radio.*

H. C. T. (Abbotsford). Q.: What is cause of trouble in receiving using the Pl circuit published in *Radio,* No. 38, although previously good results were obtained? A.: From the particulars you have given it appears your valve is at fault. Replace this with another. Probably the resistance of your grid leak is too high.

H. T. (Temora). Q.: Can you tell me why I am only able to get weak signals on a four-valve receiver using UV199 valves? A.: If you will forward us full particulars, together with diagram of your receiver we will endeavour to ascertain the cause of your trouble.

H. C. P. (Bondi). Q.: Using the circuit shown in Fig 3, *Radio,* No. 39, in what position on the panel should be coils be placed? A.: The two coils should be placed as close together as possible, or preferably in a two-coil mounting, one coil being variable. Q.: What number of turn coils will be required to receive amateur and broadcasting stations? A.: These particulars were given in the "Queries Answered" columns *Radio,* No. 40. Q.: Will this circuit be efficient for receiving local broadcasting stations? A.: The circuit you refer to will work efficiently on all wave-lengths providing you use the correct coils.

L. C. D. (Cremorne). Q.: Would it be an advantage if I used a variable condenser in conjunction with loose-coupler crystal set (particulars submitted)? A.: Yes, placing a variable in the aerial circuit will improve your tuning in conjunction with a series-parallel switch. A condenser across the secondary coil will also give you finer tuning and cut down interference to a minimum. Q.: What capacity and make would you recommend? A.: .001 mf. Any standard make will be suitable.

S. G. (Sydney). Q.: What circuit would you recommend for receiving in Moss Vale, with due regard to expense together with a list of parts required, etc.? A.: We suggest the three-valve receiver described in *Radio,* No. 40. Q.: Can you give me a one-valve circuit which would be satisfactory? A.: The Pl, particulars of which appeared in *Radio,* No. 38, should give you satisfactory results. Q.: Can low filament valves be used? A.: Yes, valves which can be worked from dry cells will give equally as good results as those requiring accumulators. Q.: Would aerial 100 feet long, 30 feet high, inverted L, be O.K.? A.: Your aerial will need to be higher than 30 feet to give good results. Q.: Is there a good publication dealing with the different circuits and giving the individual points in favour? A.: There are a number of books on this subject, such as *The Amateur's Book of Wireless Circuits* by Haynes.

R. J. G. (Forbes). Q.: Can you advise a good three-valve receiver, giving particulars for constructing, etc.? A.: We suggest you construct the three-valve receiver published in *Radio,* No. 40, full particulars as to wiring, etc., are given and can be easily followed.

L. A. W. (Sydney). Q.: What is cause of poor results using circuit as per Fig. 2, *Radio,* No. 39 (particulars of apparatus submitted)? A.: The ratio of your transformer is too high. This should be three or four to one. Suggest you carefully check up all connections, and, furthermore, see you have a good point on your crystal. You will find an aerial tuning condenser a great improvement.

S. D. (Waverley). Q.: Using a variocoupler and .001 condenser, what is cause of difficulty in picking up 2FC, although 2BL and amateurs are received quite well? A.: You will find it difficult to get a variocoupler to cover a wave range from 300 to 1,100 metres if you only have a small aerial. Following are particulars for a variocoupler which will tune between approximately 800 and 1,500 metres, using variable condensers of .001 mf. capacity in both primary and secondary circuits:—stator 100 turns No. 20 d.s.c. and rotor 120 turns No. 30 d.s.c.

T. F. (Warracknabeal). Q.: Would hard vulcanised fibre do for a panel? A.: Yes, but you will find this much more expensive than bakelite. Q.: Would a four-valve receiver bring in 2FC on a loud-speaker? A.: If you are able to get this station fairly strongly with head phones and three valves, you should be able to get satisfactory loud-speaker results on four valves. Q.: Are Farmer's transmitting on 5,000 watts? A.: Yes, and have been for some time. Q.: What times and when does 2BL transmit? A.: See our "Broadcasting and Listening-in" page. Q.: What time and wave-length does Westralian Farmers transmit? A.: See answer to above. Can atmospherics be eliminated to a certain extent without decreasing the signal strength? A.: We do not know of any method which eliminates static without effecting the signal strength.

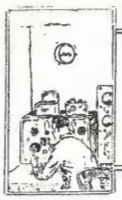
C. O. R. (Innisfail). Q.: Can you supply me with the names of the following stations:—JRW, JRZ, JRH, JRV and JRS? A.: We have no record of any of these stations. Q.: Can interference from these stations when receiving 2FC be overcome? A.: Providing that they are not working on the same wave-length as 2FC, using coupled aerial circuit with condensers in both primary and secondary circuits should enable you to cut down interference to a minimum.

A. B. (Dorrigo). Q.: Where can I obtain a dealer's license and at what price? A.: Apply to your local postmaster. The annual fee is £5. Q.: Can you supply me with a copy of the regulations? What is cost of a listening-in license? A.: A draft of the regulations was published in *Radio,* No. 35. The fee for broadcast listeners' license is 35/- per annum.

J. B. (Annandale). Q.: Would two honeycomb coils instead of one as shown in article on "Crystal-valve Receivers," *Radio,* No. 39, with an additional condenser give finer tuning (circuit submitted)? A.: Yes. Q.: What size coils should be used for 2BL and 2FC? A.: See answers in previous issues of *Radio.*

D. X. (Brisbane). Q.: In constructing a two-valve set (1 h.f. and 1 det.) would coupling reactance coil to secondary be better for obtaining reactance than coupling reactance coil to tuned anode coil of H.F. valve? A.: For preference, couple to the tuned anode coil, this will make your receiver easier to tune, and less liable to radiate energy. Q.: Could reactance be obtained by coupling anode coil to secondary coil using one stage H.F. and crystal detector? A.: Yes.

W. L. (Rozelle). Q.: What gauge, quantity of wire, etc., would be required to build an audio frequency transformer? A.: This information was supplied in article on "A Two-valve Broadcast Receiver," published in *Radio,* No. 38.



MOVEMENTS OF MARINE WIRELESS OFFICERS

OCTOBER.

Mr. L. J. Coley relieved Mr. S. J. McVeigh on s.s. *Mallina* at Sydney, 9th.

Mr. S. J. McVeigh relieved Mr. N. M. Leeder on s.s. *Mataram* at Sydney, 9th.

Messrs. J. H. Hugman, F. Marsden and R. B. Lowry signed on s.s. *Changsha* as senior, 2nd and 3rd operators respectively, at Sydney, 9th.

Mr. J. W. Fairley signed off s.s. *Ellaroo* at Melbourne, 7th, and terminated his services.

Mr. G. Vincent signed on s.s. *Ellaroo* at Melbourne, 7th.

Mr. P. C. Gillon signed on s.s. *Suva* at Sydney, 13th.

Mr. N. M. Leeder relieved Mr. E. S. Bailes on s.s. *Loongana* at Melbourne, 10th. Mr. Bailes terminated service.

Mr. G. H. Hugman signed off s.s. *Suva* at Sydney, 4th.

Mr. A. J. Costa signed off s.s. *Century* at Sydney, 7th.

Mr. A. B. Monks signed off s.s. *Katoa* at Wellington, 6th.

Mr. D. S. Bell signed on s.s. *Katoa* at Wellington, 6th.

Mr. F. N. Davidson signed on s.s. *Karori* at Auckland, 9th.

Messrs. A. J. Costa and D. Lynch signed off s.s. *Esperance Bay* as 2nd and 3rd operators respectively at Sydney, 21st.

Messrs. W. P. D'Arcy and B. I. Rose signed on s.s. *Esperance Bay* as 2nd and 3rd operators respectively at Sydney, 21st.

Mr. H. J. Crocker relieved Mr. W. P. D'Arcy as 3rd operator on s.s. *Niagara* at Sydney, 21st.

Messrs. A. W. Stewart, B. I. Rose and H. J. Crocker signed off s.s. *Bulla* as senior and 3rd operators respectively at Sydney, 21st.

Mr. H. A. Greer signed off s.s. *Aramac* at Sydney, 21st.

Mr. N. M. Leeder signed off s.s. *Loongana* at Melbourne, 10th, and signed on s.s. *Nairana* at Melbourne, same date.

Mr. D. Lynch relieved Mr. E. H. Pollard on s.s. *Monaro* at Sydney, 22nd.

Mr. E. H. Pollard relieved Mr. B. Jones on s.s. *Allara* at Sydney, 24th.

Mr. H. A. Greer relieved Mr. C. H. Kidman on s.s. *Wyreema* at Sydney, 24th. Mr. Kidman terminated service.

Mr. H. J. Byrne signed on s.s. *Urilla* at Sydney, 24th.

Mr. T. Chalmers relieved Mr. F. L. Dawe, as senior operator, on s.s. *Arafura* at Sydney, 27th.

Mr. H. F. Tye relieved Mr. V. J. Foreman on s.s. *Wear* at Sydney, 27th.

C. E. W. (Sydney). Q.: Is it possible to build a three-valve receiver simple to operate and tune in Australian stations but not employing honeycomb coils or other coils that have to be changed to get the different stations? A.: We suggest you construct the "Two-valve Broadcast Receiver" described in *Radio*, No. 38, and add a stage of audio as described in *Radio*, No. 37.

A. G. C. (Ryde). Q.: Referring to article on "Crystal-valve Receivers," published in *Radio*, No. 39, can a .001 variable condenser be used in the aerial circuit? A.: Yes. We would suggest you also use a Series-parallel Switch, described in *Radio*, No. 38. Q.: Would a carborundum crystal be satisfactory? A.: Yes, in conjunction with a small battery and potentiometer. Q.: Would it effect reception if my neighbour ran his aerial off the same pole? A.: No, providing the two wires are not less than three feet apart at the apex and well insulated.

K. B. C. (Stanmore). Q.: Have been unable to get satisfactory results with my valve receiver; can you suggest a suitable circuit using present apparatus (particulars submitted)? A.: We would suggest the P1 circuit. See *Radio*, No. 38. Q.: Can you supply data for constructing a Radio frequency transformer? A.: Pressure on space prevents us.

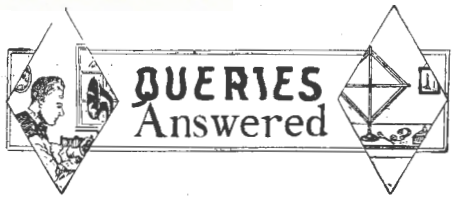
C. E. T. (Eastwood). Q.: Can you give me number of turn coils for 2FC and 2BL using circuit as per figure 4, *Radio*, No. 39? A.: With your aerial use, for 2FC, primary, 150; secondary, 200, and reaction, Primary 150, Secondary 200 and Reaction 100. For 2BL, 50, 75 and 50 respectively. Q.: Would the above circuit prevent Pennant Hills from "drowning" broadcasting? A.: With careful adjustment of coils and condensers you should not experience any interference.

W. G. I. (Sydney). Q.: Would a WD12 valve work satisfactorily in the one valve set described in *Radio*, No. 36, and what should be the value of the A and B batteries? A.: Yes. For this valve the filament voltage should be 1.5 (one dry cell) and the plate voltage 40 to 50. Q.: What should be the value of the grid condenser and leak? A.: .0003 m.f. and two megohms respectively.

L. B. (Darling Point). Q.: Having obtained satisfactory results with the P1 circuit, can you supply me with circuit using additional apparatus (particulars submitted)? A.: Your apparatus will be most suitable for making up the three-valve receiver described in *Radio*, No. 40. You will get greater selectivity using the honey comb coils instead of your vario-coupler.

J. R. (Sydney). Q.: Can you supply me with circuit for two Valve Reflex? A.: See "Reflex Receivers," *Radio*, No. 22.

P. A. H. (Sydney). Q.: Can you give me a "Low Loss" receiving circuit employing 1 to 3 valves, either as radio or audio amplifiers? A.: See "Low Loss Tuners," *Radio*, No. 32. As per Fig. 8, this receiver can be used in conjunction with any standard radio or audio amplifying circuit.



(*Continued from page 494.*)

A. R. S. (Woollahra). Q.: Would a UV201A valve be better than a WD12, using the one valve amplifier described in *Radio*, No. 37? A.: Either will be satisfactory. Q.: Would better results be obtained by adding a condenser as per diagram (submitted)? A.: This will give you more selective tuning. Q.: Are any fixed condensers required? A.: Yes. A .0003 m.f. grid condenser and a .001 'phone condenser. Q.: Will this set work a loud-speaker? A.: Not unless you are getting exceptionally loud signals in the 'phones. Q.: For adding another stage of audio frequency, should the primary of the second transformers be connected to the present 'phone terminals as per diagram? A.: Yes. Q.: Will the additional condenser give inductive coupling as mentioned in *Radio*, No. 40? A.: No. You will get far better results using honeycomb coils instead of the tapped inductance.

H. M. (Rockdale). Regret that through an error you were referred to *Radio*, No. 23 for information on "How to Make an Electrolytic Rectifier." These articles appeared in issue Nos. 3 and 8.

P. W. (Port Melbourne). Q.: Can you supply me with wave-length and times to listen for KGO? A.: Wave length, 312 metres. The best times to listen in between 6 and 7 p.m. Sundays, Tuesdays, Wednesday, and Thursdays. Q.: Is it possible to pick up this stations on one valve? A.: Yes. We have received many reports from experimenters who have heard KGO on a single valve.

A. T. (Drummoyne). Q.: Can you give me particulars for adding one and two valves to the P1 circuit? A.: Use the one valve amplifier described in *Radio*, No. 37. Circuit and full particulars using the P1 and 2 stages of audio frequency amplification appeared in *Radio*, No. 40. Q.: Would a transformer be an advantage using one valve? A.: A transformer is not necessary. Q.: Would a .0003 condenser instead of a 23 plate be satisfactory? A.: Yes.

A. R. (Ivanhoe). Q.: What size coils, using circuit as per Fig. 4, *Radio*, No. 39, would be required for wave-lengths between 150 and 2,000 metres? A.: Obtain a number of coils from 25 to 300 turns and select suitable coils for the wave-length you desire to receive. Q.: What should be the value of the aerial tuning condenser? A.: .001 m.f., variable.

T. W. (Lindfield). Q.: What should be the size of coils of L1, L2 and L3 (circuit submitted)? A.: These can be honeycomb coils in a three-coil mounting. Select suitable coils for the station you desire to receive. Sizes of coils for the various stations have been given in previous issues. Q.: Is a .0005 m.f. condenser too small for aerial tuning condenser? A.: No, but you will probably have to use larger coils in the primary circuit. Q.: Is condenser marked .0005 in the diagram of the correct value? A.: A .0005 condenser across coil L2 will be O.K.

J. P. (South Grafton). Q.: Using a crystal set with two plug-in coils, what sizes will be required for 2FC and 2BL? A.: Primary, 150; secondary, 200; for 2FC and for 2BL, 50 and 75, respectively. Q.: What height and length should my aerial be? A.: As high and as long as possible. A single wire will be satisfactory. Q.: Would a single "Frost" 'phone be suitable for receiving Sydney broadcasting stations? A.: Yes, but two ear pieces would be better. Q.: Would it be possible to tune in 2BL without a variable condenser? A.: Yes, but using one will make your receiver more selective. Q.: What are the largest coils that can be used with this set and what would be the wave-length? A.: You could go up to 2,000 metres and over, but the majority of stations transmitting above this wave-length do so on C.W. Q.: Which would be the best 'phones for a crystal set, 2000, 4000, 6000 or 8000 ohms? A.: 8000 ohms. Q.: Which would be the best circuit or circuits to use? A.: A number of crystal circuits appeared in *Radio*, No. 34.

W. B. G. (Croydon). Q.: What type of loud-speaker would you recommend, using a three-valve set, at a moderate price? A.: "Junior" Amplion, Sterling, Western Electric, etc. We refer you to advertisements in this paper. Q.: Would the three-valve receiver published in *Radio*, No. 40, operate a loud-speaker? A.: Yes, providing you are within a reasonable distance of the broadcasting station.

A. G. S. (Sydney). Although no plugs and jacks are shown in the three-valve circuit published in *Radio*, No. 40, these can be used and connected as you suggest. Any standard type of valve would be satisfactory.

U. B. A. (Donald, Vic.). Q.: Using a four valve set, would Phillips D1 and D2 valves give as good results or better, than Radiotron 200 or 199? A.: You will find very little difference, providing the correct voltages are used as specified by the makers.

R. J. O. (Manilla). Q.: Can you state cause of difficulty in picking up 2BL, although 2FC can be received with ease? A.: You are evidently using the wrong size coils. With a three coil circuit use primary 50, secondary 75 and reaction 50.

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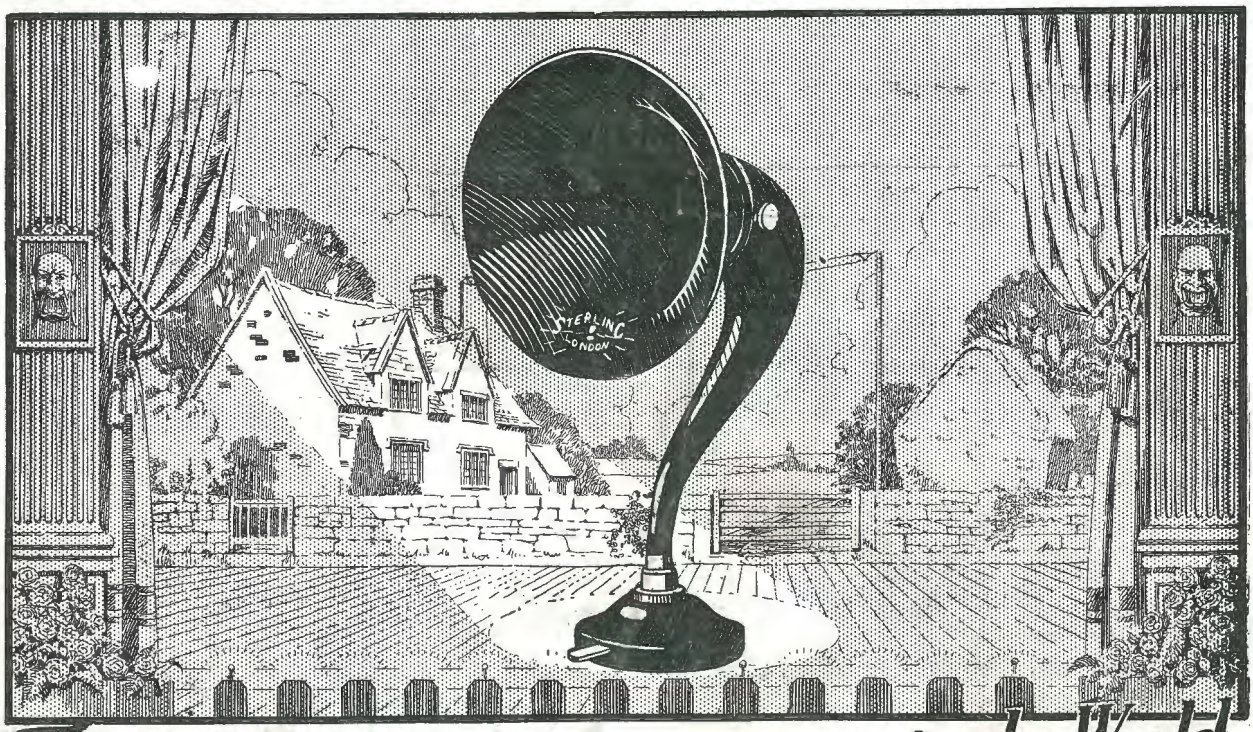

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