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SIXPENCE

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BROADCASTING BRINGS COMIC OPERA TO THE BACK-BLOCKS.

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Broadcasting—A Necessity

ALTHOUGH "Necessity is the Mother of Invention" may not be an altogether modern adage, it nevertheless possesses one shining virtue that is not so often enjoyed by a great number of others—it is true.

THE typewriter, the cotton loom, the watch, the steam engine and any other reducers of expenditure of time, labour and money were not evolved or invented by those responsible for their materialisation merely to satisfy a caprice. They were thought out, tried out and carried out because they were wanted and wanted quickly. Society demanded them and had to have them; she did. The demand was created and sooner or later, but generally sooner, this was met by supply. The supply could not precede the demand for it is quite obvious that without demand there could be no supply—which brings us to the point.

WIRELESS came not a minute too early. It arrived at a moment when something surer, quicker and cheaper than the then existing modes of communication was imperative. It came to meet the demand; it was the logical supply. Wireless met that demand, is meeting it now, and will continue to do so until a better medium is discovered. The remoteness of that possibility is such as will preclude its discussion here for some considerable time to come.

IN this world of ours, day by day, as modern progress makes its giant strides, greater advancement makes its greater demands on all and sundry. No sooner had wireless telegraphy become generally commercialised, thus making an immense step in progress and the establishment of itself as a necessity, creating its own demand, in other words, than it led to greater things—broadcasting.

THAT, too, created its own demand and supply. Its demand is caused by those necessary things of our modern daily life which it can provide. To mention a few, it gives us up-to-the-minute news, market reports, stock market quotations, weather conditions and forecasts, amusement, education, and a great deal of other information at all hours of the day and part of the night that modern living and labouring conditions make it absolutely necessary that we should know. And there is more in the service of broadcasting than this. It gives those things in a better way than we have ever been used to having them in the past. Everything is literally brought to the fireside.

NEWSPAPER reports of commerce, sport and the world of art and literature? Don the ear-'phones, tune in, and you receive the cream of it. Drama, comic and grand opera, musical comedy, music, song, story? A twist of the wrist and the best is at your side. Would you hear how the world's biggest men reached the pinnacle on which they stand to-day? A radio receiving set will tell you. If you are of the weaker sex, would you know *le dernier cri?* Experts whose life-work is fashion, who have had wide experience in the centres of the most splendid cities in Europe will give you opinions that are worth their weight in gold to a woman to whom dress is a big consideration.

PERHAPS you haven't given up "Golliwogs" yet and the gift of a box of leaden soldiers lifts you to the ninth Heaven of Delight. Would you like to hear the most wonderful and the strangest stories that ever came out of Hans Andersen or the fertile brains of the brothers Grimm? There is an "Uncle" at your nearest broadcasting station who will give you the most delightful thrills that ever ran up and down your small spine.

OR again. Perhaps you have "put away childish things." You have a wife and children to keep. You are in business in a big way. Where most of us talk in pounds you juggle with your thousands. You must be up to the minute; your business demands it, You must know the latest information concerning the European markets—it doesn't matter what they are—silks, cotton, beef. You want to be familiar with the most modern business methods. "What are they doing in Wall Street or Lombard Street?" you ask "I want to know!" Broadcasting will tell you.

AND you, Man on the Land! Your need is no less than these who have been particularised above. In fact, it is a good deal greater. You are far away from the Centres. News that may mean so much to you may take days, weeks, months, before it comes through to you. Of what use is it to you then? If, on the other hand, you could get that information at a speed of 186,000 miles a second—that might be to your advantage, eh? You would have your finger on the pulse of a falling or rising market. You could draw your own conclusions. You would be on the same level with the man who is on the spot and gauge your operations accordingly.

IN this issue's Radiotorial we have itemised a few to whom broadcasting is a necessity. We have purposely taken every-day people. People who you meet in the trams and the streets and the cafes and the theatres. People to whom broadcasting is an imperative necessity—the inference is obvious.

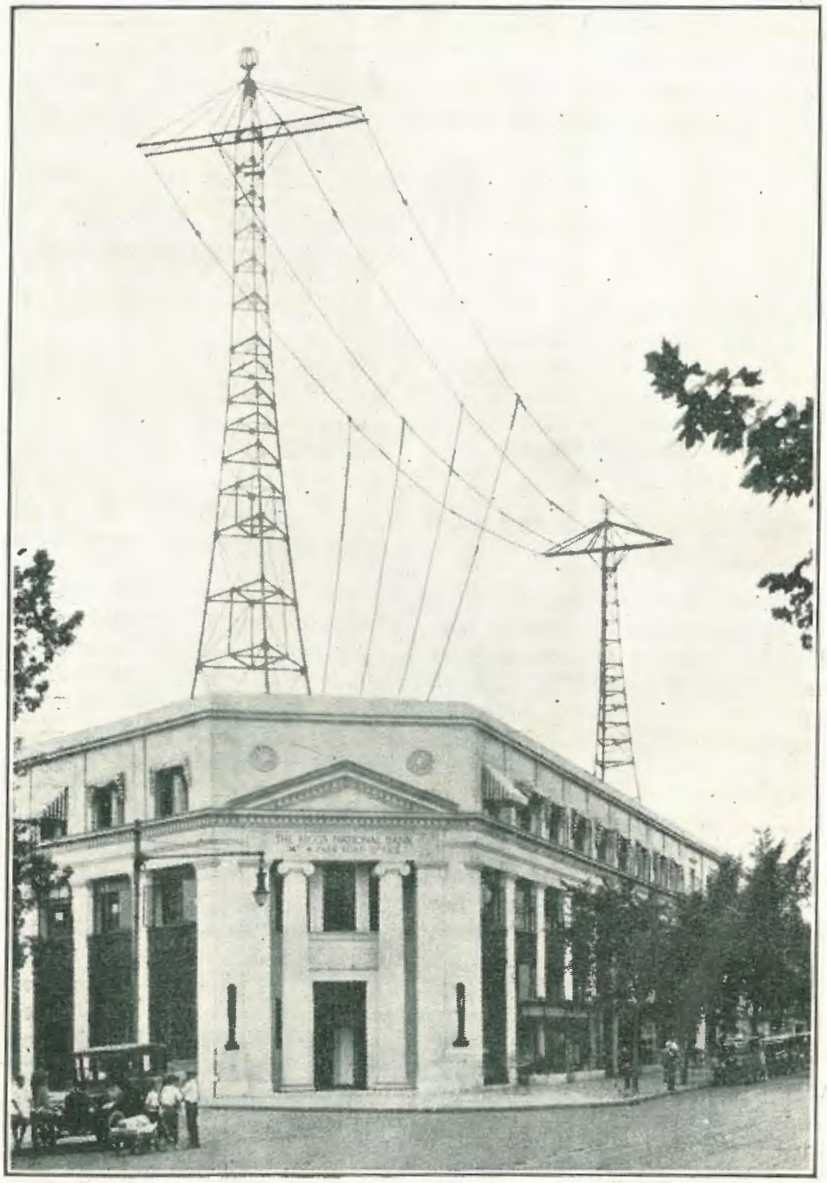
Highlights of Radio Broadcasting

A Million Swings in a Second

By ALFRED N. GOLDSMITH, B.S., Phd., Fellow I.R.E.,
Chief Broadcast Engineer, Radio Corporation of America
(Special to "Radio.")

IN the leisurely days of antiquity, mankind's unit of time was the day, or possibly the hour. Unless time has blurred our picture of those distant days past recognition, it would seem that to-day men live faster as well as longer than in the times when the speedy runner was the quickest means of getting important news from one point to another. How far we have gone in squeezing the value out of every instant of time is perhaps indicated by the new unit of time, already familiar to the radio engineer, namely the micro-second or millionth of a second! The first reaction of the broadcast listener to the mention of the micro-second would undoubtedly be: what is the use of this incredibly minute space of time? The answer to this question is: the fundamental events in radio broadcasting happen in micro-seconds; that is, the individual electrical vibrations which gave birth to the flying radio wave last but a micro-second or two for each vibration.

Suspended high over the broadcasting stations are long stretches of wire, carefully insulated from the supporting towers. To start the Radio wave, large radiotrons are employed which, suitably connected into elaborate circuits, literally pump electricity into the suspended wires and out of them very many times each second. One must regard the suspended aerial wires as a sort of electrical tank into which a considerable quantity of electricity is shot and withdrawn at very frequent and regular intervals. The number of times per second that the electrical charges are forced into and out of the aerial is called the "frequency" of the station, and is expressed in "kilocycles." The kilocycle is actually a thousand vibrations, so that when we see a station described as having a frequency of 640 k.c. ("kc." being the abbreviation for kilocycles), it means simply that the frequency or number of electrical vibrations in the aerial wires in each second is 640,000. In other words, each vibration takes about one and a-half micro-seconds! The Bureau of Standards has recommended that the kilocycle be used exclusively in giving the electrical identification of stations, rather than the wave-length in metres. The wave-length is simply the distance from crest to crest of the long radio waves which, sweeping



The Frequency of Electrical Vibrations in the Antenna at WRC is 640,000 per second.

across country with the speed of light, carry the radio message. It is, in fact, very easy to convert metres wave length into kilocycles of frequency. The rule is to divide 300,000 by the wave-length in metres to get the frequency in kilocycles. Thus, a 300-meter wave-length corresponds to 1,000 kilocycles (or, in everyday language, a million swings per second). There are a number of technical reasons, which need not be discussed, why kilocycles are a better way of describing a station than metres wave-length. There is one interesting point in connection with the frequency of a station which is worth notice. The frequencies of any two stations must not come nearer to each other than ten kilocycles, else they are bound to interfere with each other when music is being transmitted, and no amount of tuning on any kind of receiver can prevent this. It is for this reason that the Second National Radio Conference, in drawing up the recommendations which afterwards became regulations of the Department of Commerce, recommended that no stations should be assigned frequencies less than ten kilocycles apart.

The frequency of a station (or the wave-length) is measured by means of a device known as a wave-meter, and every high-grade broadcasting station is provided with a precise wave-meter, so that the frequency of the station can be set accurately, and each station, so to speak, is thus kept in its own front yard. Occasionally a station is not accurately on its own frequency, and there is produced a whistling note (known scientifically as a "beat note") in its signals and in the signals of the nearest station (in frequency). For example, if two stations happen to be tuned to frequencies of 600 and 602 kilocycles, the reception of each of them will be spoiled in some localities by a shrill two-kilocycle note which will break up the music and speech of each, whereas if they were 600 and 610 kilocycles, no interference would be noticed. Therefore it is very necessary that stations should be accurately tuned and remain so.

Tuning of a station to a definite frequency is a useful process since it enables the listener, by tuning his receiver correspondingly, to pick only that station, and to disregard stations of other frequencies unless they are too powerful or unless his own receiver is lacking in "selectivity," which is the ability to discriminate between stations on neighbouring frequencies. The higher frequencies lie at the lower end of the scales of most receivers so far manufactured, corresponding as they do to the shorter wave-lengths. It is to be hoped that the receivers of the future will be marked in frequencies in kilocycles and that their scales will run so that the low frequencies lie at the lower end of the scales and the higher frequencies at the upper end of the scales. The range of frequencies allotted to some of the various types of service are approximately as follows: For trans-oceanic communications, 12 to 60 kc. (25,000 to 5,000 metres); for overland operations, 60 to 100 kc. (5,000 to 3,000 metres); for ship long distance communications, 100 to 150 kc. (3,000 to 2,000 metres); for shorter distance ship communications, 300 to 500 kc. (1,000 to 600 metres); for all broadcasting, 550 to 1,350 kc. (546 to 222 metres); for amateur operation, 1,350 to 2,000 kc. (222 to 150 metres).

KING TO BROADCAST.

The King's Speech at the opening of the Empire Exhibition at Wembley will be broadcasted, this being the first occasion His Majesty's voice has been heard by wireless. The Royal message will be despatched instantly by the All Red Route, and will encircle the globe in less than five minutes from the time of delivery.

Some people have got the impression that the distance of a station from them was connected in some way with the frequency or wave-length of the station. There is no such relation. Nearby stations may have low or high frequencies, this being entirely dependent on their assignment of frequency from the Department of Commerce and their corresponding adjustment. The Department assigns frequencies to individual stations on a systematic, just, and scientific basis, depending entirely on the class of station, the location of the station relative to other broadcasting stations, and the reducing of interference between stations to the minimum. The aim of the Department, which is increasingly attained, is to permit every broadcast listener in the United States to hear any station within the range of his receiver without interference. It is a fact that some persons, being located almost within the shadow of the towers of a powerful broadcasting station, cannot escape hearing it with average receivers, and such persons should take a reasonable attitude toward a condition which is being continually improved. The steady improvement in selectivity of receivers, in skill of receiver operation by the broadcast listeners, and in the organizations themselves, is bound to lead to practically interference-free conditions in the reasonably near future. In the meanwhile, it is well to remember that the Department of Commerce and the various National Radio Conferences are perfectly well aware of the problems involved and are leaving no stone unturned in their attempts to satisfy everyone. They must be guided by the idea of the "greatest good for the greatest number," and they are succeeding admirably in the vast majority of instances.

In conclusion, it is interesting to visualize exactly the electrical effects produced by a station like WJZ of the Radio Corporation of America, at Aeolian Hall, New York. This station has a frequency of 660 kilocycles (455 metres). Every second there are therefore 660,000 electrical vibrations sent out, which carry the music or speech as controlled radio waves. In an evening's entertainment, there have therefore been a total of seven thousand million vibrations, and the total end-to-end length of all the waves sent out is over two billion miles! The individual electrical vibrations last only about one and a-half micro-seconds or very little over a millionth of a second. It is of such unusual elements that a broadcast program is electrically composed, and the mind of man in this scientific age must gradually accustom itself to these new and unusual units of time and space.

Interesting Address Broadcasted

Embossed Reading for the Blind

2FC's Unique Entertainment

LISTENERS-IN to Farmer's broadcastng service were treated to something really different the other night. A concert by an orchestra formed from members of the Industrial Blind Institute was given and upon its conclusion, Mr. McWilliams, L.L.B., spoke on "The Romance of Embossed Reading for the Blind." Both portions of the entertainment were delightful, and, although we cannot reproduce the musical items in these columns, we have pleasure in publishing portions of Mr. McWilliams' interesting address. He said:—

"Ladies and Gentlemen,—You who are at the other end of the wireless, I want to crave your indulgence for a few minutes to-night while I talk on one of the most interesting, and perhaps one of the most pathetic phases in the realm of literature—the Romance of Embossed Literature for the Blind. And I wish to prelude what I have to say by remarking that we are, you and I, rather connected though we may be so far apart. This wonderful system of wireless has eliminated space, has cut out for us time, just as this wonderful system of embossed reading has taken the place of sight for the blind.

"Prior to the year 1784, no blind man had ever been able to read for himself. Milton had to bully his daughters into reading for him day by day, and up to that year—that epoch-making year—the blind had never been sufficiently independent to find out for themselves the marvels of what was going on around them, but at that time a Frenchman, Valentine Hauy, devised a system whereby it was possible for blind people to run their hands over the ordinary raised printed type, and to obtain thereby some knowledge of the world around. Naturally the system was cumbrous to a degree. The letters had to be stamped on to the paper, and this system continued until a greater was invented. But to the inventor, Valentine Hauy, is due the thanks of the countless generations, for he paved the way to great and more monumental results.

"After the time of Hauy we come to the greatest of all the inventions in the reading for the blind—that of Louis Braille. Louis Braille, a Frenchman again—Oh, those French scientists with their wonderful minds! Louis Braille was born in 1798, and at the age of three he was playing in the workshop of his father, a harness maker of Paris when a bradawl became entangled in his eye and pierced the organ destroying its sight. This accident was also responsible for the loss of the sight in the other. His blindness proved a blessing to subsequent generations, for in 1829 he used his great talents to invent a system of raised dots. The system is simple in its marvels. There is a series of six indents in a brass line ruled. Each of these is covered by a paper, and the indents formed by a stylus through the paper form a group of six dots, three on one side of the cell, and by this means, 63 different characters can be formed in each cell of this series or group of steel spaces, so that it is possible not only to have the 26 letters of the alphabet, but a balance for contractions and abbreviations. The wonderful advantage in this system over Valentine Hauy's system is that it is written as well as read, and that it is adaptable to music. If you visit the Library of the Sydney Industrial Blind Institution, which is responsible through Messrs. Farmer and Co. for this concert to-night, when you are next in

In recent years Indian War-cries have either been heard per Phonograph or at the scene of Wild West shows. Recently, however, some resplendent Sioux "braves" gave a realistic demonstration from 2LO, the London studio of the British Broadcasting Co.

Sydney, you will find that there are hundreds of volumes of the latest and the most classical music. They can convey nothing to you but a blur of dots, but to the blind musician, such as we have heard to-night, they are alive with meaning. They convey to him exactly what a piece of Chopin, or Beethoven or Liszt conveys to you. Indeed, some of these artists whom you have heard to-night are products of this wonderful system of Braille music, but I must pass on. I want to deal with this Braille system generally, and to point out that Louis Braille's invention is most adaptable, that it has been translated and is capable of translation into every extant and every dead language. An Indian missionary, the Rev. Knolls, translated from the Koran in Arabic into Braille, and another missionary, Dr. Murray, used the system to translate Chinese literature into Braille, and the system is so adapted for the number of illiterate Chinese that even the sighted are frequently taught to use this system in preference to their ordinary writing.

"I want, now, to pass shortly into the home of Braille literature of embossed reading for the blind in New South Wales—the Sydney Industrial Blind Institution. In 1898 that Institution housed some 1,200 volumes. In 1924 its library consists of nearly 11,000 volumes. The number and kind of these would pass description. They import from England the best and most up-to-date magazines of the time or articles from them. They produce a magazine of their own. Their literature extends from the Book, to the most up-to-date and very often not the most decorous literature that you can find in New South Wales. The cost of producing these books is enormous. It works out at £1 per volume, and if it is done on zinc, it takes a fast operator an hour to punch 400 words."

Wireless as it Will Be

Professor's Astounding Forecasts

THE staggering progress of wireless during the past five years needs no reference here, but if we are to believe the verbal anticipations of some of Britain's foremost radio authorities, the advancement in the past will be as nothing to that to be achieved in the near future.

Speaking recently to a member of the British Press, Professor A. M. Low, one of the few experimenters who have been successful in transmitting photographs by wireless, said that in the next few years he expected to see broadcasting going at the rate of twelve hours a day, with several programmes of different nature being disseminated at the one time, from the same station, on different wavelengths. More frequent and comprehensive news bulletins would be issued, while an important development would be the radio tape machine, by which news would be recorded during the owner's absence. While Parliament was sitting, complete verbatim reports would be sent out, and these would allow interested electors to follow every word of the debates.

"House and public clocks of the future will probably be synchronised with special signals broadcasted several times a day," the Professor continued. "Another useful development will be wireless alarm clocks worked by signals sent out every half-hour in the morning. It will merely be necessary to set the clock to pick up the signal at the selected time."

The best educational facilities will be available to all, as any number of colleges will be able to link up, and any diagrams to be drawn for the pupils will be transmitted by television (the sending of photographs and actual reproduction of the taking place of events by wireless).

Even to-day, the radio control of an aeroplane by which it can be sent out and brought back from a 100-mile flight is an established fact, and as we progress our wireless control methods will accordingly improve. "Tanks," trams, trains, torpedoes, air-ships, lorries—all will be controlled through the ether. In the case of the aeroplane, a great advantage will be secured by radio control. The machine will be able to ascend to heights in which a pilot could not live, owing to the extreme rarity of the air, but where, through the lack of it and consequent decrease in resistance, enormous speeds will be attained with ease.

Experiments to date have shown without a doubt that the transmission of induced power is only a matter of further careful research to bring it to a stage of complete efficiency. Even now, a thin iron wire can be inductively destroyed at a distance of some feet without actual connection. As might perhaps be thought, this process of destruction is not a matter of transmitting heat waves through the ether, as they would cool long before they reached their objective, but a case of transferring energy in the form of electrical oscillation which would only generate heat upon actually coming into contact with the metal.

Another branch of wireless science which will come to fruition in the future will be the transmission of light. So far, it is possible to-day, to place twelve bulbs on a stand without connection, and light them inductively by an expenditure of two horse-power. It is not at all beyond the bounds of possibility that wireless light will be broadcasted in the same way as power before many years are gone.

"Wireless transmission of writing will be of great use in the future," concluded Professor Low. "It will speed up business, for business men will be able to see, speak and write to each other by radio. Cheques and documents will be signed at a distance, and plans and drawings of all descriptions will be sent by wireless."

Radio Development in England

Great Progress Being Made

(By H. G. Bell)

An Extract from "The Manchester Guardian Commercial."

AT the end of 1922 there were only three broadcasting stations in operation in this country, of which the newly-formed British Broadcasting Company had not assumed full control. The conditions under which receiving licenses would be granted had been laid down by the Postmaster-General, but owing to the limitations of the first scheme and the uncertainty of their position, a large proportion of the public abstained from purchasing sets or taking out licences. This uncertainty re-acted greatly to the detriment of the radio manufacturing industry.

During the year 1923 the British Broadcasting Company has taken over or replaced the three original stations, and built and equipped five more, thus completing the original scheme. These stations are so placed geographically as to be as close as possible to the most populated centres at the same time giving the best service available to the country as a whole. As a result of the year's work considerable experience as to so-called "blind spots" or bad receiving localities has been obtained, and it is now proposed to instal a number of relay stations, each to serve a particular area of population otherwise poorly placed for broadcast reception. To render this possible, the broadcast band of wave-lengths has been widened and now extends from 300 to 500 metres. The first relay station was recently opened at Sheffield, and a second is to be opened soon at Plymouth.

Another form of the Three-pence-in-the-slot Radio Machine. This one is equipped with Special Apparatus which gives Advance Information as to the nature of the coming Programme. Ask your Barber to instal one!

Great strides have been made towards technical perfection in the transmissions from the various stations by improvements in studio layout, in microphone design and in control and monitoring circuits. In the matter of programmes noteworthy progress may be claimed, both as regards material and artists. Of great technical interest is the development of simultaneous broadcasting of the same programme from two or more stations by linking the control circuits through trunk telephone lines of the Post Office. Much pioneer work has had to be done by the engineers of the British Broadcasting Company to assure the success which has attended their efforts in this direction.

The most striking testimony to the popularity of broadcasting is shown in the increasing number of aerials of all descriptions and appearances throughout the country. The necessity for large aerials supported by masts is diminishing as a result of the experience obtained with small aerials or even internal aerials which have been found to give greater selectivity with sensitive valve receivers. The necessity for filament batteries and high-tension batteries still remains a great drawback to the installation of a multi-valve receiver on account of the difficulties of charging in many households, though where electric power is available, small charging sets both for alternating and direct currents may be installed.

In order to reduce discharge currents for any particular degree of magnification, developments have been made by utilising valves to obtain the maximum magnification by the dual system, wherein a valve is used first as a high frequency magnifier and again as a low frequency magnifier. By utilising a crystal as a detector, a further economy in filament current has been obtained in some valve sets. The introduction of dull emitter valves has been a great improvement from the battery point of view, as some of these require less than one-tenth of the heating current of the bright filament valves normally used. Although at present those dull emitters are rather expensive, the increased cost should be compensated for by an increased life of the valve

under the dull conditions of working the filament.

In comparison with the short-wave and low-power trans-Atlantic trials, should be mentioned the American-England trials carried out by the American Telegraph and Telephone Company in conjunction with the Radio Corporation of America and the Western Electric Company. These trials were instituted to ascertain what would be necessary to give a satisfactory or even a restricted commercial telephone service across the Atlantic. A very successful demonstration was given during the early hours of the morning at a favourable time of the year, but the trials were repeated several times after that and observations taken on the varying atmospheric conditions from season to season. A reliable trans-Atlantic telephone service, even if restricted to a few hours a day, would have a wide field of application for speeding up inter-communication between the two countries.

In connection with the development of reception on commercial telegraph services, the general tendencies have been towards greater selection on account of the increasing number of high-power stations. By the use of the latest form of the Beverage type of antenna, simultaneous reception of several stations is carried out on a single aerial, while the uni-directional properties of aerial systems, which are now being utilised have greatly reduced the interference from atmospherics. These improvements in aerial systems, which are now being utilised have greatly reduced the interference from atmospherics and, together with high frequency and low frequency filter systems in the receivers, have added to the reliability of long-distance communication even to the extent of permitting high-speed automatic working. By relaying the received signals from the respective receiving stations to a central station, the wireless services are being controlled and worked in a similar way to an ordinary land-line telegraph circuit.

The development in transmitting valves has been concentrated on increasing the output and dissipation in the valve itself. The introduction of water-cooled valves, in which the anode is cooled by water circulation, has allowed greater power dissipations and consequent outputs. These improvements are confined to constructional details and methods for obtaining the necessary seal between the copper anode and the glass container.

A new departure in high-power transmitting valves is the Holweck valve, the anode of which is water cooled. This valve is capable of being assembled and dissembled at will, so that a new filament may be inserted after the valve has been in use for some time. The various components are jointed together and a special pump is used while the valve is in operation to retain the necessary vacuum.

CONTEMPORARIES

Mr. Allen Gill told the Incorporated Society of Musicians at Cambridge, England, that he owed much to broadcasting. His neighbours now had their wireless, he said, and he could enjoy a Sunday nap in peace instead of having to listen to the continual thumping of the piano.—*Radio Times,* England.

* * *

Anita Stewart, the famous film star, recently broadcasted a song recital from WEAF. For several years Miss Stewart has cultivated an exceptionally fine soprano voice under expert tutilage and she is also an accomplished musician.—*Radio Sun and Globe,* U.S.A.

* * *

"Has he taken up radio as a fad?"
"No, as a frenzy."
—*Boston Transcript.*

* * *

"O.U": My grid leak is not functioning properly. What do you advise? Answer: Try the pan under the ice-chest, and if that does not cure the defect, call the plumber.—*Evening Mail Radio Review,* New York.

* * * *

Judge John Rounds, of the Conciliation Court in St. Paul, Minn., is probably the first judge in the world to try a case by radio. Frank Yost sued C. E. Kopp for a radio set; Kopp had refused to pay for the set because he said "it would not pick up distant stations." The judge could not decide whether it would or would not and so he adjourned the case, went to Kopp's house and listened in—later giving his decision.—*Popular Rádio,* New York.

* * *

Broadcasting throughout Canada of the proceedings of Parliament while in session, radio concerts on Canadian railway trains while travelling, together with important news announcements, are brought immeasurably nearer with the project to establish a powerful Canadian National railway broadcasting station on the roof of the Jackson Building, one of the capital's largest business blocks. The broadcasting power has not yet been decided upon, though there are rumours of it being projected to establish the most powerful station so far known.—*Radio,* Toronto.

* * *

The daily press seems to have discovered a new scientific apparatus by which wireless messages transmitted some time ago may be recorded. Little thought is given to wireless waves more than a moment after transmission, but really they travel on and on, getting weaker, of course, for an indefinite time. The new apparatus is so sensitive that it is supposed to pick up mesages transmitted maybe months ago. The listener-in of the future will no doubt be equipped with this instrument, and then it will be posible to repeat any tune—if he wants to!—*The Broadcaster and Wireless Retailer,* London.

"KGO, Oakland, California"

The Station that Some Australians Have Heard

A Description

SUCH intense interest has been aroused in Australasian wireless circles by the publication, from time to time, in *Radio* of particulars of those who have succeeded in hearing broadcasted items from KGO, Oakland, California, that it is with pleasure that we publish herewith a description of the station.

Erected by the General Electric Company, it is generally considered to be one of the most luxurious broadcasting stations in the United States —which is no mean reputation! In addition to this, it is the largest station on the Pacific Coast of America and the only one that has been exclusively built and intended for broadcasting alone. KGO is the prototype of WGY, at Shenectady, New York, and forms the second link in the projected three-station scheme.

KGO itself is located in East Fourteenth Street, Oakland, and the site was chosen because of the technical advantages that would be assured, the easy facilities for securing superior musical talent at short notice and because of its nearness to San Francisco, the commercial wireless centre of the Eastern Coast of North America. The building itself in which the station is situated is a two-storey brick one with the offices of the studio manager on the first floor. Adjacent to these is the correspondence room where all business appertaining to KGO is done. Other departments include a handsome reception room the floor of which is covered with an expensive piled carpet of a beaver taupe colour. Tinted wood-work of a soft antique ivory is extensively used in the decorative scheme and the walls are covered with a two-toned blue and grey figured tapestry. The furniture is of carved walnut and is modelled on the period of the eighteenth century. On this floor is also a room in which are housed the storage batteries and motor generator set.

On the next floor are two studios, both designed and decorated after the same pattern. One can accommodate a large choir or full orchestra, while the other, which is not so big, is used for the broadcasting of speeches and musical solos. Naturally, with these two studios, simultaneous broadcasting is possible.

It is in the large studio, however, that the decorator has had his greatest fling but before a tack was hammered or a square inch of tapestry hung, the engineers had to do their work—and it was none the less exacting. The walls were lined with a network of insulated wire connected with the microphones and control apparatus in the adjoining room. After this was done, exhaustive experiments were carried out in order to ascertain the reverberative qualities and also to see that the proper amount of "damping" would be secured in order to insure the greatest musical quality.

WAKE UP, EXPERIMENTERS!

SINCE the last issue of "Radio," in which two reports were published stating the clear reception of KGO, the General Electric Company's wireless broadcasting station at Oakland, California, U.S.A., we have received several further letters from Mr. A. E. Wright, of Scarborough, South Coast, N.S.W., in all of which he gives particulars of successful "logging." Mr. Wright's radio activities in this direction might almost be termed "a monotony of perfection," but nevertheless, the regularity with which he hears the Oakland station leaves not the slightest doubt that the feat is not one of mere luck or chance but the result of intelligently applied knowledge and effort.

HE has heard music and speech under the most difficult of conditions. On one recent occasion when KGO came in, the rain was pelting down on the house, which is made of iron, but, despite this and consequent induction the familiar call came through as clear as a bell: "KGO, Oaklond, California."

HOWEVER, it would seem that Mr. Wright is steadily gaining a monopoly on the items disseminated from KGO; are there no other Australian experimenters who have equalled his praiseworthy feat? Through his reception of this station an experimenter is making Wireless History. Are there none who would like to help him? The opportunity will not last much longer. At the moment, KGO is working on 1000 watts, but this shortly is to be increased to 5000 watts and then the glory and honour of picking it up will not be half so much as it would be now when there are difficulties to be surmounted. Now, then, Australian Experimenters!

Then followed the sound-proofing of walls and ceiling. After that the decorator was told to do his best—it was a very good one! The microphone is concealed in a silk shaded lamp and the *tout ensemble* is that of beauty and repose.

On this floor, but unseen to the performers, is the control room. It has three stages of speech amplification, consisting of two five-watt tubes and four 50-watt tubes. A fourth stage is situated in the power-house. The antenna is of the multiple-tuned pattern strung between two steel towers 150 feet high and 250 feet apart. Beneath this is the counterpoise which is composed of a network of wire, fourteen feet above the ground and covering an area of 300 by 150 square feet.

Known as the "Sunset Station" KGO by means of pick-up circuits is equipped to broadcast literally everything from speeches to football games. The wave-length is 312 metres.

Are these Articles of Interest to You?

HAVE you been a reader of "Radio" from the first? No? Then perhaps in some of those numbers we published before you became a subscriber there appeared matter which would have interested you.

IT is to help you to repair these omissions that we publish the following list of articles taken at random from this magazine since its beginning to the conclusion of Vol. 1.

ANY of the back numbers mentioned may be had at the usual rates upon application.

THE articles are: Simple Method of Constructing Grid Leaks, No. 1; *Inductance, Capacity and Self Capacity of Coils, No.* 3; *Direction and Position Finding By Wireless, No.* 4; *How Sydney Radio Works; Radio and Reflex Amplification, by J. G. Reid, No.* 5; *An Experimental Loop Aerial, by Chas. D. Maclurcan, No.* 10; *The Radio Crystal Set—How to Make It, by C. W. Mann, No.* 11; *How to Get Results from Broadcasting, by Dr. Alfred N. Goldsmith, Director of Research Department, Radio Corporation of America, No.* 14; *Broadcasting Receiving Sets—Points to Observe When Selecting, No.* 18; *International Break Sign, New Arrangements Complete, No.* 22; *Low Power Trans-Pacific Tests, C. D. Maclurcan's Venture, No.* 23. *Ways and Means of Increasing Radio Sales; List of Amateur Transmitting Licenses issued to December,* 1923, *No.* 25, *and Report of Results of First Section of Trans-Pacific Tests, No.* 26.

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Club Delegates Meet

THE meeting of club delegates called to consider what steps should be taken to consolidate the experimental movement in N.S.W. was held at the Royal Society's Hall, 5 Elizabeth Street, Sydney, on Wednesday, March 19, 1924, and was an unqualified success. The gathering was characterised by the most harmonious relations throughout. One saw there a body of men impressed with the necessity of taking concerted action and prepared to find a solution of the problem which confronted them.

Altogether, 18 clubs were represented, some having sent more than one delegate, and clubs as far afield as Katoomba and Newcastle having arranged to send delegates.

Mr. F. Basil Cooke, F.R.A.S., was in the chair, and, after welcoming the delegates, he called upon Mr. Phil Renshaw to outline the scheme proposed by the Wireless Institute of Australia (N.S.W. Division). The chairman in opening the meeting for discussion stressed the importance of unity. Matters were very thoroughly discussed, and, on the proposal of the delegate from the Waverley Radio Club, seconded by the delegate from the Croydon Radio Club, the following motion was unanimously carried:

> "That all N.S.W. Radio Societies affiliate with the Wireless Institute (N.S.W. Division). Such affiliation not to affect the entity of the affiliating Society in any way other than that they will be required to adopt the Memorandum and Articles of Association under which the Institute is constituted, and shall pay an annual affiliation fee to the Institute."

Under this scheme a council will be formed consisting of delegates from the various affiliated societies, on the basis of one delegate for every fifty members or part thereof. This body will deal with all experimental matters affecting the various clubs and will be responsible to the Executive Council of the Institute for the proper government of the affiliated societies. It will make recommendations to the Executive Council, who will be responsible for putting into effect the various resolutions and who will act as an intermediary between the clubs and the authorities.

It was further unanimously resolved that the affiliation fee be fixed at the sum of £1/1/ per club per annum, this being just sufficient to meet the anticipated cost of postage and incidental expenses.

The next step will be for the Executive Council to arrange for a meeting of the council of the affiliated societies as soon as possible, so that the working details of the arrangement may be put into operation without further delay.

This meeting certainly marks a turning point in the history of experimental wireless in the State. It is confidently expected that those clubs which were unable to be represented will immediately fall into line, as it was apparent to all present that this was the only way to meet the difficulties which are confronting the experimental movement at the present time. Unity is strength and the time will never be more opportune than at present to practically demonstrate this fact.

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RADIO SECTION

DIRECTED BY

MR.F.BASIL COOKE, F.R.A.S.

Consequent upon the demand for high-class Wireless equipment David Jones' have installed a special section for the sale of these goods. This presents an opportunity for all interested in wireless to avail themselves of ideal buying conditions. Licenses will be issued upon payment of the required fee.

David Jones' have made a special feature of providing all wireless accessories, including the following:

"Radio Corporation" Radio Transformers ranging from 200 to 5000 metres. Price ... 45/-

Hydrometers, very convenient for keeping accumulator in good order. Price ... ... 6/6.

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"A" Battery Lighting Switch, 4/6.

"Framingham" Series Parallel Switch. Price 5/6

"Weston" Ammeters for transmitters. We hold a very large stock of these meters, ranging in prices from 50/- to ... 107/6

DAVID JONES'

Radio Section

252 YORK ST., SYDNEY

CAN YOU BEAT IT?

Coster lady, unable to make telephone girl understand the number she requires (.....Ealing), is asked to spell it:

E for 'Erbert.
A for what the asses heat.
L for the place your'e a-going to.
I for what yer sees wiv.
N for what lays the heggs.
G for — Gorblimey! Got it nah?

"A RECEIVING SET IN EVERY HOME."

No home in which it is desired to create the real "home atmosphere" should be without a broadcast receiving set. The cost is small; the value great. Investigate the matter for yourself, and you will soon follow the lead of thousands of other happy home makers.

Trans-Pacific Tests

A cable from Mr. Charles D. Maclurcan at San Francisco has been received by Mr. F. Basil Cooke. As most experimenters and amateurs know, Mr. Maclurcan, in company with Master Jack Davis, recently left Sydney by the R.M.S. "Tahiti" for San Francisco in order to carry out low power, short wave transmission tests. What will be the ultimate result of those experiments, whether they will prove succeessful or otherwise remains to be seen. It would appear, though, judging by the contents of the communication received by Mr. Cooke that when Mr. Maclurcan returns to Sydney he will have some startling announcements to make. The cable reads:—

"Signals Received 'Frisco. Now Send Only Eleven to Twelve Both Sets Until Notified. Listen from Twelfth. Notify All States Call Half-hour."

It is thus evident that while in San Francisco aboard the big mail steamer that Mr. Maclurcan, at his special station 2CDM, received signals from 2CM, his Strathfield (N.S.W.) station, controlled by Messrs. F. Basil Cooke and Ben Gow. What a lot those three words mean! "Signals Received 'Frisco." They may revolutionise the whole system of low power, short wave transmission!

The next sentence refers to the times when transmission from 2CM is to be effected, i.e., from 11 p.m. to midnight. Two sets are being used from the home station, a 10-watt and a 100-watt. The first was originally arranged to be only used when between the times the "Tahiti" left Sydney and reached Wellington when thereafter the 100-watt would be used. It is thus obvious that Mr. Maclurcan is sanguine of receiving signals with the lower-powered set at a far greater distance than was at first thought possible. Failing further advice from Mr. Maclurcan, Mr. Cooke regards "Notify All States Call Half-hour" as a bit of a "poser." He is uncertain whether it is meant that 2CDM will call all States twice hourly or that all States should call Mr. Maclurcan every half-an-hour. "Listen From Twelfth," of course, is self-explanatory.

"The Day's Work"

ONE day on a recent trip made by the s.s. *Eastern* from Hongkong to Kobe, when within 15 hours of Shanghai, another steamer suddenly hove in sight over the horizon and, as is the way all over the Seven Seas, "cards" were exchanged. "QRA?" (What ship are you?) queried the stranger, the *Mirzapore*, bound from Japan to Singapore. "The *Eastern*," whispered back the ether waves. "Have you a doctor aboard?" came the next query. "Two," answered the Kobe-bound boat. "We have serious case of appendicitis aboard," announced the P. and O. ship. A little while later, the vessels came abreast and two white-suited figures, one of whom carried a black bag, left the sides of one ship, and climbed the side of the other. After some time they returned as unostentatiously as they had gone. To judge by their faces no one would have thought that they had just performed successfully a serious operation in mid-ocean! They were Professor Watson, of the Adelaide University, and Dr. Mainwaring. The patient was taken ashore at Hongkong and is now well on the way to recovery.

STROMBERG-CARLSON

SUPER No. 2-A Radio Headset SENSITIVE

£2/5/-.

Why buy a cheap inferior set when you can obtain a high efficiency No. 2-A at half the cost of an equal set? It is built by Telephone Manufacturers of 30 years' standing. DURABLE, COMFORTABLE, ACCURATELY REPRODUCES VOICE and MUSIC. Permanent adjustment, unaffected, by climatic and temperature changes. Also RADIO PLUGS and JACKS; MICROPHONES, all types.

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F. L. Moore Relief Fund

Although previously the date was fixed at April 16, the trustees of the fund, Messrs. F. Basil Cooke, J. A. Robinson and Phil Renshaw have decided that the appeal shall close on April 30. Thus there is still time for those who have not yet sent in their donations to do so now.

Some of our new readers may be unaware of the uses to which the proceeds of the F. L. Moore Relief Fund are to be put, so a brief résumé of the facts here will not be amiss.

During last February, Mr. F. L. Moore, of Haberfield, a well-known wireless worker and experimenter, while making some adjustments to his wireless apparatus came into direct contact with a high tension wire from a transformer. Death was practically instantaneous. Incidentally, it may be remarked, that at the time many people thought that Mr. Moore had met his death as a result of careless handling of a wireless telephony receiving set. Such, of course, was impossible, these sets being absolutely harmless.

However, by his death, Mr. Moore left a wife and kiddies unprovided for and, in fact, in a condition closely approaching actual want. It was then that the F. L. Moore Relief Fund, through the honorary offices of Messrs. Cooke, Robinson and Renshaw was inaugurated.

To date, the response has been excellent but it could still be better. To those who have already subscribed *Radio* takes this opportunity of offering its deepest thanks, while to those who have not yet forwarded their donation we would impress upon them that there is yet time—but not too much.

To date the donations received are as follow:—

F. L. MOORE RELIEF FUND.

	£	s.	d.
Radio Magazine	5	5	0
Amalgamated Wireless Ltd.	10	10	0
Marconi School of Wireless	5	5	0
E. T. Fisk	3	3	0
Major W. H. Newman ..	1	1	0
W. E. Wilson	1	1	0
L. A. Hooke	2	2	0
C. D. Maclurcan	2	2	0
Neutral Bay Radio Club ..	1	1	0
Q.S.A. Crystals	1	1	0
Bacon and Co., Ltd.	2	2	0
Hyde, Gluck and Co. ..	0	10	0
C. H. O'Brien and Nicholl	1	1	0
Gordon and Gotch	1	1	0
R. J. Fagan	3	3	0
"Country Amateur" .. .	1	0	0
Total to date	£41	8	0

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PERSONALITIES

THERE has recently returned to Sydney, Mr. S. M. Newman, one of the Technical Engineers of the staff of Amalgamated Wireless (A/sia.) Limited, and son of the Managing Director of Messrs. Howard Smith, Limited. Mr. Newman has been in England and America for the past year, engaged in investigating all phases of wireless developments, especially the methods of sound collection and broadcasting studio technique. During his sojourn in England, he spent six months at the Chelmsford works of Marconi's Wireless Telegraph Company, and for several months was engaged in studying the technical operation of the British Broadcasting stations at London, Bournemouth and Birmingham. Inspections were also made of the modern high-power trans-ocean stations at Brentwood, Ongar and Carnarvon. In America an interesting itinerary comprised a study of the broadcasting methods in operation at the American Radio Corporation's two studios at New York, and the General Electric Company's new broadcasting station recently opened at Oaklands, California. Some time was spent at the American Radio Corporation's wireless laboratories at New York, and several inspections made of Radio Central, Long Island, one of the largest and most modern high-power stations in the world.

THE selection of Mr. R. Brasted, of the Y.M.C.A., as secretary augers well for the success of the Association of Auckland Amateurs and Listeners-in which has just been formed.

"Hullo! Hullo! Hullo!"

THE Wellington Government station VLW sprang a surprise on listeners-in one night recently. Hitherto, the transmission of speech by radio has been left to amateurs and broadcasters, while Government stations have retained the Morse Code method of transmission. Great was the pleasure, therefore, when VLW was heard telling its hearers by Morse to "stand by for telephony," which immediately followed. The experiment was a great success, as listeners-in have reported excellent reception.

Radio Plays Its Part

A SPEEDY reply to a wireless message calling a daughter to her dying father's bedside is reported from Ashburton. A patient in the local hospital was dangerously ill, and it was desired to summon his daughter who was in Auckland. As the telegraph office was closed, friends of the sick man resorted to wireless in an endeavour to get the message through. A low-powered broadcasting plant was the only one available, and from it the urgent appeal was sent out. An amateur in Wellington picked up the message, and sent a telegram to Auckland. At 6.10 p.m., one hour before the express left for the South, the Auckland telegraph officials succeeded in communicating by telephone with the lady to whom the message was addressed. She was thus able to catch the train, though unfortunately she reached her father's bedside just too late to see him alive.

Wireless Institute

N.S.W. Division.

THE monthly general meeting of the Division took place on Thursday, March 20. Mr. E. B. Crocker occupied the chair. Mr. J. W. Robinson, was to have lectured on Modern Broadcasting Methods, but he was unfortunately prevented at the last minute from attending.

In his absence a very interesting discussion took place on the status of amateurs in N.S.W. Many definitions of the term "experimenters" were suggested, but the concensus of opinion was that anyone who traversed what was to him a new path having a definite object in view was an experimenter. A plea was entered for more definite quantitative results in wireless work and it was generally agreed that this was advisable. Many new lines for experiments were suggested and altogther a very profitable evening was spent.

The next meeting will be the annual general meeting and will be held at the Royal Society's Hall, 5 Elizabeth Street, Sydney, on Thursday, April 17.

Members are reminded that ballot papers for the election of Council should be in the hands of the Secretary not later than noon, April 16. They should be enclosed in a sealed envelope alone and unsigned and endorsed "Ballot Paper."

Peaks Support Antenna

South of Munich, Bavaria, is the mountain Herzogstand, on the summit of which is being erected a huge wireless station, which will lift its antennas higher than those upon the Paris Eiffel Tower.

On the other side of the valley, from the 6,000 feet high peak, is another eminence almost as high. From these two peaks is swung a long wire cable, by which means the costly construction of steel towers is avoided, while the stupendous electrical energy required to work a station of this nature is developed from water power.

On account of the great weight and length of the cable, together with the strength of the wind-pressure, an ingenious system of counter-weights is used to compensate this. The sides of the peaks away from the valley are gently inclined, and easy to climb, but those which form its inner walls are almost inaccessible, and make the locality an ideal one for radio purposes.

BY ferry, tram and train, all Sydney can now go home to "listen in." In each suburban cottage or flat, there is a seat at the theatre. Every farm home contains a front row seat for a wonderful programme. At the turn of a knob you hear first—just as if you were on the spot—bedtime stories for children, then fun, music, lectures and world happenings.

But to realise to the full the enjoyment and educational advantages of Radio in the home, you must obtain

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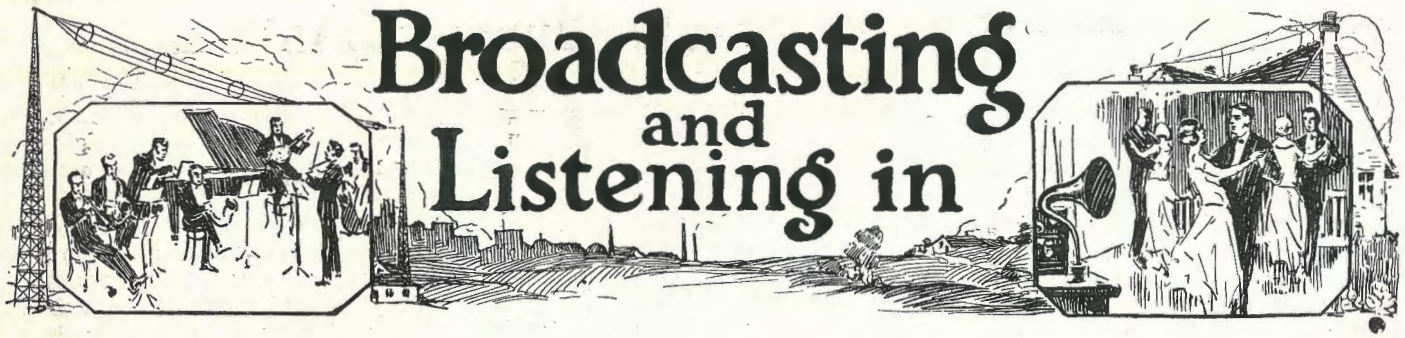


Broadcasting and Listening in

According to the United States Department of Commerce, there are 534 broadcasting stations now in operation in that country.

* * *

Scotland Yard's wireless equipment includes a motor radio patrol. This station can keep in continuous communication with Police Headquarters even when the car is travelling at 40 miles an hour. Four more of a similar pattern are shortly to be commissioned. The aerial will be placed on the roof of each car and will be mounted on collapsible frames, so that they can be lowered when passing under low bridges or over-hanging tree branches.

* * *

Olga Petrova, well-known for some years to Australian movie-goers, recently was broadcasted in a theatrical production called "Hurricane" from WJZ.

* * *

Not to be outdone, Mary Pickford and Douglas Fairbanks were also broadcasted a few days later. It is stated that this was their first "appearance" on the air, as prior to the occasion they were in that state of mind which is known as "radio-shy."

* * *

It seems everybody is broadcasted eventually. The latest to have the experience is Marcel Dupré, the famous organist of Notre Dame Cathedral, Paris. The recital was disseminated from WJZ.

* * *

Reports state that WGY, the Schenectady broadcasting station of the General Electric Company has been heard in Denmark, Berlin and Trondhjem, Norway.

* * *

The Geelong (Vic.) Wireless Club has succeeded in transmitting a church service. The instrument was installed in the Newtown Presbyterian Church and both morning and evening services were sent out. Several Melbourne and also a Bendigo experimenter reported clear reception.

* * *

Christiania reports a recent radio experiment in a Norwegian mountain cottage, where a London concert was heard distinctly.

2FC

BROADCASTING TIMES.

Sydney Mean Time.

P.M.

12.55: Tune in to the Music of the Chimes.
1: "Sydney Morning Herald" News and Cable Service.
1.25: Coastal Farmers' Market Reports.
1.30: Stock Exchange Intelligence.
1.32: Weather Report.
1.35: Midday "Evening News" News and Cable Service.
1.45: Close down.
3: Chimes.
3.5 to 3.45: Musical Programme.
3.47: Afternoon Weather News.
3.50: "Evening News" News and Cable Service.
4: Close down.
6.30: Chimes.
6.33: Children's Time — Lamplighter Stories.
7: Dalgety's Market Reports.
7.5: Fruit and Vegetable Market Reports.
7.7: Closing Stock Exchange Intelligence.
7.10: Late "Evening News" News and Cable Service.
7.15: Close down.
7.55: Tune in to the Music of the Chimes.

8.00 to 10.00 — Entertainment. See List hereunder.

EVENING ENTERTAINMENT.

Mondays:	Popular Concert.
Tuesday:	Theatrical items.
Wednesday:	Dance Programme by Farmer's Novelty Jazz Orchestra.
Thursday:	Music Lovers' Night.
Friday:	Popular Concert and Amateur Theatricals.
Saturday:	Choral and Popular numbers.

It is calculated that in the United States five million people at night listen to radio broadcasting.

* * *

WGY, Schenectady, has been successfully received in Hawaii, Argentina, Alaska and Denmark.

Hiram Percy Maxim, President of the American Radio Relay League, recently left America for Europe with a first-class short-wave radio set fitted up in his cabin. He expects to hear United States amateurs in the Mediterranean.

* * *

Radio receiving sets in Denmark now number 3,109.

* * *

E. W. Vogel, a marine wireless operator, recently picked up and took down in full a radio telegraphy message transmitted from France while his ship was somewhere in the 180th meridian in the Pacific. This meant that the sending station was over 12,000 miles away—half-way round the earth. The feat is thought to be a world's record for long-distance reception.

* * *

Mr. W. S. Percy, the well-known stage comedian and etcher, who was lately in Australia as a member of a J. C. Williamson comedy company recently broadcasted from London a specially written play entitled, "The Man Who Would Sing in His Bath." To add realism to the piece, a thousand guinea bath-room, situated in the Savoy Hotel, was commissioned, and it was from there that the splashing of water was heard over the country. In an interview with the London representative of the Sydney *Sun*, Mr. Percy said: "I took the opportunity of rehearsals to go into training and so I shouted into the microphone. The engineers were alarmed and rushed in and said I would burst the machine unless I was more careful. I thereupon spoke from eight feet away. I have heard of a man breaking a camera when he was photographed, but I did not think it possible to burst a broadcaster with a voice."

Wireless Broadcasting

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED desire to announce that the Company's Radio-Electric Works in Sydney are at present occupied with the manufacture of eight broadcasting transmitting stations and large numbers of broadcasting receivers.

During the past ten years, the Company has produced in Australia every piece of apparatus that can be made here efficiently and economically.

The Company has consistently followed the policy of building up a self-contained national Wireless Industry, with Australian brains, Australian capital and Australian labour, and the number of its employees total 800 people.

The staff is exclusively recruited in Australia. In pursuance of its policy to encourage and train local ability, instead of importing experts, the Company sends its Australian engineers abroad for training, and collects the world's latest scientific knowledge, enabling it to manufacture in Australia apparatus equal to, if not better than, that imported.

By the investment of Australian capital in a new industry and the training of Australian workers in the highly technical processes of radio production, Amalgamated Wireless (A'sia) Ltd. is not only pioneering Wireless manufacture to serve the Wireless necessities of to-day, but is building up an industrial organisation capable of ministering to national needs in times of emergency.

Amalgamated Wireless (Australasia) Ltd.

Pioneers of the Wireless Industry in Australasia.

AWA

The Staccatone

New Radio Musical Instrument

THOSE of us who are familiar with the annoying howls and squeals of radio, may use them to advantage now. The Staccatone, a new musical instrument, originated and developed by Mr. H. Gernsback, Editor of *Radio News, Science and Invention* and *Practical Electrics* and originator of many scientific developments, utilises those sounds to produce pure musical tones in perfect tune but radically different from any musical tone that has ever been produced before.

In describing his new invention in the March issue of *Practical Electrics,* Mr. Gernsback says that the characteristic squeal rising in pitch from zero to a note beyond the limit of audibility is familiar to all of us. This range of frequencies runs much higher than can be obtained from any known musical instrument. If properly controlled we have a musical instrument that surpasses in tonal range any other musical instrument, with exceptional purity, practically free from harmonics. With several vacuum tubes harmonic cords can be developed. With the single vacuum tube used in the particular instrument described here, musical chimes and tunes can be played that are very pleasing to the ear when played alone or in connection with an orchestra. The experimenter will find much amusement constructing and operating one of these musical oscillators which the Staccatone really is and if careful in tuning it should have many calls for its use by orchestras, especially those used for dancing for which this new music, with its weird flute-like undulation, is especially suited.

The squeals heard in radio sets are caused by the interference of two waves of different frequency setting up an audible beat-note. These squeals are difficult to control as the slightest change on the capacity of the apparatus, such as is caused by moving the hand near the set, etc., will change the pitch of the beat-note considerably. During the exhaustive experimenting that was required to develop the Staccatone this method was found impractical for the purpose, so that the vacuum tube was used and connected to generate low or audible frequency notes sounding very much the same as the beat-notes heard in radio.

Such a circuit requires larger values of capacity and inductance than are used in the ordinary radio circuit and for this purpose a number of large honeycomb coils are used with fixed and variable condensers of comparatively large capacities, so that the natural frequency of the oscillating circuit will be at a low audible note. By employing sufficient capacity and inductance in the circuit to give us the lowest note desired, we can with a number of switches corresponding with the keys on a piano cut inductance or capacity, or both, in and out of the air and raise the pitch to any value we wish, each key or switch corresponding to a musical note of the scale. The tones are heard from a loud speaker connected in the plate circuit of the vacuum tube.

The complete circuit is shown in figure 1. Those familiar with radio hook-ups will recognise this at once as the Hartley circuit. The inductance consists of six 1,500 turn honey-comb coils, connected in series and clamped together as shown in figure 3. Care should be taken while connecting the coils to make certain that their magnetic fields will assist rather than oppose each other, or the circuit may not oscillate. The coils will be properly connected if the outside lead of one is connected to the inside lead of the other, and all are placed so that the wire is wound in the same direction. It will be noted that the negative side of the "B" battery is connected to one of the end coils which for convenience we will call the first coil. The filament of the tube is connected to the other lead of the first coil, where it makes connection with the second. Taps are brought out and connected to the switch keys as will be described later.

For the fixed condensers about twenty small mica condensers of .006 Mfds. each are required. The variable condenser may be of the 43-plate type. The purpose of the variable

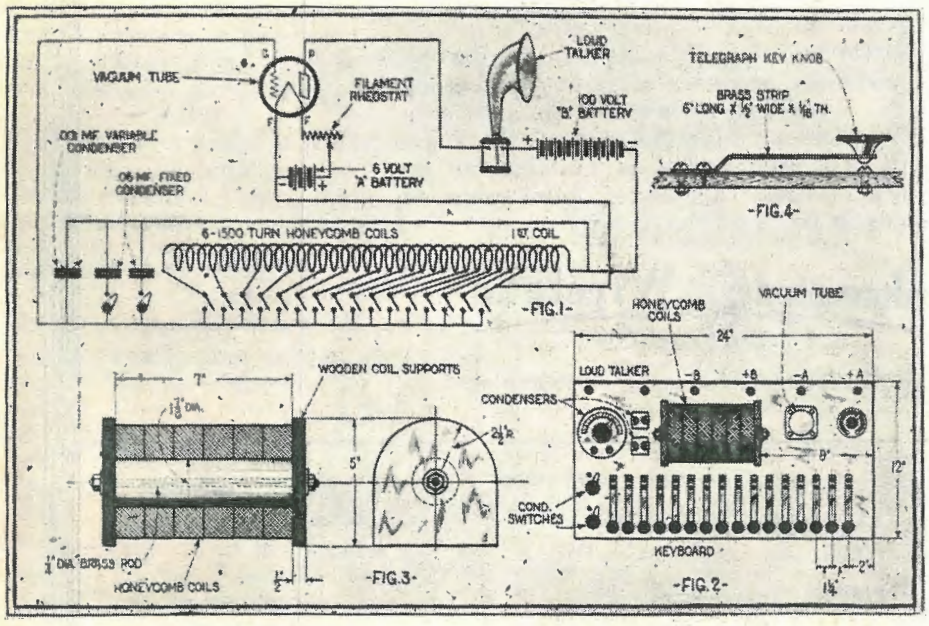
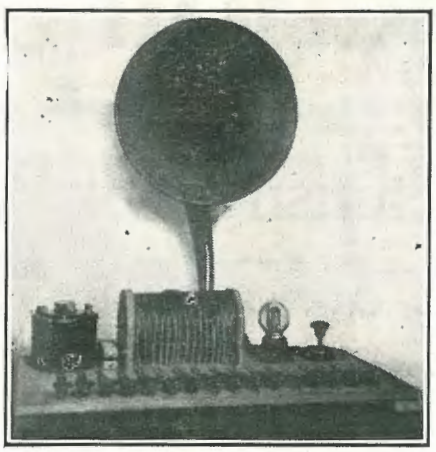


Diagram Showing Details of Construction of the Staccatone.

condenser is to adjust the apparatus to be in tune with other musical instruments, as it has been found by experience that different tubes and different values of (A) and (B) battery voltages slightly change the frequency of the generated current. Therefore, to tune the Staccatone to other instruments the variable condenser will be found convenient. The condensers are divided into two sections as shown; the exact capacities of each will have to be determined when tuning the oscillator. With all of the condensers connected in the circuit the note should be the lowest desired. The switch keys are connected at the proper intervals so as to cover one octave, including all half notes. Then by cutting out the remaining fixed condensers increases the frequency another octave, and with the variable condenser the frequency can be increased to inaudibility.

With the aid of the reproduced photograph and the plan view of the finished apparatus little difficulty should be experienced in connecting and mounting the instruments. Figure 4 shows how the switch keys are made. Everything should be connected but the taps to the coils and the condensers. Six binding posts are provided, for the (A) and (B) batteries and the loud talker. These

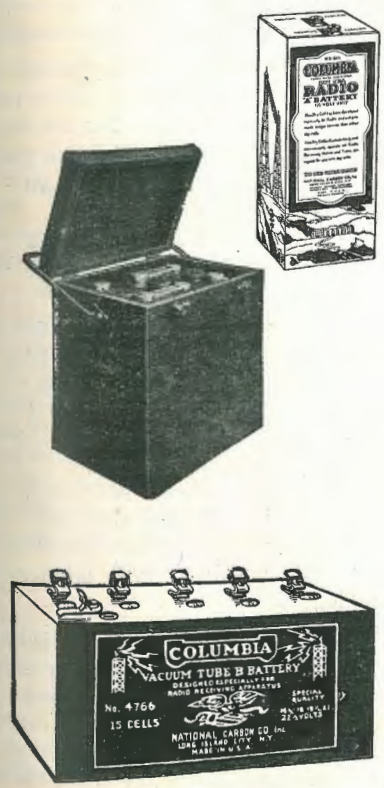


The Staccatone as Completed.

should be connected up and the tube lighted to test the circuit and determine whether it oscillates. A loud howl should be heard in the loud talker.

The greatest difficulty is to properly tune the oscillator. If a piano is available this will be a great help. If not, a tuning fork in conjunction with any musical instrument will do. To begin, the lowest switch key, marked No. 1 in the diagram, should be connected to the end of the last coil. Then the condensers should be added until the desired note is obtained, which for best results should be G. The variable condenser will aid in obtaining the correct frequency, and if not, it may be necessary to tap the coil near the end rather than at the end turn. Then the next key should be connected by tapping on the coil until G flat is obtained. There is no way of determining the position of the tap—it must be done by the cut and try method. When separating the coils to make the tap, they should be clamped together again when trying the note, as the pitch will be different with the coils separated. The remaining taps are connected in the same manner, so as to form a complete musical scale of over one octave as follows:—G, G flat, A, A flat, B, middle C. C flat, D, D flat, E. F, F

(*Continued on page* 48.)



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Characteristics of Valves

By CHARLES W. DONNE

IN order to avoid confusion, only those characteristics which are of general interest to the experimenter in selecting a valve will be given, and all figures quoted are those for normal operation of any particular valve.

The first thing to be discussed, and to the experimenter, probably the most important, is that of filament consumption. Receiving valves with operating voltages from .8 to 5, and current consumption values from .06 to 1.0 ampere are available on the Australian market. The experimenter is largely guided by the financial means at his disposal and those who do not possess accumulators, or, who are not disposed to spend the several pounds that these sets cost, are recommended to use valves of the dull emitter type, various examples of which are: Radiotron UV.199, 201A, WD.11 and 12. Marconi D.E.R., Ediswan A.R.D.E., and Weston Electric 215A, all of which may be operated from the larger capacity dry cells costing but a few shillings.

The dull emitter types will also appeal to experimentres residing in country or other centres, where facilities for charging accumulators are not available, for the ease with which dry cells may be obtained and forwarded per post from city stores is a point of considerable advantage possessed only by this piece of apparatus.

The experimenter who has, or can, afford to purchase an accumulator, has a much larger range of valves to choose from. In addition to the types already mentioned, there are numerous valves designed for operation from accumulators whose current consumption varies from .3 to 1.0 ampere at potentials from 4 to 6 volts. Well-known examples of these types are: Marconi "R" "V24" and "QX", Radiotron UV.201, Mullard "R" and "ORA", Western Electric 216A, Cossor, Ediswan "AR" and "R," Phillips, "Expanse B," Audiotron and Radiotron "UV200", the last three types being known as soft valves, of which more anon.

The next point to consider is the purpose for which the valve is required, as some of the valves already mentioned are designed for specific purposes and will only give maximum results when used in their particular application.

At this stage a few words on valve vacua may not be amiss. Valves are said to be "soft" or "hard," according to the degree of exhaustion within the envelope. A highly exhausted valve (an average figure being a pressure of 0.00001 mm. of mercury) is said to be hard, while valves which have a minute quantity of a certain gas introduced into the envelope are said to be "soft."

For use in single valve circuits where accumulators are available, a soft valve possesses many advantages, for it is highly sensitive, requires relatively low applied anode potentials and carries out the combined functions of amplification and rectification with considerable efficiency. Well known types are the "Expanse B," Audiotron and Radiotron UV.200.

Soft valves, however, do not possess the stability of the hard type, and require rather critical adjustments of the filament current and anode potential, and when used in re-action circuits, careful adjustment of the reaction coupling is necessary.

It is, therefore, obvious that a little experience is necessary to obtain the maximum results from this type of valve. Remarkable results have, however, been obtained from them when in the hands of expert operators. Night ranges of over 4,000 miles from short-wave, low-power spark stations are of fairly common occurence in the Pacific and Indian Oceans.

If a "hard" valve is preferred on account of its greater stability and less critical adjustments for use in a single receiver, any of the hard types already mentioned will give good results, the choice between the dull emitter and ordinary types being decided by financial means and also the presence of re-charging facilities.

When selecting a valve for use as a Radio Frequency Amplifier, care should be taken to obtain one with minimum capacity between electrodes and the leads thereto combined with stable operating characteristics. The valve that best meets these requirements is the "V24" through the wide distribution of its four terminals combined with stability and silence in operation.

The detector valve is preferably a "soft" one on account of its greater sensitivity. The writer has used the Audiotron, "Expanse B" and Radiotron UV.200 types with considerable success, but all hard types of valves will give satisfactory results.

The requirements of a valve for low frequency amplification are:—(1) A relatively high electron emission concurrent with as low as possible a filament consumption; (2) a low ouput impedance, which is inversely proportional to the effective area of the anode and therefore requires a reasonably large electrode area.

A valve which meets these requirements is the Radiotron UV.201A, which, owing to the spceial construction of its filament, has a relatively high electron emission, and the large area of its electrodes results in an output impedance of about 16,500 ohms, giving an amplification constant of over 7.

TABLE OF COMPARATIVE VALVE CHARACTERISTICS.

Type	Filament volts.	Filament amps.	Plate volts.	Plate Filament impedance (ohms).	Amplification Factor.
Radiotron U.V.199 .	3.0	0.06	40.0	18,000	6.25
Radiotron U.V.200 .	5.0	1.0	25.0	10,000	Detector Valve
Radiotron U.V.201A	5.0	0.25	25 to 120	16,000	6.0
Radiotron W.D. 11 and 12	1.1	0.25	45	20,000	6.0
Marconi R.	4.0	0.67	45 to 75	23,000	6.6
Marconi V24	5.0	0.7	24 to 60	16,500	7.0
Marconi Q.	6.0	0.4	160.0	50,000	47.5
Marconi QX.	5.0	0.7	25 to 60	71,500	18.0
Marconi D.E.R. ...	1.5	0.4	30 to 50	35,000	6.0
Western Electric 215A	1.1	0.25	45	25,000	6.5

The above tabulated characteristic figures of well-known values may be of assistance to experimenters in selecting a valve to their requirements and may also be of use for reference purposes.

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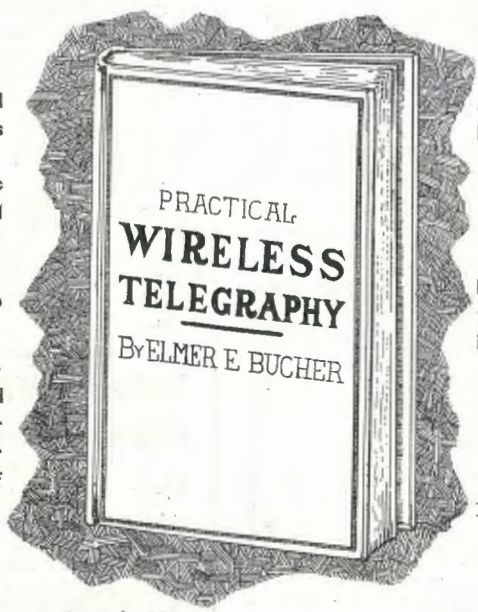

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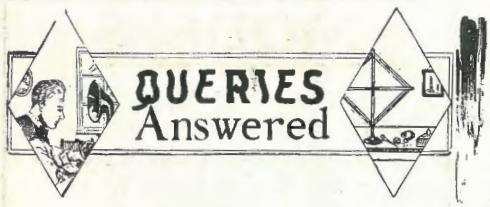

J. K. (South Singleton): Please supply full details of winding sizes, etc., when we will go further into your remarkable results.

"*Buzzer*": The set illustrated on our front cover was merely a drawing and as such but a figment of the imagination of the artist.

A. A. McC. (Sydney): A design is being prepared for your transformer and will appear in a coming issue of *Radio*.

C. N. C. (St. Kilda): We think the best thing for you to do would be to purchase "Elementary Principles of Wireless Telegraphy" by Bangay. It is a Wireless Press publication and one that would be of great value to you as "a raw beginner." The questions you have asked us are a little too elementary for this section.

G. V. H. (Cremorne)—Q.: I have a variable condenser of .0002 mf. capacity. How could I use this in order to improve the reception of experimental wireless telephony?

A.: Use your condenser to tune the secondary winding of a variocoupler for more selective reception.

Q.: How can I tune out 2BL and receive experimental music from a near-by station?

A.: Use coupled circuits.

Q.: Would a double wire aerial the same length and height as my present one be more efficient for the reception of short-wave transmissions?

A.: Yes.

"*But*" (Rooty Hill)—Q.: What is a reliable formula for finding the wave-length of a set including aerial and earth?

A.: Knowing the inductance and capacity of the circuit, use the following formula: W.L. = 1885 $\sqrt{LC}$, where L = Inductance in microhenries and C = Capacity in microfarads.

Q.: In wiring up a valve set does the size of the wire materially affect the efficiency? If so, what is the best wire to use and why?

A.: Very little difference is experienced in a regenerative valve circuit, owing to the effect of the re-action neutralising the positive resistance. For mechanical reasons do not use a smaller wire than No. 30 gauge.

H. G. B. (Crystal Brook, S.A.)—Q.: How many turns of an inductance wound on a four-inch former are necessary to tune to 250 metres?

A.: Use twenty turns of No. 20 D.S.C. wire on a four-inch former, with a series variable condenser of 0.0005 mf. capacity.

H. G. C. (Renmark) would like to hear from any experimenter who has put the "Popular Wireless" Combination Set together. Address all answers c/o. The Editor, *Radio*.

"Man Overboard!"

Mr. E. W. Coldwell, wireless operator aboard the s.s. *Eastern*, writes: We had quite a little excitement during a recent run to Brisbane. Just before reaching Cape Moreton, I was standing on the starboard side of the promenade deck, right amidships, talking to the old ship's surgeon, Professor Watson. Suddenly I turned round and was just in time to see one of the Chinese sailors drop into the sea. I immediately threw over a lifebelt and rushed to the bridge and gave the alarm, and the ship began to circle towards the Oriental. In all, three lifebelts were thrown over, but the Chink did not worry any of them, although mine was within thirty or forty feet of him; he seemed to be a good swimmer and preferred to keep himself afloat until he was picked up. I think that this rescue was very creditable because from the time the alarm was given until he was picked up and put aboard, only nine minutes elapsed.

P.S.—As these parts are infested with sharks, I think that this "guy" is worth rubbing against, and having a ticket in "Tatt.'s". I have been trying to do so, but to the present have been unsuccessful.

A Correction

In the course of an article which appeared on page 11 of our last issue it was stated that a five-valve radio receiving set upon which has come in music and speech from KGO, California, had been built by Amalgamated Wireless (Australasia) Ltd. Unfortunately, this was stated in error, the apparatus being the excellent handiwork of the Burgin Electric Company, Sydney.

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KATOOMBA (N.S.W.) SCHOOL OF ARTS RADIO CLUB.

THIS body holds its meetings every Thursday evening and is at present engaged in building a three-valve neutrodyne set. A syllabus of lectures covering the whole field of wireless has been drawn up, and will be carried out in the near future, when various members will address the club. An original grant of £5 made by the School of Arts Committee has been supplemented by a further one of £25. A subscription list has been opened to assist the F. L. Moore Relief Fund. The Hon. Secretary, Mr. R. V. Stewart, states that any radio experimenter visiting Katoomba should visit the club which will take pleasure in making him welcome. This association has only been in existence a few months but already it is in a very flourishing condition. The principal offices are held by Messrs. A. M. Soper, President, R. H. Caton, Hon. Instructor and T. N. Ayling, Hon. Treasurer.

RADIO SOCIETY OF QUEENSLAND.

The recently-formed Radio Society of Queensland is making rapid progress, and if the present rate is maintained, it is destined to become a very brilliant star in the radio world. The following Working Committee has been elected:—Messrs. Gabriel, Dillon, Milner, Underwood, Wilson, Stephens, Barry (2) and Jonsen. The task of erecting benches and making cabinets has been completed and the finished product stand a credit to the craftsmanship of the members. Theatre benefits have been the means of bringing in an acceptable sum of money and this will be spent on experimental apparatus. The Society has the nucleus of a small technical library, and further additions to this have been promised. Mr. A. E. Dillon (vice-president) has kindly consented to give a series of experimental lectures on Electricity and Wireless, to take place at intervals of three weeks.

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MARCH.

Mr. A. V. Middleton signed off s.s. *Enoggera,* at Sydney, 21st, and signed on s.s. *Burwah* same date.

Mr. E. McPherson signed off s.s. *Burwah,* at Sydney, 21st, and terminated service.

Messrs. E. D. Nicholl and F. N. Toohey signed off s.s. *Bakara,* as 3rd operators, at Sydney, 21st.

Mr. E. D. Nicholl relieved Mr. L. E. Ashby as 3rd operator on s.s. *Cooee,* at Sydney, 21st.

Mr. F. N. Toohey relieved Mr. S. Hamilton as 3rd operator on s.s. *Cooee,* at Sydney, 21st.

Mr. J. Doggett signed off s.s. *Bakara* as senior operator, at Sydney, 24th, and relieved Mr. G. Pow on s.s. *Melusia,* at Sydney, 25th.

Messrs. E. W. Coldwell and G. Britcher signed off s.s. *Eastern* as 2nd and 3rd operators respectively, at Sydney, 24th.

Mr. G. Britcher signed on s.s. *Milluna,* at Sydney, 25th.

Mr. J. H. Surplice relieved Mr. W. F. Hartley on s.s. *Waiotapu,* at Sydney, 27th.

Mr. H. F. Hartley relieved Mr. J. F. McGinley on s.s. *Kanowna,* at Sydney, 29th.

Mr. L. E. Ashby signed on s.s. *Yarra,* at Sydney, 29th.

Mr. L. A. Paul signed off s.s. *Chronos,* at Melbourne, 21st, and proceeded on Home Port leave.

Mr. W. Hill signed on s.s. *Wear,* at Melbourne, 27th.

Mr. J. R. Kennedy relieved Mr. W. C. Williams on s.s. *Bambra,* at Fremantle, 26th.

Mr. W. C. Williams relieved Mr. J. K. Kennedy on s.s. *Charon,* at Fremantle, 26th.

STAFF CHANGES.

Mr. Geo. Foot, radiotelegraphist in charge, Port Moresby, has been transferred to King Island Radio on completion of his term of Tropical Service.

Mr. H. Selfe, radiotelegraphist, Perth Radio, has been transferred to Brisbane Radio.

Mr. J. Leslie, officer-in-charge, Brisbane Radio, has been temporarily transferred to Townsville Radio for relief duties.

Mr. J. J. W. Lamb, officer-in-charge, Townsville Radio, has been transferred to Sydney Radio as officer-in-charge on completion of his Tropical Service.

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BOOK REVIEWS

"THE HOME CONSTRUCTOR'S WIRELESS GUIDE," BY W. JAMES.

THERE are few people who can derive pleasure from a study which is merely a mental exercise, but where practical application is posible the satisfaction of knowledge becomes a real enjoyment. A study of mathematics may be cited as one of those mental exercises which a student never fully appreciates until he is able to apply it to the solution of practical problems.

The average wireless amateur at the present time usually reverses the normal order of things, and acquires a fair practical knowledge of the nature and operation of wireless apparatus first, leaving theoretical to a later date. There are many who are even tempted to ignore all but the practical side, believing they can acquire all the theory they need from practical experience alone. The fallacy of this attitude is obvious. It is only by a proper understanding of the function of each component that one is able to modify circuits and conduct experimental work with confidence in obtaining results, and with an appreciation of the effect which various modifications will have.

This volume differs essentially from many books on the subject of wireless which have appeared recently, in that it is written by an engineer who has also a large amount of experience of the practical difficulties encountered by students, through acting as technical supervisor of the "Questions and Answers" Department of "The Wireless World and Radio Review." Many other books constitute little more than a re-hash by technical journalists of information gleaned from various publications. In all his writings Mr. James strikes a new note and inspires the confidence of the reader, because he not only explains, but shows his reader how his explanation is arrived at in such a way that the reader himself can follow the reasoning and acquire the same confidence to tackle his own difficulties.

The reader of this book will find that in a week or two he can reach a higher standard than the average man can acquire after months, perhaps years, of practical experience alone, whilst in addition, he will have confidence in everything which he does, for the reason that he will be in a position to understand *the reason why.*

The book is well compiled in strong, attractive cover, containing 199 pages and 95 illustrations, diagrams and tables. The Wireles Press, Sydney. (Price, 4/6, postage 6d.)

RADIO FOR VATICAN.

Word has been received in Sydney from Rome that the Vatican is erecting a very powerful wireless station. It will be used to broadcast throughout Europe and to America the Pope's allocations and also the blessings spoken by new Popes after their election.

The Staccatone

(*Continued from page* 43.)

flat, G, G flat, A, A flat. When so tuned any musical selection can be played.

Although not necessary, the complete keyboard can be shifted one octave higher by cutting out the proper number of condensers. The correct number must be determined by trial. By adding more condensers the scale can be shifted one octave lower. By cutting out all of the fixed condensers an exceptionally high squeal can be obtained which will rise to inaudibility as the variable condenser is decreased to zero capacity.

With a six-volt vacuum tube, such as the type UV-201, and a B battery voltage of 90 or more, the sound will be so loud as to be heard for several blocks. Of course, a good loud speaker must be used. But for inside use in a small room a dry cell tube may be used with a 45-volt B battery. In fact, most of the instruments that are used in radio receiving sets may be employed in the Staccatone.

Mr. Gernsback is now completing a Staccatone that will be used publicly at the Rialto of New York City by Dr. Hugo Riesenfeld, the well-known conductor of the famous symphony orchestra of that theatre, in conjunction with his famous orchestra. It is expected that its use will be witnessed by many of the leading musical directors of the United States. Mr. Gernsback first used this instrument on the occasion of broadcasting the recent Radio News Song Contest from WJZ, New York.

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No receiving set is better than its re-producer.
Our Loud-Speakers are foremost in design, pattern and efficiency; for clarity of voice production, freedom from distortion and low cost of maintenance, they cannot be equalled.
They are clear, mellow toned, resonant and sonorous, accoustically perfect, fairly priced and unreservedly guaranteed.
Their sound-producing elements respond easily to the many tones of the human voice and all musical instruments.
The apparatus can be connected to your own Wireless Set, of whatever design and construction.

PRICE, £9/-/-. Carriage extra.

NEW SYSTEM T.M.C. "DE LUXE" HEADPHONES.

These Headphones are extraordinarily seusitive; they remarkably enhance the clearness and range of the Radio-Receiver. You judge a Radio-Receiver by what you hear. If your receiving set is not equipped with New System "De Luxe" Headphones, you are not doing justice either to yourself or your receiver (2,000 and 4,000 ohms).

ONLY 40/- PER PAIR. Postage extra.

N.S.T. AND T.M.C. DOUBLE HANDPHONES—FOR THE LADIES.

The advantages inherent in these Double Handphones will be readily apparent. Using them, ladies do not disarrange their hair; they are more easily adjusted than Headphones, and in many other respects are a boon to lady "Listeners-in."
They are light, artistically fashioned, and mounted on polished ebonite handle, with flex. Resistance, 4000 ohms.

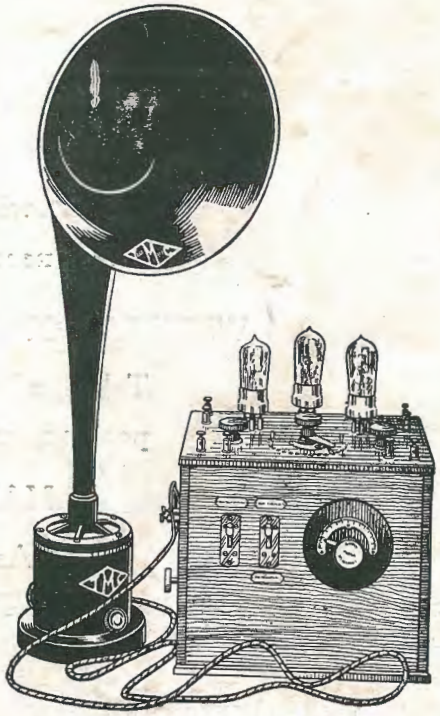
PRICE, £2/15/-. Postage extra.

T.M.C. 3-VALVE LOUD-SPEAKING RECEIVING SET.

DESCRIPTION:
This model stands alone in high-class receivers with its high efficiency, distinctive appearance and unique features, chief of which is the Loud-Speaker device which is contained in the receiver cabinet.
Special terminals are provided for an extra Loud-Speaker and two pairs of Head Telephones without alteration of connecting wires.
This set has been designed to comply with the Government Regulations for sealed wave-lengths. It may be adjusted by the manufacturers to receive any one or all the Broadcast stations within reasonable distance.
The cabinet is built of well-seasoned, highly finished walnut. All fittings and terminals are of polished brass and lacquered, except at points of electrical contact. Overall dimensions, 10½in. x 10in. x 7½in.

PRICE, £48/10/-.

With built-in Loud-Speaker, which does not include extra Loud-Speaker, and accessories. Carriage extra.
No Loud-Speaker need be purchased with this Set, and no extra amplifiers are necessary. It is a complete receiving set, suitable for Broadcast reception up to 400 miles.



Model illustrated with extra T.M.C. Loud-Speaker.

Type approved by Postmaster-General.
Under normal conditions this set will give efficient service, up to a distance of approximately 350 to 450 miles.

New System Telephones Pty. Ltd.

25-27 Queen's Bridge Street, MELBOURNE.
Tels.: Cent. 11130 and 1761.

280 Castlereagh Street, SYDNEY.
Tel.: M 3230.

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