If further tests on Goodyear dirigible models bear out Dr. Coffin's discovery and substantiate his theory, dirigible builders state that there is no reason why such air-pockets should not help to decrease materially the ship's resistance by permitting the air itself to supply added propelling power.

The plan of air-pockets suggested by Mr. Ralph Upson, Goodyear aeronautical expert and famous dirigible pilot, and which, in all probability, will be tried out on some of the large Goodyear dirigibles, will be to encircle the rear of the hull with a number of inch-wide strips of rubberised fabric. Each strip will be cemented securely to the hull on its forward edge, with the loose edge tacked at intervals, thus providing loose flaps, or pockets, in which the looping air currents can catch as the ship glides through the ethereal regions on trans-continental and, possibly, trans-oceanic voyages, and help speed it on its way.

Thus the lowly duck becomes a logical candidate for a conspicuous pedestal in a mythical hall of fame, for the important part it is about to play in dirigible buildings and for the service it seems about to render to the aeronautical world—a service of inestimable value which will tend to intensify airship building and which will make possible increase in propulsive efficiency by reduction of air resistance. And every aeronautical engineer recognises this last as a vital factor in sucessful dirigible navigation.

Fig. 4.—The new Goodyear two-man "Pony" blimp, or "Flyabout," probably the smallest practicable dirigible ever built. It carries two people at a speed of forty miles an hour with enough fuel for ten hours' continuous flight. It will probably be upon this type of ship that The Goodyear Company will test Dr. Coffin's new theory, by arranging for a series of air pockets on the tail of the hull, to catch the assumed twisting air currents as they return after being deflected by the nose, and to take advantage of the forward push thus given.

THE WIRELESS TELEPHONE

As is well known, ordinary conversation is carried on by means of sound waves in the air which are "transmitted" by the speaker and "received" by the listener. Ordinary conversation is, in fact, the wireless telephony of Nature. The transmitter, *i.e.*, the lungs, throat and mouth of the speaker, imparts to the air particles a vibratory motion corresponding to the particular sounds emitted, and the ear drum of the listener responds by moving in an identical manner under the influence of these vibrations.

As an example *Fig. 1* illustrates the kind of ear-drum motion corresponding to a particular sound, in this case the vowel sound "ah" as in the word "jar."

In ordinary telephony by wires, *Fig. 2*, the listener places his ear in proximity to a flexible receiver diaphragm to which is imparted a motion corresponding to the conversation of the speaker.

The speaker influences the receiver diaphragm by causing his voice to act upon the diaphragm of the transmitter which in vibrating brings about corresponding vibrations in an otherwise steady electric current flowing through the circuit. The receiver is so constructed that a steady current has no effect upon it, but its diaphragm follows the *variations* in current set up by the transmitter and so reproduces the sound of the speaker's voice.

It will be seen that ordinary telephony depends upon acoustic variations in an

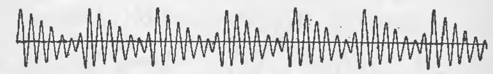


Fig. 1.—Ear-drum Movement Corresponding to the Vowel Sound "ah" as in the Word "jar."

otherwise steady electric current flowing in a wire.

It is not possible to send a steady current through space without wires, but an equivalent result is obtained in wireless telephony by means of currents which vary in a uniform manner at a rate so great as to be far above the range of the human ear, and moreover quite incapable of affecting any receiver diaphragm.

Such currents correspond to the steady current of ordinary telephony. In transmitting speech they are caused to vary in a secondary manner, at acoustic frequencies, by the relatively slow vibrations of the human voice acting upon the transmitter diaphragm, and these variations are faithfully reproduced by the diaphragm of

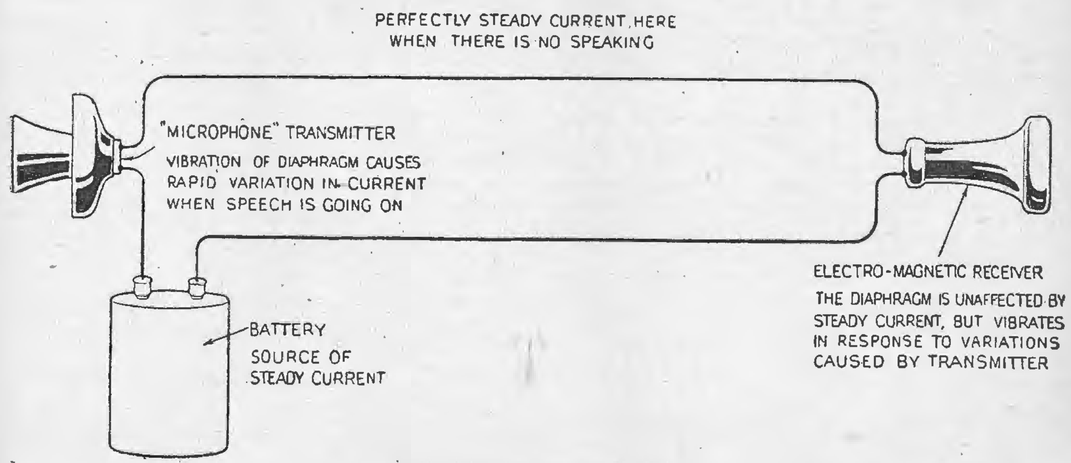


Fig. 2.—Telephony With Wires.

the receiver. *Fig. 3* illustrates the principle diagrammatically.

Marconi's Wireless Telegraph Company, Limited, has developed several methods of generating and controlling the steady high frequency, or "continuous wave," currents which form the basis of Wireless Telephony. Where hundreds of horse-power are required, machines driven by large electric motors are used; for medium powers a special form of electric arc generator is available, which for lower powers the oscillating valve holds the field.

Progress is being made in connection with the commercial use of the oscillating valve for larger powers, and as this form of generator is pre-eminently suited to the requirements of wireless telephony further important developments may be anticipated.

In the telephones exhibited on this occasion the oscillating valve forms the source of energy, the control is by the ordinary microphone of "wired" telephony, and the speech is received and amplified by means of the standard Marconi receiving valve.

Among the practical applications of Wireless Telephony, its use in ship and aircraft may perhaps be regarded as the most important at the moment, since in this sphere of work it provides the only possible means of transmitting articulate speech. In this connection it may be noted that the Wireless Telephone functions perfectly in fog or haze, *i.e.*, under conditions when visual signalling would be impossible.

On *terra firma* it provides an efficient and economical means of communication in mountainous districts, across rivers and estuaries or to islands, since by its use the cost of installing and maintaining lines or cables, a controlling factor under such conditions, is entirely avoided.

Long distance transmission is at present in a state of rapid development and highly satisfactory results have been already achieved. In this sphere the Wireless Telephone has an inherent advantage, apart from that of economy, arising from the fact that the quality of speech, or what is technically termed the 'articulation," is not affected by the distance over which it is transmitted. The wave-form, or "shape," of the wave leaving the transmitting aerial does not change on its way to the receiving aerial, no matter what the distance may be. In wire telephony distortion takes place, and it is only by means of expensive artifices that speech can be carried on over very long distances by land, and long distance speech by submarine cable may be regarded as impracticable.

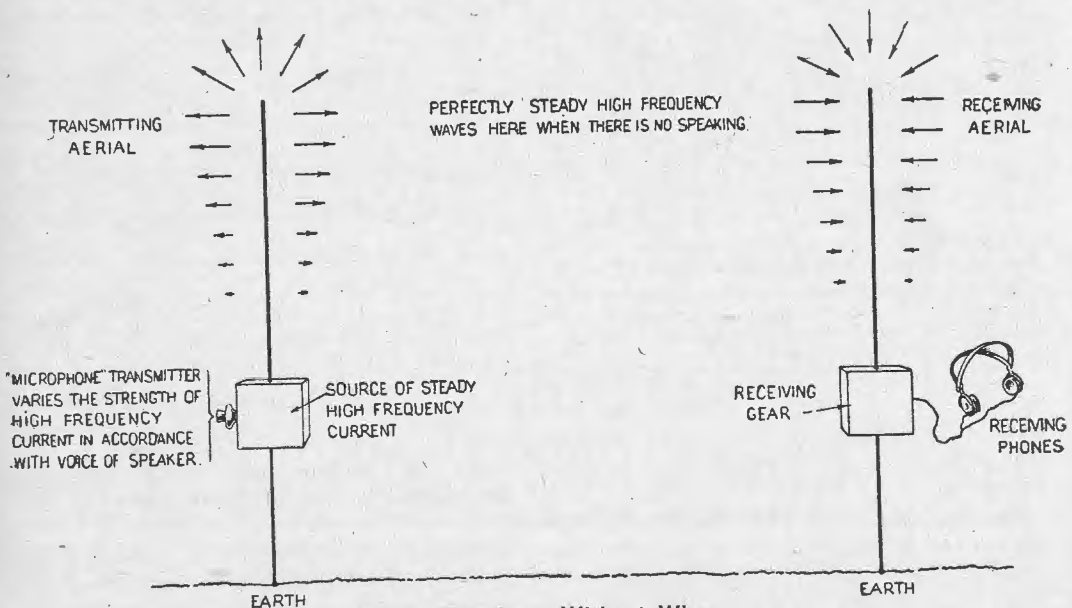


Fig. 3.—Telephony Without Wires.

WIRELESS AT THE HENLEY REGATTA

BY

THOMAS P. COURT, Hon. Secretary Wireless Institute of Australia (Victorian Division).

Mr. W. H. Conry, former Secretary of the Wireless Institute of Australia (Victorian Division), while discussing the Henley Regatta with a sculling enthusiast, was informed by the latter that the Regatta Executive had to rely for its "lines of communication" entirely on a telephone to the starter, a flag signaller, and two one-horse cabs.

Mr. Conry at once interviewed the Secretary of the Henley Committee, and said, "What about wireless?" (or words to that effect). The Secretary cordially agreed that a radiographic installation would fill a long-felt want. Without delay the Radio Service was approached and a licence issued to the Institute. This licence authorised the erection and operation of five stations along the Regatta course, on a wave-length of 200 *mètres*, with a power input not to exceed 20 watts.

Three members of the Institute (Messrs. Conry, Hiam and Maddick), immediately got to work on the stations and, within the week, had them completed and ready for testing.

Preliminary tests revealed insufficient power to overcome the noise along the course, and to ensure perfect reception, very strong signals would be essential. It was decided to use two-inch induction coils, and these were borrowed from Mr. P. H. McElroy—there being no time to have them constructed.

The second test was carried out in the presence of the Regatta Executive, who expressed surprise at the ease and efficiency with which communication was established and maintained.

Permanent aerials were erected at the starting point, midway umpire, judges' box and boatsheds, the lastnamed situated some considerable distance from the finishing point.

The day originally fixed for the Regatta was one of torrential rain; the Yarra rose rapidly, and at 11.30 the Executive decided to postpone the event until the following Saturday.

To the Institute, which had expended much time and labour in preparing the stations, this postponement came as a great disappointment. Everything had been got in readiness for operation by October 23, and on the subsequent date (October 30) many members were unable to attend. In the interval the instruments suffered as well.

The receiving instruments consisted of a small, loose-coupler variable condenser, crystal receiver and 'phones. The sending gear comprised a fixed gap, two-inch induction coil, 6-volt accumulator, helix or oscillating transformer, and key. At the beginning, the sets were fairly well tuned, but the postponement entailed a dismantling of the instruments, thus rendering impracticable that very sharp tuning essential for avoidance of "jamming" the Melbourne Radio Station.

At the stations the work consisted of the starter station announcing—to all stations—the commencement of each race, and maintaining constant communication with the Executive. This station, operated by Mr. C. Hiam, worked perfectly and took every detail of the messages handed in between 12.30 and 5.0 p.m.

The Judges' Box station (finish) was constructed and operated by Mr. Maddick. Owing to its proximity to the Melbourne Radio, some "interference" was at first experienced, but was speedily obviated. This station was kept extremely busy and several relief operators were required.

At the start of each race, the operator rang a bell and an assistant megaphoned the start. The position of boats passing the first umpire was similarly megaphoned and the "finish" radio-ed to all stations.

Although a telephone was installed it was not once used during the event, wireless making it quite superfluous.

Mr. W. Malone, the newly appointed Assistant-Director of Radio Services (formerly of the Australian Flying Corps) visited the stations during the afternoon, and spent some time listening-in with the operator on the Judges' Box station. He warmly congratulated the Institute on the success of its venture and commented on the smart handling of the sets and the disposal of the "traffic." As the Institute had guaranteed that none but operators holding first-class certificates, and possessing at least three years' practical experience, would handle the stations, the result was but a foregone conclusion.

The Boatsheds station was constructed and operated by Mr. W. H. Conry. Its work consisted mainly of receiving, and the information gained was of great assistance to competing crews, who clamoured for news regarding the races. Owing to the dense crowds no other form of communication with these sheds was practicable and Mr. Conry was kept very busy obtaining and posting results.

The Regatta Executive also expressed congratulations to the operators on the general success of their performance.

The maximum power used throughout the day was 12 watts, and signals were at all times extremely loud although the aerials were only 15 to 25 feet high and 30 feet long, and "earths" rather doubtful.

The entire cost of the demonstration was borne by members of the Wireless Institute who constructed the sets, all other assistance being of an honorary nature.

WIRELESS AND THE N.S.W. AERIAL DERBY.

Much of the success with attended Australia's first Aerial Derby must ungrudgingly be attributed to the distinctly modern methods employed in the matter of communication between the home aerodrome and the turning point.

That spectators might trace the progress of competitors, wireless stations were erected at the Mascot and Richmond aerodromes. To ensure the despatch of authentic and correct reports these stations were situated as closely as possible to the Aero Club Officials' Stand, the news from the Richmond station being posted immediately at Mascot on a bulletin board which recorded each competitor's distinguishing number and the actual time at which he passed Richmond on his return flight to the home aerodrome.

The apparatus at both stations was identical, and is a product of the Sydney workshops of Amalgamated Wireless (Australasia) Ltd., by which company the stations were generously installed and maintained without cost.

Since the development of aerial navigation is closely linked with wireless telegraphy and wireless telephony, a brief description of these two stations, with a few notes as to their working, will perhaps not be without interest.

The stations were Portable (Type "A") and the apparatus consisted of storage batteries, Telmar coil, tuning devices, valve receivers, aerial wires and portable masts.

The storage battery supplied the electricity to the Telmar spark coil, which transformed the electrical pressure from a few volts to several thousands. This high tension current is utilised to set up electrical oscillations in the aerial wires suspended between the masts. Thees oscillations which are of extremely high periodicity to the order of hundreds of thousands per second cause stress and strain in the immediate surrounding ether.

The effect of this stress and strain is propagated radially in all directions at the speed of light (approximately 186,000 miles per second) in the form of Electromagnetic waves. When these waves strike other aerial wires they set up electrical oscillations of exactly the same nature as those originally produced at the sending station, but of considerably reduced energy, the amount of reduction depending on the distance and the nature of the surface over which the waves have travelled.

The received electrical oscillations are then passed through the receiving instruments, and made to produce audible signals in the telephone head pieces. Thus is wireless communication established.

The more sensitive the receiving apparatus the greater will be the distance at which electro-magnetic waves radiated from any particular station could be detected. So enormously has the development of the electronic valve increased wireless telegraph and telephone ranges that the installations which were designed to communicate a few hundred miles before the invention of the valve can to-day be heard half way across the world. These valves were employed in the receiving instruments at Mascot and Richmond.

THE AEROPLANE.

FABRIC AND DOPE

VI.

While much has been said of the air pressure on wing members and control-surfaces of an aeroplane, no mention has yet been made of the covering which takes up this pressure and transfers it to the frame-work.

In early days of aeroplane design, a variety of fabrics—such as silk, cotton, linen, and ramie—were used as coverings. To-day the most widely used is linen, although American firms favour a specially prepared cotton fabric.

To understand why linen has largely superseded other types of material, we must consider exactly what is required of the coverings. These requirements are: weight, strength, suitability and durability.

As regards weight, the demands are simple—the covering must be as light as possible in comparison with its other properties.

Strength presents a more complex problem, since the fabric may fail in several ways. In ordinary conditions of flight there is a suction force acting on the upper surface, and a compression on the lower surface of the wing, which tend to deform and burst the covering. If any local injury occurs, the fabric may tear away. These tearing and bursting actions have quite dissimilar effects, as will be demonstrated hereunder.

Under the heading of "suitability," several points must be considered. First, the covering must readily take up any desired contour; it must not lose its shape owing to sagging; it must present a smooth surface to the air in order to prevent increase in drag due to "skin friction"; and, finally, it must be airtight—otherwise, the compressed air beneath the wing would pass through to the vacuum area above, and the lift would be destroyed.

The fourth requirement, "durability," is one of especial importance in Australia and demands the serious consideration of designers, since sunlight is by far the most potent factor in the destruction of fabrics of all kinds.

Before comparing the strengths of the various fabrics, it is necessary to explain more fully how these strengths are measured. The strength of undamaged fabric may be calculated in two days.

The bursting strength is measured by clamping the fabric over a rubber diaphragm and applying water-pressure. This is a useful test, but is not a very convenient method of comparison, because much depends on the size and shape of the area tested. The standard (tensile) test measures the breaking strength per inch width for fabrics under pure tension. In actual fact the fabric is never subjected to pure tension; but it has been found that there is a close analogy between the results obtained for the bursting and tensile tests.

The tensile test is carried out in an Avery testing machine, which operates on the following simple principle. A strip of fabric is clamped between a pair of jaws, set vertically one above the other. The lower jaw is loaded, at the rate of 150 lbs. per minute per inch width of the fabric. The usual dimensions of fabric for test are 10 in. long by 2 in. wide, allowing 7 in. between the jaws of the machine. The breaking load per inch width is taken as the standard of the fabric, other strengths being calculated as a percentage of the breaking, or "tensile," strength—with the exception of the bursting strength, which cannot conveniently be expressed in the same way.

Since the possibility of damage to fabric has to be borne in mind, it must also be tested for certain forms of tearing. In fact, although breaking strength is a convenient standard for specification purposes, the relative "tearing" and "rip" strengths of fabrics largely govern their selection as wing coverings.

There are two ways in which tearing, once begun, may be continued:

(*a*) If the area in which the tear occurs is subjected to pressure, the loads which would have been taken by the cut threads have to be borne by the surrounding yarns, in addition to their normal load; thus uniform industrial legislation, but they have not done so. They promised to give the Commonwealth increased powers, but they have not done so.

Hon. W. M. Marks (Wentworth, N.S.W.): Without this legislation, there may be a tragedy.

Mr. Tudor: I realise it, and I quite believe that there should be one controlling Parliament in this, as in other matters, and that that controlling body should be the Commonwealth Parliament. If the States are not likely to interfere with our control, and are prepared to pass the necessary legislation giving us this power, the sooner they do it the better.

Sir Granville Ryrie: We cannot operate this measure unless they give us the power.

Mr. Tudor: Every State Parliament is sitting at the present time, but some of them are about to conclude their business, and may not meet again until July next. If they go into recess without handing us this power, we shall be in exactly the same position when we pass this Bill as we would be in without passing it. *I hope the Minister* (Sir Granville Ryrie) *can let us know how many aeroplanes are owned by civilians in Australia.*

Sir Granville Ryrie: *There is a great number of them, but I do not know exactly how many there are.*

Mr. Tudor: Nor do I. The Minister surprised me, and I presume many others, when he said that at present a man can go up in the air without being possessed of a certificate of competency. The driver of a motor car is required to have a certificate of competency. I thought the Defence Department were issuing certificates of competency to air pilots, because when I was at Point Cook at the invitation of the late Mr. Basil Watson, who wanted me to see his machine, there was a man qualifying for his pilot's certificate.

Sir Granville Ryrie: He was probably in the military service.

Mr. Tudor: No. He was a civilian. Does the Defence Department issue certificates to civilians who are qualifying for military positions?

Sir Granville Ryrie: Yes, if they are endeavouring to get billets under the Defence Department.

Mr. Tudor: In this case, I understand, the man had no intention of securing the billet under the Defence Department, but was merely anxious to let it be known that he had attended a course of instruction at Point Cook qualifying him to make a flight. He was a motor car driver, and I understand that, because of their knowledge of mechanics, motor car drivers make the best aviators. Unless certificates are issued, the public will always be in danger. I am a frequent visitor to a seaside place about forty miles from Melbourne. Last year, the Melbourne *Herald,* partly to advertise itself and partly to allow visitors at Sorrento to get the *Herald* at night, which otherwise they could not do, sent an aviator right down the east side of Port Phillip Bay. One afternoon, when he was landing at Mornington, the crowd overran the landing ground, and he, finding that he could not make a landing at the pre-arranged spot without injuring some one in the crowd, made for what he thought was a suitable ground on the other side of the railway line; but he came into contact with a telegraph wire, with the result that the son of a prominent Melbourne business man who was accompanying him was killed. That accident was occasioned by the crowd. One reason why we must have active co-operation with the States is the fact that the control of crowds must rest with the State police. In another accident in *Adelaide, which was not due to the crowd, the propeller of a machine cut off a boy's head. Other accidents have occurred elsewhere. Another reason for co-operating with the States is the necessity for providing landing grounds.

Sir Granville Ryrie: That is all provided for in the regulations.

Mr. Tudor: Unfortunately, I have not seen the regulations. I am game to say that 5 per cent. of honourable members have not seen them, or had an opportunity of reading them.

Mr. Marks: They are very complete.

Mr. Tudor: I am prepared to admit that they are, but we ought to know what we are doing. The conditions in Australia might differ from those obtaining elsewhere. However, I see no reason why we should not pass the Bill as early as possible, and get active co-operation with the States, but I think that the Bill ought to state distinctly what Minister is to control it. Otherwise, the control of aviation may be transferred from one Minister to another, and honourable members may not know to what Minister questions or complaints should be directed.

Mr. McWilliam: This is a skeleton Bill, but we have become accustomed to government by regulations. However, I welcome the introduction of the measure. Aviation is quite new to all of us; but every thinking person will admit that unless something is done to secure the control of the air, or what would be called on land "the right of the road," we shall wake up some day and find that some terrific accident has occurred. We have been very close to it on some occasions, more often than some of us would care to think of. There is only one Department which can administer a measure like this, and that is the Defence Department. Necessarily it must have a Department to control its own air-craft, and no one would desire to create a second Department to deal with what, after all, will be a very small affair once these regulations are put into operation. *We do not know anything about aviation,* and it is well for the Minister (Sir Granville Ryrie) to consider whether it would not be wise to place a time limit in this Bill, so that the whole subject will come up for reconsideration later on. I do not think there will be the slightest difficulty in getting the co-ordination of the States. A small Bill giving the Commonwealth Parliament the control of the air could be passed in a couple of hours by each State Parliament, and as all the State Houses are now in session, there should be no difficulty in this respect. With little management and careful handling much closer co-ordination could be achieved between the Federal Government and State Governments in many directions. It only requires a little give and take to meet the requirements of the different States. The State

* This statement is incorrect.—*Ed.*

FOR THE WIRELESS EXPERIMENTER

LONG-WAVE RECEIVERS*

BY

JOSEPH G. REED

There are two systems employed in radio telegraphy, namely, damped and continuous wave transmitters. Practically all the short-wave stations employ one or the other system of spark or damped wave systems, while continuous wave transmission is almost exclusively employed by the long-wave stations.

As we are to deal now with long-wave reception only, consideration will be given to the practical details of the design of a receiving station capable of picking up waves from about 3,000 to 19,000 *mètres.*

Let us first consider the primary circuit and determine the values of inductance and capacity which will be required to tune up to approximately 19,000 *mètres.* From the formula, $\lambda = 1885\sqrt{LC}$, we ascertain that the value for LC must be 100 to cause resonance at 18,850 *mètres.* This figure is taken because of ease in calculations which are to follow.

Next we must consider the capacity of the aerial, and the following table of capacities of single wire aerials will be extremely useful:—

Length in feet of 7/20 copper wire.

Height	40ft.	60 ft.	80 ft.	100 ft.	120 ft.	160 ft.	200 ft.	240 ft.
Capacity..		0.00023 m.f.	0.00028 m.f.	0.00032 m.f.	0.00037 m.f.	0.00045 m.f.	0.00053 m.f.	0.00058 m.f.

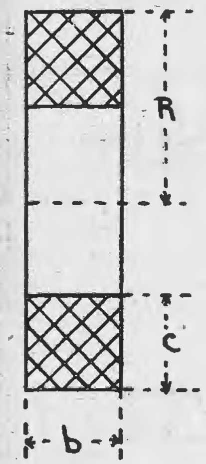
The above figures are the results of actual tests carried out by the author. Selecting for example an aerial 40 ft. high and 80 ft. long, this is found to have a capacity of 0.00028 m.f., and with the average condenser of about 0.0008 m.f. used for aerial tuning, a maximum capacity of about 0.001 m.f. is available. To obtain an LC value of 100, an inductance of 100,000 *microhenries* is required.

Before going into actual constructional details the inductance of the secondary and tickler coil will be determined. To obtain best results with the audion, or valve, which is a voltage operated device, the inductance must be kept high and capacity low, so we will assume a maximum condenser value for the secondary of 0.0005 m.f., which approximates the capacity of the Murdoch 23 plate pattern. This valve requires an inductance of 200,000 *microhenries* to give the required LC = 100. A suitable value for the tickler will be about half this value. There is no hard and fast rule for the inductance of this coil, but in practice it is generally made about half that of the secondary.

To enable these coils to oscillate in the most efficient manner, the ohmic resistance must be kept as low as possible, in other words, maximum inductance must be obtained with minimum wire.

The empirical constants for a coil possessing these desirable features are given in *Figure 1.*

As these coils are of the multilayer pattern, speci..l precautions must be taken to keep the distributed capacity at a minimum.



For max. Inductance with min. Resistance.

$$\frac{R}{C} = 2 \quad , \quad \frac{b}{c} = 1$$

$$L\ c/ms = \frac{c/ms^2}{b + c + R} \times \left\{\frac{10b + 12c + 2R}{10b + 10c + 1.4R}\right\} \times 0.5 \log_{10}\left\{100 + \frac{14R}{2b + 3c}\right\}$$

Cms = Length of wire in centimeters.

Fig. 1.

Construct three wooden formers of the dimensions shown in *Figure 2,* and proceed to wind as follows. Cover the coil with a layer of Empire Cloth and wind from left to right a complete layer of the wire mentioned in the table below. Now cover the wire with two layers of unsized paper, or brown paper which has been cut into strips 30 m.m. wide. Between the first and second layer of paper lead the wire back to the left and place on another layer *in the same direction.* This produces a uniform distribution of potential between layers and reduces losses due to dielectric hysterisis. The use of double cotton wire assists in this direction, as well as being cheaper than silk. It

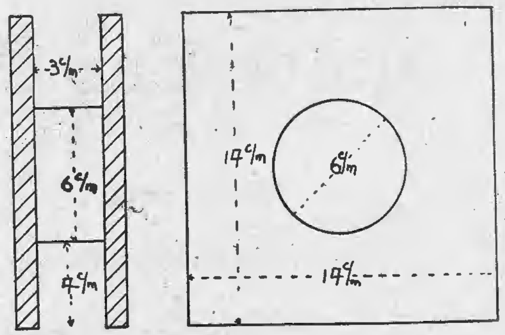


Fig. 2.—Dimensions of Formers.

* Lecture delivered in Sydney on December 3, 1920, before N.S.W. Division of the Wireless Institute of Australia.

will be seen that this method of winding is very similar to the regular bank winding, and owing to the spacing between layers, is more efficient as regards distributed capacity.

Coil.	Turns.	Wire.	Layers.
Primary ...	1,200	# 26 D.C.C.	30
Secondary ..	1,750	# 30 D.C.C.	35
Tickler	1,200	# 30 D.C.C.	25

Drill holes in the side of the former to accommodate the leads from the coil to the switches.

Divide the coils into five equal sections, looping the wire out at the end of each section for about 12 inches. A terminal strip on the top of the coil should be provided, to which the taps are connected, at one end, and flexible leads to the switches at the other. These switches are of special construction. From the outside they appear similar to the regular contact switch, but at the back, on a continuation of the spindle which holds the switch knob, is a special drum commutator with four segments which automatically cut in or out of circuit the isolated sections of the coil. A description of this switch is given in Bucher's "Practical Wireless Telegraphy."

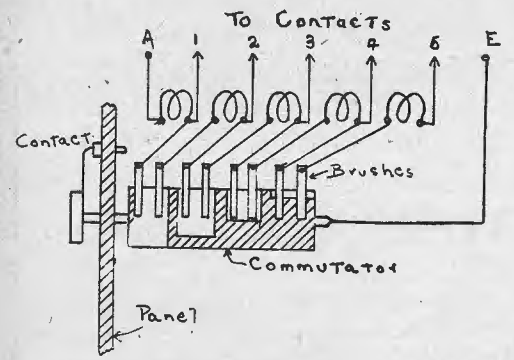


Fig. 3.—Schematic Diagram of Connections to Dead-end Switches.

Figure 3 gives an idea of the construction of this switch. The drum switch consists of a piece of hard rubber rod which has been turned to fit a brass cylinder, which, after parting into four sections is cut to provide segments of the required angular displacement. A 45° displacement is a suitable value. Instead of this drum switch, which requires a lathe for its construction, the operation of coupling-up the sections can be manually accomplished by means of several small knife- or plug-switches on the panel. All coils should preferably be "dead-ended" to ensure efficient working on the shorter wavelengths.

It is essential that the secondary be provided with some means of cutting-out unused turns.

Regarding the mounting of these coils so as to secure variable coupling, it will be found easiest to make the secondary the stationary coil, and arrange the primary and tickler to swing through an angle of 90° on each side. Details of this mounting are given in *Figure 4*. Dimensios are not given as most experimenters have some particular "best way" which will suit the general design of their cabinet.

Before closing, I have a little valuable information for users of valves, which deals with the high voltage plate battery. Most of you employ a bank of small flashlight cells for this purpose, and have undoubtedly noticed that, after about six months' use, the zinc casing begins to eat through—with disastrous results. The electrolyte leaks out, causing short-circuits in other cells and consequent deterioration of the whole battery in a short space of time. The obvious remedy for this is to isolate each cell from its neighbours, and so localise any trouble that may occur.

Here's the secret!

When putting a new battery into commission, remove the small cardboard cover from the top of the cells, and pour around the three cells sufficient hot paraffin wax to completely fill the battery. The wax must be very hot and almost on the point of smoking, so as to ensure

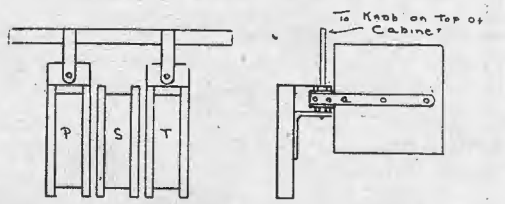


Fig. 4.—Suggested Method of Mounting Coils for Coupling.

its penetration all through the battery. When all are filled, dip them into a can of boiling wax to cover the outside covering with a thin film of wax and thereby reduce surface leakage.

At a later date I intend dealing with the construction of intervalve and telephone transformers, both necessary articles for use with amplifiers, which I am sure you will all make it your business to build after your introduction to the long-wave stations on the set briefly described above.

WIRELESS INSTITUTE OF AUSTRALIA

New South Wales Division.

The 45th General Meeting was held in The Lecture Hall at Sydney Observatory on December 3, Mr. C. P. Bartholomew presiding in the absence of Mr. E. T. Fisk.

The Chairman gave a short *résumé* outlining the reasons for the apparent inaction in regard to Institute matters in New South Wales during the last couple of months, special mention being made regarding the control of wireless matters recently resumed by the Postmaster-General's Department. He also gave prominence to the doings at the last Council Meeting held on November 22, when committees were formed to deal with the following matters:—

(*a*) Communication with the authorities regarding licences.

(*b*) Drawing up of a syllabus, including, as well as subjects for general meetings, visits to interesting plants, etc.

(*c*) Making inquiries regarding permanent accommodation for the Division's headquarters.

(*d*) Making inquiries regarding the registration of the Institute.

Two new members were elected.

The following Motion, by Mr. P. Renshaw, was carried unanimously.

(1) That Rule 5 be amended to read:—

Membership in the N.S.W. Division of the Wireless Institute of Australia shall be of three grades constituted as follows:—

All applicants for membership or associate membership must be of British nationality.

Associate Members.—Those interested in the scientific study of Wireless Telegraphy or Telephony not necessarily experimenters. Applicants for this grade must have attained the age of 15 years. Associate members shall not have power to vote at any Meetings nor shall they be eligible to hold office in the Institute.

Members.—Bona fide experimenters or those interested in the scientific study of Wireless Telegraphy or Telephony either profesionally or otherwise who shall have attained a standard equivalent to that necessary for a second-class operator's certificate and who have reached the age of 18 years. The Council shall have power to investigate intending member's qualifications (also in being raised from one grade to another) and its decision shall be final.

Honorary Members.—Persons may from time to time be admitted to the privilege of Honorary Membership for a period not exceeding six months on the proposal of any financial member provided such application be approved by any two officers of the Division. The proposing member shall be in every respect responsible for the conduct of his nominee.

The whole of the existing Rule 5 to follow immediately hereafter, except the last sentence, which is to be deleted.

(2) That the first clause of Rule 6 be amended to read:—

The annual Subscription within 100 miles of Sydney shall be: (*a*) For Associate Members, 10s. 6d.; and (*b*) for Members, £1 1s., payable in advance on the first day of April in each year.

Mr. J. G. Reed then delivered a lecture on the "Construction of Long Wave Tuners and Data in Connection Therewith," which is fully reported on page 682.

South Australian Division.

A Monthly General Meeting was held in Adelaide on December 1, Mr. Hambly Clark presiding over a large attendance.

The Honorary Secretary, Mr. C. E. Ames, read a paper on Direction Finding with Loop Aerials, explaining by means of diagrams how the loop gives maximum signals when in the plane of the direction of a transmitting station, and minimum strength signals when at right angles to the transmitter. He also gave circuits for use with this type of aerial.

The paper will be continued at the next General Meeting, which is fixed for January 5.

One new member was admitted to the Institute.

Among the visitors was Mr. Waite (ex-wireless officer of s.s. *Quiloa*), who delivered an interesting address on the life of a wireless operator at sea.

LIST OF WIRELESS OFFICERS ATTACHED TO VESSELS OF THE AUSTRALASIAN MERCANTILE MARINE

Revised to December 8, 1920.

SHIP.	OPERATOR.
Apolda	J. W. McKay
Arahura	W. C. Brown
Araluen	H. H. Black
Aramac	C. Williamson
Arawatta	D. W. Higgins
Atua	L. G. Devenport
Australbrook	J. F. McGinley
Australcrag	V. E. Stanley
Australford	T. W. Bearup
Australglen	W. H. Richardson
Australmead	S. V. Blight
Australmount	A. R. Catford
Australpeak	H. P. Weedle
Australplain	A. Stuart
Australpool	E. J. Glaisher
Australport	J. H. Pullan
Australrange	V. P. Nevins
Bakara	C. W. Donne
Baldina	———
Barambah	M. L. Robertson
Bellata	G. Soilleux
Berringa	L. E. Ternes
Bethanga	F. G. Forrest
Bingera	J. H. Hawkins
Birriwa	F. G. Lewis
Bombala	A. H. Jeremy
Boonah	F. A. Cook
Booral	T. V. Tressler
Boorara	T. Alexander
Bulla	A. W. Watt
Bundarra	H. G. Reilly
Calulu	F. Exon
Canberra	H. W. Barnfield
Carina	W. Hall
Changsha	B. Boni
Charon	J. E. Cleary
Cooee	P. D. Hodges
Cooma	J. A. Guy
Delungra	I. B. Gibson
Dilga	R. Jordon
Dimboola	S. L. Filer
Dinoga	R. R. Robinson
Dongarra	H. J. Byrne
Dromana	F. Stevens
Dumosa	H. Beckett
Dundula	J. A. Cooper
Eastern	C. H. A. Kidman
Emita	———
Eurelia	———
Eudunda	———
Gilgai	D. H. George
Hwah Ping	H. F. Hartley
Kaiapoi	E. A. Miller
Kaitangata	H. F. Harman
Kaituna	F. E. Duggan
Kaiwarra	L. H. Jones
Kanna	K. McSwann
Kanowna	W. J. Washbourne
Karoola	R. R. Pilmore
Katoomba	T. A. Jones
Karori	W. C. Lucas
Katoa	K. L. Freeman
Kauri	H. S. Chown
Koromiko	A. E. Lawrence
Kowarra	H. Fullerton
Kurow	A. D. R. Davis
Levuka	A. S. Smith
Loongana	H. A. de Dassel
Macedon	H. E. Young
Mackarra	A. G. Ross
Macumba	S. G. Joues
Maheno	G. H. Hugman
Makambo	C. F. Griffiths
Makura	E. A. Hunter (s) M. Webb Watts (j)
Malayan	H. F. Giles
Manuka	J. A. Heavey
Maori	R. S. Taylor
Mapourika	C. F. G. Taylor
Marama	J. H. Bennett (s) F. Ouvrier (j)
Mararoa	G. M. Gormlie
Marella	———
Marsina	J. R. Gilligan
Mataram	J. F. Hutton
Maunganui	———
Melusia	S. F. Stafford
Minderoo	M. A. Prudence
Mindini	E. F. Hayes
Moana	S. R. Dixon
Moeraki	A. Cuthill
Mokoia	T. H. McWilliams
Monowai	———
Montoro	A. L. Dixon
Morinda	F. C. Davies
Navua	D. C. Lane
Ngakuta	H. Bargrove
Niagara	W. H. Harris (s) F. A. Hunter (j)
Ooma	A. E. Sheppherd
Oonah	R. M. Firminger
Paloona	R. P. Ginders
Parattah	K. L. Simpson
Pateena	———
Rakanoa	W. A. Hawkins
Riverina	G. Illingworth
Rotomahana	J. B. Ponsonby
Shandon	G. Vincent
South Africa	E. J. Giles
St. Albans	T. Bannister
St. George	A. J. Sawyer
Suva	L. S. Lane
Tahiti	E. M. Bain (s) W. S. Ringrose (j)
Taiyuan	F. A. Woodall
Talawa	D. Hairs
Talune	R. W. Barnes
Tarawera	G. M. Whiteside
Tofua	L. R. Dickson (s) E. N. Williams (j)
Toromeo	M. Sedgers
Ulimaroa	H. Tuson
Victoria	H. M. Lamb
Wahine	J. O. Taylor
Waihora	H. Bashford
Waihemo	G. Maxwell
Waikawa	N. Leeder

(*Continued on page 690.*)

(Continued from page 688.)

Waimarino	A. S. Dening
Waipori	G. Donnelly
Wairuna	F. N. Davidson
Waitemata	G. Poole
Waitomo	S. J. McVeigh
Wanaka	J. Elmore
Wandilla	D. N. Quinn
Westralia	M. A. Ryan
Whangape	A. O. Sutherland
Wodonga	A. W. Hooper
Wyreema	T. Chalmers
Wyandra	J. Doggett
Zealandia	J. G. C. Higgins

A.W. (A'sia.) Ltd. Operators Temporarily Employed on M.I.M.C.C. and Other Ships.

Rupara	G. Cook
Durham	H. Heather
Wattle	L. N. Callagham

Mr. A. L. Dixon (of Amalgamated Wireless, Australasia, Ltd.), has rejoined the sea staff after some months ashore, and sailed for Singapore in the *Montoro*, on December 4.

Mr. P. Moore-Farmer, Inspector (of the same Company), has returned to duty from his vacation at Tuggerah Lakes, N.S.W.

CALL LETTERS.

The following additions and cancellations are notified:—

Additions.

VHG	*Emita*
VXF	*Bethanga*
VXC	*Berringa*
VXG	*Enoggera*
GBKJ	*Marella* (ex *Wahehe*)
XXE	*Baldina*
VLS	*Mapourika*

Cancellations.

VKZ	*Morialta*
VZA	*Rupara*

NEW TONNAGE FOR AUSTRALIA.

The following vessels have recently passed into the ownership of the companies indicated hereunder:—

Adelaide Steamship Company Limited.

Baldina—Ex *War Duchess* (4,333 tons), built Montreal, September, 1918.

Barunga—Ex *Cape Premier*, ex *War Faith* (4,342) tons, built Montreal October, 1918.

Merriwa—Ex *Gertrud*, ex *Willy Rickmers*, (5,091 tons), built Bremerhaven, 1915.

Milluna—Ex *Franziska*, ex *Mabel Rickmers*, (5,129 tons), built Bremerhaven, 1914.

Aldinga—Ex *Glenstal*, ex *War Cloud* (3,112 tons), built Dublin, 1920.

Aroona—Ex *Cape of Good Hope*, ex *War Typhoon* (3,116 tons), built Middlesborough, October, 1918.

Union Steamship Co. of N.Z., Ltd.

Kekerangu—Ex *Cosmos*, ex *War Coast* (3,091 tons), built Newcastle-on-Tyne, March, 1919.

Kawatiri—Ex *Shahristan* (3,076 tons), built Sunderland, July, 1919.

Kaitoke—Ex *Cape Colony*, ex *War Palace* (3,112 tons), built Middlesborough, November, 1918.

Kaikorai—Ex *Cape Natal*, ex *War Foam* (3,096 tons), built West Hartlepool, May, 1918.

Waiotapu—Ex *Stolberg* (5,886 tons), built Flensburg, January, 1913.

Waikouaiti—Ex *Irmgard* (3,680 tons), built Rostock, 1914.

Kaimanawa—Ex *John Heidmann* (2,380 tons), built Flensburg, 1909.

Burns, Philp & Co., Ltd.

Marella—Ex *Wahehe*, ex *Hilda Woermann* (7,372 tons), built Hamburg, 1914.

WIRELESS NOTES.

The "St. George's" Successful Installation.

The s.s. *St. George*, recently fitted with a Marconi Type C4 set Emergency Apparatus and 103 Magnifying Valve Receiver, is now trading among the Gilbert Islands.

Her wireless officer reports that the installation is giving excellent results, and has created a splendid impression.

The *St. George*, being but of small tonnage, has in use a very short and low aerial and, owing to the high efficiency of the apparatus, is able to maintain regular daylight communication with Ocean Island Radio Station from any part of the Gilbert Group.

As an instance of particularly good working, her wireless officer reports that he worked Ocean Island at a distance of 361 miles in daylight with his emergency transmitting gear.

An Australasian Record.

A smart piece of wireless work was recently performed in mid-ocean between Australia and New Zealand. At 10.20 p.m. a passenger on board an inter-colonial steamer, handed in a message addressed to Wellington, New Zealand. This was transmitted from the ship to the Wellington Radio Station, and thence by telephone to the addressee. The reply was telephoned to Wellington Radio, transmitted thence to the ship, and delivered at 10.30 p.m., the total time between handing in the message and receipt of reply being 10 minutes—which constitutes a record.

Use for Old Dry Cells.

For testing buzzers and spark coils, exhausted cells may be utilised in the following manner: Split the zinc, unwrap from cell, and clean. Take bag containing carbon rod, etc., and also clean.

Then, in suitable glass jar, containing water with handful of salammoniac, stand zinc and bag. Result—a cheap cell with long life.

Mr. A. F. Vipan, from whom the above hint is received, states that he has proved the efficiency of these cells for nine months, when he used 8 connected in series working a ½-in. spark coil.

Wireless Workshops.

The Treasurer's Statement of the Commonwealth Receipts and Expenditure for the quarter ended September 30, 1920, shows that the Government-controlled wireless workshops are operating at an annual loss of more than £8,000, the actual figures for the three months under review being as follow:—

	£	s.	d.
Expenditure	£46,387	9	3
Receipts	£44,331	15	6
Loss	£2,055	13	9

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AMONG THE SOLOMONS

BY

EMMA H. ADAMS

Solomon Island Natives.

The Solomon Islands form one of the most extensive, and in some respects one of the most interesting groups in the South-western Pacific. They were among the first discovered in that part of the island world. Yet, owing to a series of peculiar circumstances, they have until quite recently been the least known of the larger groups of the great ocean. For over two hundred years after their discovery all knowledge of them was lost to the world. The commander of our trim craft remarks that at the rate we are flying along before this stiff trade-wind, we shall touch the group to-morrow morning about sunrise.

This will bring first into view the lofty island of Guadalcanar, with tropical Malaita on our right, and beautiful St. Christoval on our left. Let us, therefore, now gather all the general information possible about the long-lost group. There is the captain trying to make out that strange sail off the coast of St. Christoval. The