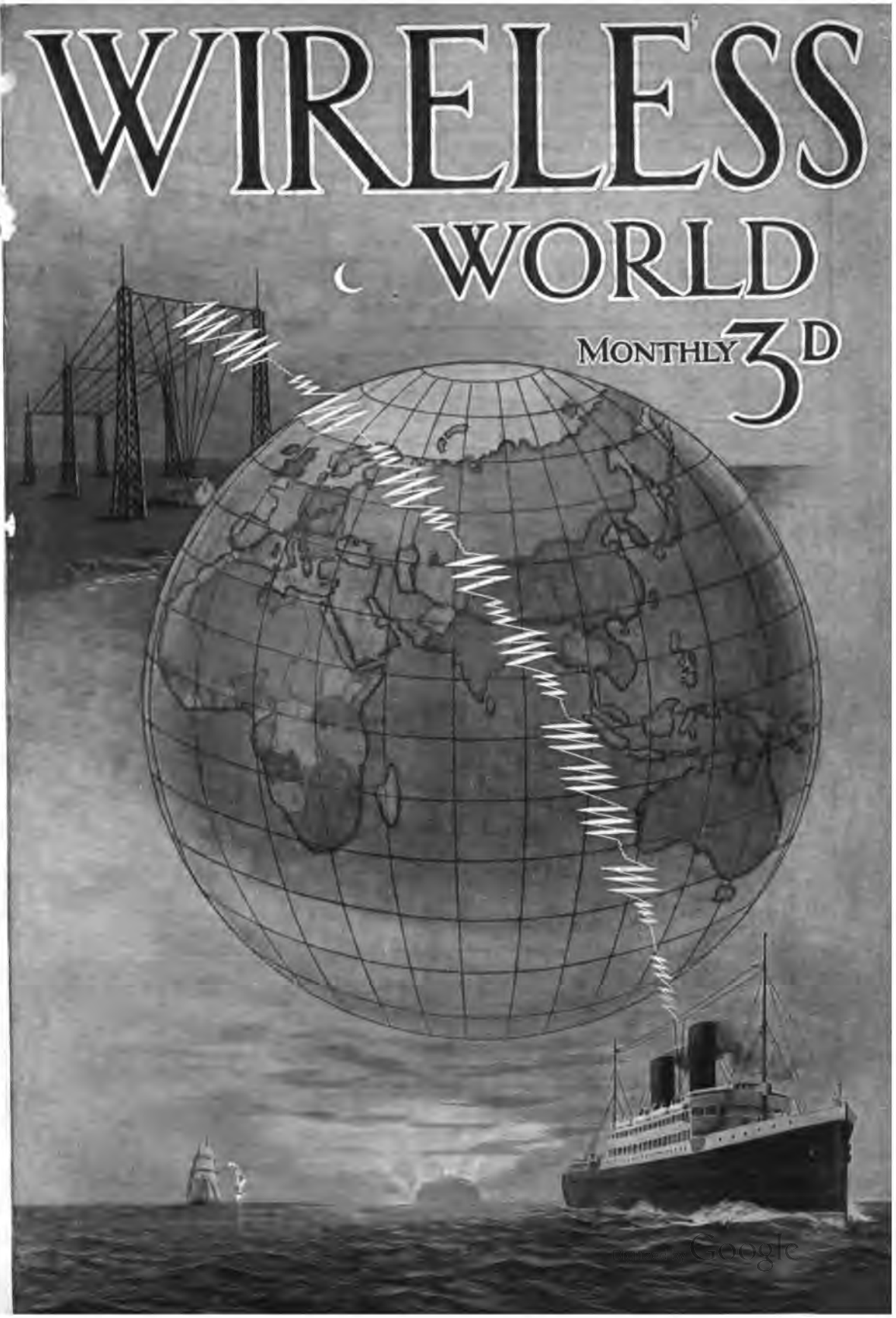
WIRELESS WORLD

MONTHLY 3D



THE WIRELESS WORLD

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OUR NEW VOLUME

Some Notes of Progress and a Recommendation.

LAST month we briefly advised our readers that the new volume, which commences with the April issue, will embody a number of alterations, all of which will assuredly commend themselves to our readers. It is not every magazine that finds itself in the position of being able to enlarge its scope under war conditions; yet such is the appreciation shown by our friends that we feel ourselves justified in making the forthcoming substantial increase and improvement.

The outward and visible sign of this extension will strike the eye as soon as the magazine is sighted in shop or bookstall. The new and artistic cover needs but little comment. In former days it was necessary to emphasise the fact that wireless, like Alexander, had set out "to conquer the world." It is now a matter of common knowledge that no portion of the hemispheres is free from the influence of radio-telegraphy, and the globe, therefore, disappears from our cover design.

Notable amongst the innovations will be found additional space devoted to technical articles. This is a point which in the past has been repeatedly urged upon us by readers to whom these sections have appealed. Under former circumstances, in justice to other readers, we were not able to comply with their request. Now the way is open. We are availing ourselves of the present opportunity in a manner which will certainly appeal to the more scientifically inclined of our *clientèle*. We are adding, moreover, in "Operators' Notes," a feature whose title speaks for itself, and whose matter will be found of great practical value.

Instead of a single pictorial account of stations in various parts of the world, each of our issues will contain two. We intend, moreover, to recognise the increasing value of volumes dealing with the various branches and activities of wireless telegraphy, by producing monthly a long article devoted to some one or other of the more important recent publications. This will be additional to our regular feature of "The Library Table."

In order to relieve the monotony of wireless operators at sea, we are introducing a section devoted to Operators' Pastimes, and dealing with such recreations as are suitable under the circumstances. The appeal of such articles should be a wide one, and we shall be glad to hear from readers on any point connected therewith. Mr. Heath Robinson, the world-famous humorous artist, contributes the monthly cartoon for our first issue.

One point which we would commend to *readers' special attention* is that of placing definite standing orders for THE WIRELESS WORLD with their newsagent. This recommendation should not be treated lightly, because, partly owing to the shortage of paper which is affecting every branch of the newspaper and magazine world, and partly owing to our increase in price from 3d. to 6d., we are obliged to make every endeavour to avoid wastage, and any reader who fails to adopt the course we recommend is liable to serious risk of finding himself unable to obtain the magazine.

RT. HON. J. A. PEASE,
P.C., M.P.

Personalities in the Wireless World

THE RIGHT HON. J. A. PEASE, P.C., M.P.

(*Postmaster-General of the United Kingdom.*)

THE appointment of a new Postmaster-General is an event of the greatest importance to the Wireless World, because it means that that sphere of its influence which is known as the United Kingdom will now be under the control of a new Governor, who will have charge of its destinies for good or evil. A moment's thought will impress upon the reader what power and authority the new Minister of the Crown assumes when he takes up his duties as Postmaster-General.

He becomes by nomination Supreme Ruler of a mighty organisation; a network of telegraph and telephone cables stretching to the four corners of the earth is under his control. He holds the threads in his hands. Packet-boats travelling over every section of the high seas are under his command; mail trains are speeding past mountain and valley, over moor and fen, to fulfil his purpose. Again, messages pass and repass like motes in a sunbeam, voice speaks to distant voice; but, over and above all, invisible ether waves are radiating through space carrying inaudible messages to unseen ears. It falls to the Postmaster-General to regulate this complex machinery, which is itself the mainspring of modern existence.

Yet every year this scene increases in grandeur and breadth. For some time wireless telegraphy has subjected illimitable space to its suzerainty, and now wireless telephony can claim a similar privilege. But, after all, to most of us who live in a workaday world and have letters to scribble and posts to catch and telegrams to despatch, little enough time is left for contemplation. We prefer facts to words; therefore we conclude with a biographical sketch of the personality who fulfils the important office.

The new Postmaster-General is a man well fitted for his appointment, for he is in every essential a capable minister and withal a courtly gentleman. He is comparatively young for the important office which he holds; he attained the age of fifty-six on January 17th last. His parliamentary career, if brief, has been far from uneventful. He began as private secretary to Mr. John Morley, and after serving as Junior Whip and then as Chief Liberal Whip (from 1908 to 1910) he entered the Cabinet as Chancellor of the Duchy of Lancaster in 1910.

From 1911 to May, 1915, he ably filled the important office of President of the Board of Education. At the Cabinet crisis in May, 1915, room was not found for him in the newly constituted Coalition Cabinet, and he consequently retired from office. Last June he was granted a political pension of £1,200 a year, and in the following month, at the request of the Army Council he undertook the post of Civil Member (unpaid) on the Claims Commission in France. In consequence he resigned his position on the Cabinet Committee for the Prevention and Relief of Distress and the Chairmanship of the Professional Classes Sub-Committee.

He was responsible for the introduction of an Education Bill in the closing days of the 1913 session. Mr. Pease is a member of the well-known Yorkshire family, and a Director of Pease and Partners, Ltd. He represents in Parliament the Rotherham division of the West Riding of Yorkshire in the Liberal interest. In his earlier days he was a master of draghounds and beagles, was captain of his county cricketing eleven (Durham) for several years, and an all-round sportsman. It is interesting to note that Mr. Pike Pease, Assistant Postmaster-General, is a cousin of the new Minister, and will retain his post.

The Special Problems of Aircraft Wireless—IV.

By H. M. DOWSETT, M.I.E.E.

Aircraft Balancing Capacities.
Airships—(continued).

"SEMI-RIGID" and "non-rigid" airships, as will be seen from the illustrations given below, must of necessity have balancing capacities of less simple form than those already dealt with; consequently it becomes more difficult to calculate their actual capacity values, and more reliance must be placed on measurement.

Fig. 1, for instance, is an outline sketch of *La Patrie*—unfortunately lost in the North Sea—a vessel of the improved Lebaudy type, which may be considered fairly typical of the semi-rigid class. It was similar to, but smaller than, the vessels *La République* and *La Liberté*.

A rigid frame, *FF*, forming a flat plane, was built into the lower part of the body of the balloon, and from this the car was supported. Under the frame was a strengthening girder, *H*. The frame and girder were both covered with rubber fabric, and extensions of both were carried well towards the rear of the balloon, the whole construction forming two "stabilisating planes," one horizontal and one vertical. The extensions

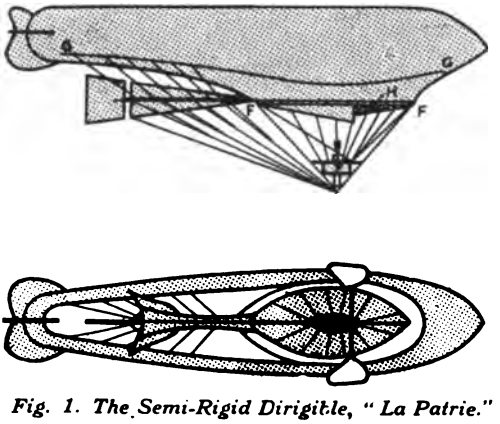


Fig. 1. The Semi-Rigid Dirigible, "La Patrie."

obtained their support from wire suspensions, terminating in "goose-feet" of hemp fastened to boxwood stakes, which were enclosed in the girth *GG* sewn into the balloon fabric.

The *Gross* airship has similar stabilisating planes extending almost the whole length of the balloon, but they are not built into the envelope; instead, they are made semi-rigid with the balloon by means of triangulated wire bracing to the longitudinal girths.

It is the wire suspensions, the metal frames of the fixed stabilisating planes, the aluminium or tubular steel strengthening girder, that the wireless engineer must make use of for his balancing capacity. If the plane frames are metal it is clear from what has already been said * that it is not worth while to metalise completely the planes as the additional gain in capacity is relatively small.

In many cases the frames of the planes, and in the smaller airships especially, the main frame and strengthening girder are not constructed of metal, but of bamboo, ash, or other suitable woods, and only the wire suspensions, properly adapted for the purpose so as to avoid the danger of high-tension corona effects, can be used. The maximum capacity obtainable in this way may be too small to give satisfactory results, and it has been found advisable on vessels of the *République* type to add to the capacity by spanning additional wires to the top of the balloon.

In the *Clément-Bayard*, Fig. 2, one of the most successful of the non-rigid airships, the wireless engineer finds a system of wire suspension and stiffening girder which lends itself more readily to form a useful balancing capacity than any other example of the semi-rigid or non-rigid types. Also the simple geometrical shape of the system sug-

* WIRELESS WORLD, February, 1916.

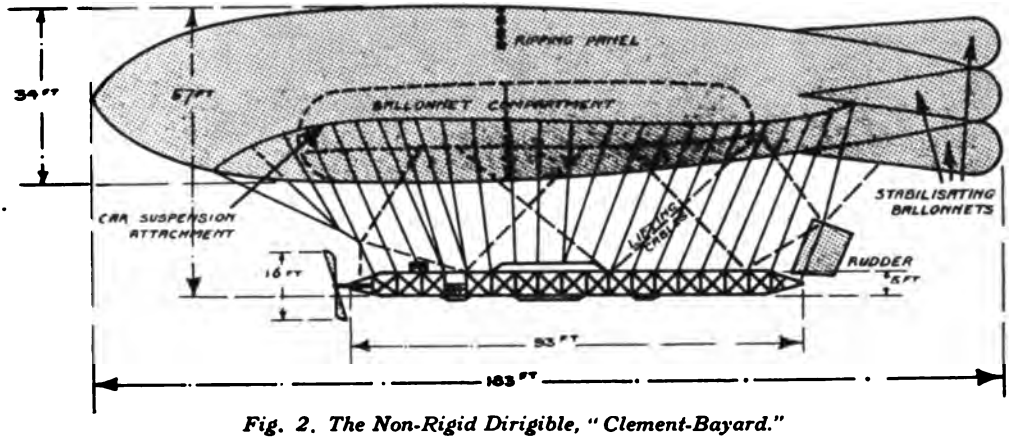


Fig. 2. The Non-Rigid Dirigible, "Clement-Bayard."

gests that its capacity value can be calculated.

The car consists of a cubular lattice frame of steel tubing 93 feet long, the sides of the cube being 5 feet, and the tubes 1·2 inch and 1·6 inch diameter. Wire diagonals fitted with stretchers maintain the rigidity of the structure. This frame, suitably insulated from the steel suspension and lifting cables, has been used as a balancing capacity. If it is treated as an ellipsoid of revolution it is a simple matter to calculate what its value should be in free space, making allowance for the wire diagonals as being equivalent to two additional wires on each of the four sides of the frame and parallel to the length.*

The calculated capacity of a sheet metal ellipsoid of the dimensions given is 414·2 cms.

The ratio of "length/mean distance apart" of all the longitudinal members —tubes, and equivalent wires—is 56 : 1, so that the above value is about 14 per cent. high—see curve, Fig. 3—and the actual value will be about 356 cms., quite a low figure.

Obviously a much larger capacity could be obtained by including as great a length of the suspension cables as possible. These cables are of stranded steel, three threads to each strand, some 3 mms. others 4 mms. in diameter. Can we estimate the full amount of capacity obtainable in this way?

The shape and dimensions of the system are shown approximately in Fig. 4. The steel lifting cables, being inside and fairly close to the suspension cables, can add little to the total capacity, and so are omitted. Suppose we assume the suspensions to be attached to the *bottom* of the car frame so as to enclose and electrically screen it, then the amount the frame will add to the total capacity will also be small.

To further simplify the problem, assume that the two suspension girths are parallel, and at a distance apart equal to their actual mean distance.

Also that the suspension cables run right up to the girths instead of being attached to them by hemp goose-feet, and are parallel, the end cables being separated a distance equal to the mean of *AB* and *CD*, Fig. 4. We shall then obtain a *V*-shaped wire frame dimensioned somewhat as shown in Fig. 5.

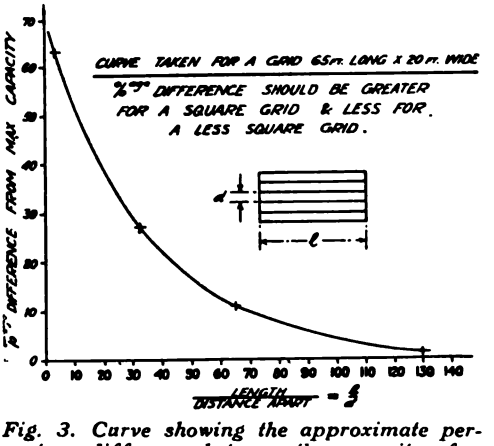


Fig. 3. Curve showing the approximate percentage difference between the capacity of a rectangular area of sheet metal, and a parallel wire grid of the same shape and area, for different values of l/d.

* WIRELESS WORLD, February, 1915.

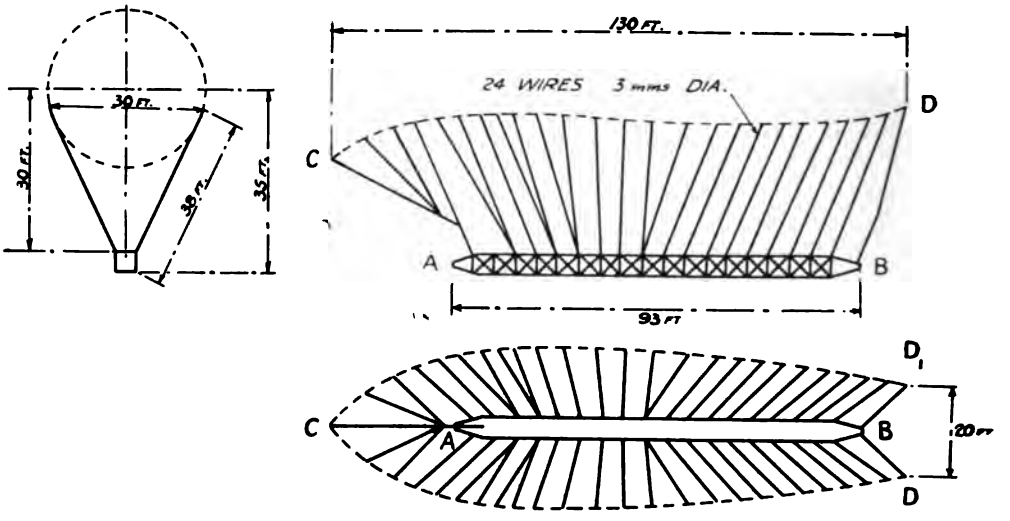


Fig. 4. Suspension System and Car of the "Clement-Bayard."

To calculate its capacity we can treat it as two grids, the wires of which are transverse to the length instead of parallel to it, the more usual case, and which are inclined to each other at a definite angle.

Professor Howe's formula,* which we have already found applicable when the wires are parallel to the longer dimension of the grid, cannot be used in this case. An inspection of it shows that when the distance between the wires is greater than their individual length it cannot be accurate, as the principal term in the denominator "$\log l/d$" then has a negative value, which represents a decrease of potential, due to the influence of the wires on each other, equivalent to an *increase* of capacity per unit length of wire—instead of a *decrease*.

The writer was interested to know at what ratio of "l/d" the denominator vanished altogether and thus gave an infinite value for the capacity.

For grids of both 24 wires and 42 wires this occurs when the width is about 3·7 times the length.

As no safe working formula has been put forward up to the present which is applicable to the type of grid described,† it becomes useful to know the limit of application of the Howe formula, and, taking this into account, to see whether its range cannot be extended by some suitable method so as to include this type of grid also. What accuracy has the formula when applied, for instance, to a grid of width equal to its length?

This case can be tested, for we can compare the capacity of a thin circular disc of a given area, calculated from the well-known rule "C=diameter in cms./π," with the capacity of a square of sheet metal of the same area calculated from the Howe formula for a square wire grid, and corrected for sheet metal in the usual way by the aid of curve, Fig. 3. The two values should not be substantially different.

Suppose the disc to have the area of a section through a 40,000 cubic foot balloon—to keep to a dimension already familiar in these articles—and therefore to have a diameter of 42·5 feet. We will assume that its thickness is ·084 inch, which is equivalent to that of 7/22 S.W.G. copper wire.

The ratio of "diameter of disc/thickness" will then be 6080 : 1, which is large enough

* $$C=\frac{nl}{2[n\{\log_e(l/d+\sqrt{l^2/d^2+1})-\sqrt{1+d^2/l^2}+d/l\}+\log_e d/r-B]}.$$

† The theory of the capacity of parallel wires relative to the earth has been studied by: A. Russell, *The Theory of Alternating Currents*, vol. 1, 1914; L. Cohen, *Electrician*, February 14th and 21st, 1913; P. O. Pedersen, *Jahrbuch der Drahtlosen Telegraphie, etc.*, Band. 7, Heft. 4, 1913; and a collection of useful formulæ is given by: W. H. Eccles, *Wireless Telegraphy and Telephony*, 1915. But the capacity in free space of a grid of parallel wires of equal length, having a greater distance between the outside wires than their individual length, does not appear to have yet been worked out.

for us safely to assume that the capacity due to the thickness compared with the total capacity will be negligible. The capacity of the disc works out as 412·4 cms.* A square grid of the same area as the disc will have a side of 37·6 feet.

Let this grid be made up of 42 equally spaced wires of 7/22 S.W.G.; then they will be ·92 feet apart.

The ratio "l/d" will be 41 : 1, and therefore the capacity found will be at least 22 per cent. less than the capacity of a square of sheet metal of the same area and thickness—see curve, Fig. 3. The capacity of the grid works out as 449 cms.; adding 22 per cent. increases this value to 548 cms., which is 33 per cent. greater than the calculated capacity of the circular disc.

If, then, the formula for a disc is to be accepted as correct, the case of a square wire grid can be taken as the limit of application for the Howe formula when used with a correcting factor of 33 per cent.

The writer proposes to make this a basis from which to obtain an approximation to the capacity of the grid in Fig. 5.

First consider the part *ACDB* by itself. A section through its field is shown in Fig. 6. It divides clearly into two distinct parts: a part (*A*) which is nearly parallel, denser towards the ends than at the middle, and a part (*B*1+*B*2) which is radial. The field (*B*1+*B*2) is common to grids of all widths, and approximates to that of a single wire in free space. The part (*A*) can be calculated in sections, and, provided the width of each section is about the same as the length, or greater, the error in adding their values plus the capacity of a single wire to obtain the capacity of the whole is only small.†

The grid *ACDB* is composed of 24 wires 4·82 feet apart. To assist calculation

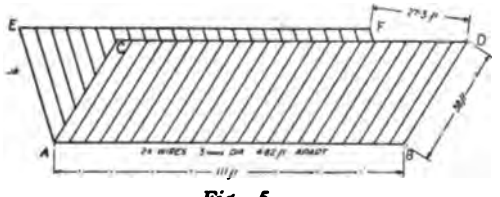


Fig. 5.

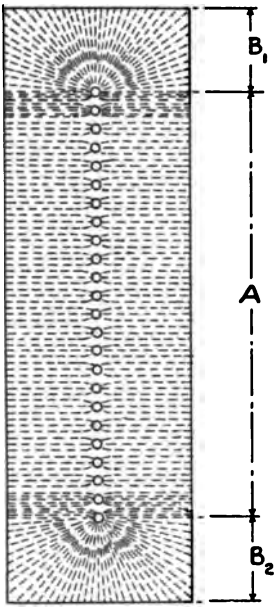


Fig. 6. Section through Grid ACDB at right angles to the wires, showing electrostatic field.

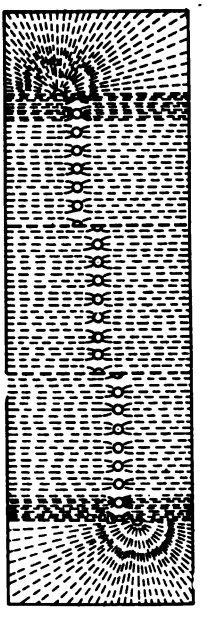


Fig. 7. The Grid and Field in Fig. 6. split up into sections for the purpose of calculation.

assume there are 25 wires spaced 4·62 feet apart, the overall width of 111 feet thus remaining the same. Fig. 7 shows this grid divided into three equal sections, the divisions between the sections cutting through the wires and thus equally dividing the field; the outside half wires which account for the radial field being also shown.

Then to calculate the value of one of these (*A*) sections use the Howe formula with correcting factor, for a grid 38 feet long and 37 feet wide, made up of nine 3-mm. wires spaced 4·62 feet apart, and subtract from it the capacity of one 38-foot wire. Thus:

	cms.
Capacity of one (*A*) section by formula	325·7
Less 33 per cent...	107·4
Less capacity of one single 38-foot wire	67·1
Total for one (*A*) section ..	151·2
Total for three (*A*) sections ..	453·6
Three (*A*) sections plus capacity of one 38-foot wire	=520·7

which gives the approximate capacity of grid *ACDB*.

* This value is as much as 63·7 per cent. of the capacity of a metalised balloon of the same diameter.

† The error consists in the omission of a correction for the increase of potential on each section due to the presence of the others.

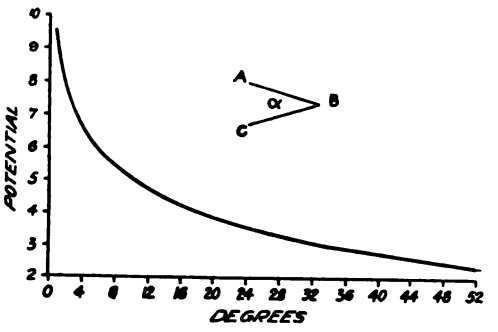


Fig. 8. Average Potential on AB due to Unit Charge per Centimetre on BC.

Finally, to obtain the complete capacity of the *V*-shaped grid make use of the curve Fig. 8, which corresponds to Fig. 28 in Professor Howe's paper.* This curve gives the average potential on one wire due to a uniformly distributed charge of one unit per centimetre on another wire inclined to it at any given angle, and should also be applicable to the case of two inclined similar grids.

The potential on the grid *ACDB* can be obtained from the expression for the capacity $C=Q/V=ln/V$, where V is the average potential on all the wires in the grid due to a uniformly distributed charge of one unit per centimetre length.

Then $V=ln/C=1{,}158$ cms.$\times 25/520{\cdot}7=55{\cdot}6$ units. For two grids inclined to each other at an angle of 42° 28′ this potential should be increased according to the curve by 2·65 units. Then the capacity of the two grids forming the *V* will be

$$\frac{2\times 1158\times 25}{55{\cdot}6+2{\cdot}65}=994 \text{ cms.}$$

Another leading type of non-rigid airship is the *Parseval*, illustrated in Fig. 9. As far as it is generally known the largest vessel of this kind has a length of 240 feet, a diameter of 40 feet, and a car 30 feet× 6 feet of aluminium tube and wood, supported on rollers by the main vertical cables, *AB* and *CD*, and oblique cables, *EFG*, on each side of the balloon, all of half-inch steel, with manilla rope attachments to the suspension girths. Only some of the intermediate suspensions are shown in Fig. 9. The cable available as balancing capacity would be the part below *EHACKG*.

Further details of dimensions are not available, but it may be fairly assumed that a vessel of the size mentioned above will not have its car more than 30 feet below the balloon, as, for reasons of speed and control, the shorter the suspension the better. Then the oblique cable, *EFG*, will be about 200 feet.

Where there is great disparity in the lengths of the individual wires composing the balancing capacity—as there must be in the present instance—there is clearly a gain if all the extreme ends of the wires are connected together. Thus *EHACKG* should all be joined by wire. The capacity of such a system in free space—consisting of two grids roughly triangular in shape, each with,

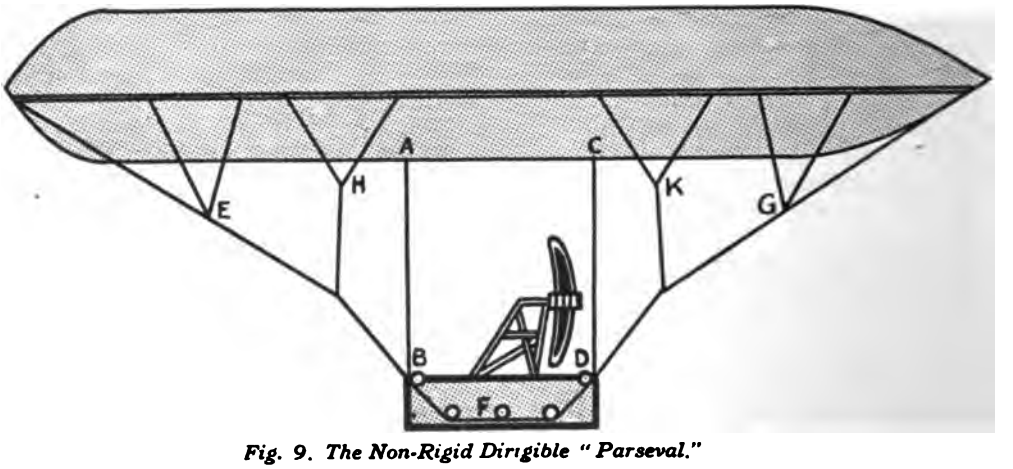


Fig. 9. The Non-Rigid Dirigible "Parseval."

* WIRELESS WORLD, January, 1915.

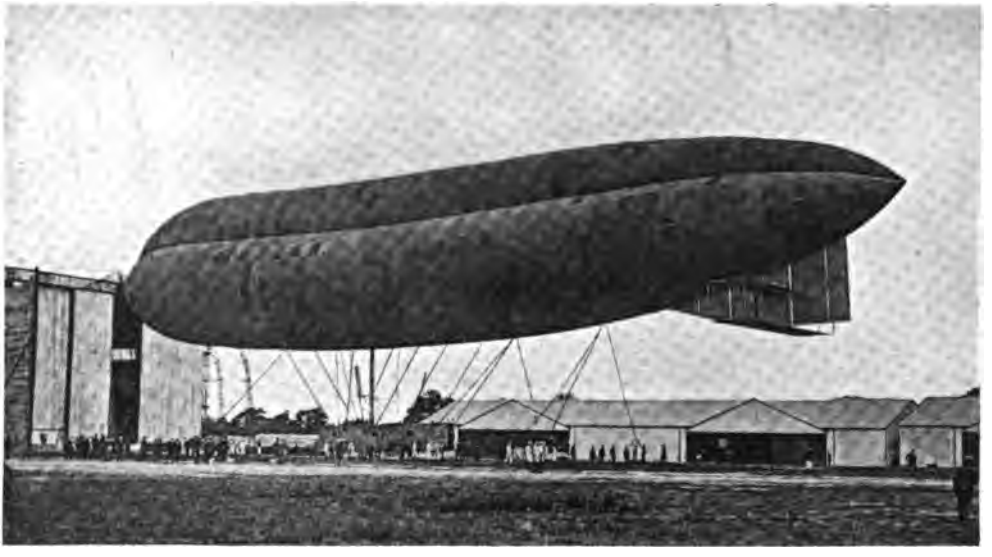


Fig. 10. The Non-Rigid Dirigible "Astra-Torres."

say, six intermediate suspension wires, and inclined to each other at the car at an angle of about 47°—will be of the order 540 cms.

This general review of the conditions obtaining among airships which determine the character of the balancing capacities used would not be complete without a reference to the non-rigid airship *Astra-Torres*, Fig. 10. The big step forward which this type illustrates introduces an important new problem to the radio engineer, or rather reintroduces an old problem in a new form.

It is estimated that air friction on the wire and rope rigging of the *Parseval* is responsible for the reduction of this vessel's speed by about 60 per cent. The *Torres* invention aims at diminishing air friction on the suspension system to a minimum. It does this by supporting the suspension *inside* the balloon instead of outside. A section of the gas bag is shown in Fig. 11. The envelope, *AAA*, forms three semi-cylindrical bags joined together on a triangular support of cloth bands, *BBB*. The suspensions, *CC*, are attached to the two top angles of the triangle, and end in a ring connection to a single cable which emerges through a special accordion sleeve in the lower wall of the envelope, and forms one of the supports of the car, or cars—two being sometimes used in tandem. The only external metal work available as balancing capacity is the frame of the car, the part of the suspension system outside the gas-bag after it has been effectively insulated from the inside part, and perhaps a few short steady stays, in all an amount not enough to be of much practical use. If the capacity were to be increased by long wires hung from insulators on the outside of the envelope they would introduce additional air friction,

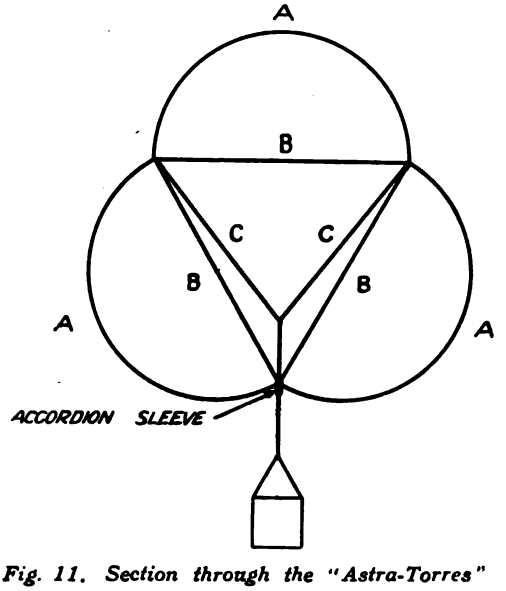


Fig. 11. Section through the "Astra-Torres" balloon, showing method of suspending the Car.

and part of the advantage of the inside suspension would thereby be lost.

The case is one which suggests that the requirements of wireless could best be met by a capacity system, arranged, if possible, *inside* the gas-bag. This brings us face to face again with the problem of the safe use of a charged wire in an explosive gas, a problem similar to that presented by the *Zeppelin*, which uses the metal frame of its balloon as a balancing capacity, and does so apparently with reasonable safety.

The danger of explosion due to brush discharge and the tendency which the brush has to burn the wire supports without creating an immediate explosion would both have to be seriously considered; but there is no longer any doubt that with our present knowledge it should be possible to design a satisfactory internal capacity system for the *Astra-Torres*, which would carry with it no greater risk of fire than that which exists at present on the *Zeppelin*.

The special features of such a design will be discussed later under a more convenient heading.

(*To be continued.*)

BACK FROM EXILE.

Wireless Operator and Meteorological Expert Recalled.

THE auxiliary brigantine *Rachel Cohen* recently arrived at Sydney, says a special message to the *New Zealand Times* (Wellington), after a smart trip of six days from Macquarie Island. She brought over as passengers the wireless operator (Mr. F. J. Henderson), meteorological officer (Mr. A. C. Tulloch), and cook (Mr. Ferguson). The wireless station has been closed on account of the expense of upkeep.

Messrs. Tulloch and Henderson, interviewed on arrival, said that they were tired of sea-lion tongue, Maori hens, penguins, and penguins' eggs, and were looking forward to a good square "tuck in" on civilised fare after their two years' solitude.

Mr. Tulloch mentioned that subsidies for the wireless station amounted to £1,500, made up of £1,000 from the Commonwealth and £500 from New Zealand. The arrangement was for a term of three years, dating from 1912. The Commonwealth Government has decided to economise, and so the station was closed. The value of the station for meteorological and weather reports was greater than most people imagined. The prevailing wind was south-west, and it had a west-to-east velocity of 400 miles a day. That is to say, New Zealand, being approximately 600 miles distant, an approaching storm would take one and a half days to reach New Zealand (from the Macquaries), and so the Macquarie Island station could give the Dominion at least 36 hours' warning of an approaching storm. The same thing applied to Australia. Melbourne was 1,200 miles distant, and so could receive three days' warning.

Mr. Henderson said the wireless station had worked successfully throughout his territory. They were frequently in communication with Awanui (Auckland), at a radius of 1,500 miles, and with Wellington, Bluff, and the Chathams. By some freak of wireless they were sometimes able to speak with the Chatham Islands station while unable to call up Wellington or other stations. That was all the more remarkable because the Chathams station was much lower-powered. They had been unsuccessful in getting into communication with Shackleton's expedition; nor had they even heard a word from them, although the *Aurora* was lying in M'Murdo Sound—Scott's old quarters. It was only a radius of 1,000 miles, and they were surprised that they could not get a response. The expedition's other vessel (the *Endurance*) was in the Weddel Sea, but she was separated by a 10,000 to 12,000 feet range of mountains, and there was less chance of reaching the *Endurance* than the *Aurora*. No doubt the Falklands Island station would have a better chance of communication.

Mr. Henderson mentioned that the wireless station at Macquarie Island was considerably above sea level, and for convenience in heavy weather he had installed a small receiving station at Eastern Harbour, the timber for which he salvaged from the wrecked schooner *Clyde*. Although not able to transmit with it he was able to receive calls when it was perhaps impossible to get up the hill to the main station.

Digest of Wireless Literature

ABSTRACTS OF IMPORTANT ORIGINAL ARTICLES DEALING WITH WIRELESS TELEGRAPHY AND COMMUNICATIONS READ BEFORE SCIENTIFIC SOCIETIES.

WIRELESS AND BOMB EXPLODING

The *Wireless Age*, in an article entitled "Those Wireless Bomb-exploding Devices," says that it is just possible that gullible newspapers and pseudo-scientific journals will now drop a certain type of story which has been appearing with regularity on an average of once a month over a period of some three years. A story referred to is that an inventor has perfected a death-dealing machine which can sink battleships and blow up impregnable fortresses from a distance by the aid of a wireless spark.

No less an authority than Dr. Edouard Branly says what those self-confessed inventors purpose doing is an impossibility. And for those who do not know Dr. Branly it may be mentioned that he is the inventor of the coherer, which was so prominent a feature in early wireless telegraph apparatus. Besides this, Dr. Branly has the degrees of Doctor of Physical Science and Doctor of Medicine; he received for his exhibit of radio conductors the *grand prix* awarded by the International Jury of Superior Precept Instruction, and the order, Chevalier of the Legion of Honour, for his valued aid in the discovery of wireless telegraphy. Many other French honours have come to Dr. Branly in the 71 years of his lifetime.

"The human species," says Dr. Branly, "is paying a sufficiently large tribute to science in this war; it is scarcely worth while to discuss the visionary powers that are attributed to it. The false notion of those who pretend to transmit destructive power through space arises from the fact that wireless telegraphy is accomplished through the production of a minuscule spark at the receiving station. That spark being sufficient to produce an effect upon extremely sensitive instruments at a great distance, they conclude that at a limited distance a much stronger spark could be produced; as that spark is supposed to go through all sorts of obstacles, they inferred that it could also pierce the steel shell of engines of war. In the first place no available power could produce a spark of sufficient intensity; there isn't the slightest calorific power in the wireless spark at the receiving end. In the second place it would be necessary for it to strike with absolute precision a joint or fissure in the plates in order to get into contact with the explosive. Different accidents erroneously attributed to the wireless current may have put some of these visionaries on this track.

"The Eiffel Tower wireless transmitting station produces most formidable sparks, yet not the slightest accident has been caused in the vicinity. To produce explosions at a distance something different from wireless electric currents must be found. Most of the inventions for this purpose that have come to my notice when thoroughly investigated were found to be connected with concealed clockwork, and in no case where powder was brought in by disinterested parties were they able to provoke an explosion."

* * *

ELECTRICAL WORK OF THE BUREAU OF STANDARDS

The *Electrical World* prints in a recent issue a valuable article from the pen of Mr. F. Nicholas on the above subject. It is headed by the following statement made by Secretary Redfield:—

"The Bureau of Standards works in close harmony with the great technical and engineering societies of the country (U.S.A.), and with the practical engineers who in many lines of applied science are doing the work of the country. It studies the problems of chemistry and electricity and operates a varied and mechanical plant working out the problems which vex the industrial manager. Its domain is the scientific world, but it does not enter fields which can be covered effectively by private laboratories. It is a stimulus to the estab-

lishment of industrial research laboratories, and it helps our industries to be more scientific."

This statement of the aims of the Bureau of Standards should interest many who are concerned with the establishment of a proper scientific organisation for fostering British trade. The article then proceeds to give an account of the researches which have been carried out in the past and outlines the work being performed at the present time. Dealing with radio research work the author says that the European war has stimulated this branch of the work of the bureau, part of which is conducted in conjunction with the Army and Navy Departments. In general, however, the investigations of the bureau are directed chiefly towards measures to promote the safety of life at sea and the safety of navigation. Small radio outfits have been designed for lighthouse tenders. The bureau is engaged on plans for the design and installation of radio fog-signalling apparatus at lighthouses on important coasts. Similarly the bureau is urging the equipment of lightships with radio apparatus. One of the contributions to the art of radio communication made by the radio section of the electrical division is the decremeter, which was invented after the passage of the radio navigation law to provide a simple means of measuring directly the logarithmic decrement of wave-lengths.

Among the investigations now under way or completed during last year we find radio communication, radio interference, and design of inductance coils for wireless work.

* * *

HIGH SPEED GENERATORS

Considerable attention has been devoted in recent years to the construction of high-frequency alternators for use in wireless telegraphy, with the result that a number of such machines, more or less practical, have been brought before the scientific public. One of the earliest was constructed by Professor Fessenden, and enabled him to conduct some successful experiments in wireless telephony. By far the most ingenious of such machines is that due to Professor Goldschmidt, the patents for which were acquired by the Marconi Company two or three years ago.

All high-frequency generators require to be driven at a very high speed, and because of this present a number of difficulties in construction, particularly in high-powered machines where the rotor is of considerable weight. A paper recently read before the Institution of Electrical Engineers by Professor A. B. Field deals with some of the difficulties experienced in the design of high-speed generators, and, although the paper does not devote itself to the type of generator used for producing high-frequency currents for wireless telegraphy, it nevertheless contains matter of interest to those who are interested in such machines.

An illustration of the process of evolution, says the writer, may be found in the development of steam turbo-generators. In early days the limitation of speeds imposed by the generator design acted somewhat as a handicap in the rapid development of the turbine, but recent years have witnessed a concurrent development of both turbine and generator, with the raising of the speeds of the combined sets to the limits corresponding to a 2-pole and 4-pole design. Simultaneously the output per machine has been greatly raised.

In attaining these results many difficulties have been overcome in as many different ways. Speaking of a certain 20,000 kw. 3-phase machine, the writer points out that the design of such a machine represents to a greater degree than is usually the case a compromise between many conflicting mechanical and electrical requirements. Viewed in a general way, there is first the problem of constructing a rotor which must necessarily weigh something of the order of 60,000 lb., and which will be running with a peripheral speed in the neighbourhood of 24,000 ft. per minute. Such a rotor, unfortunately, must be of the nature of a cage, being irregularly cut into from the periphery and carrying much metal which is not self-supporting. The centrifugal force acting upon a 1-lb. mass at the periphery will be about 1 ton.

Dealing with the question of critical speed of the rotor, Professor Field stated that, while many large rotors are running satisfactorily at operating speeds above their critical speeds, it is believed that there is a distinct advantage in keeping the critical speed above the running speed, when this is feasible.

"The Home of the Blizzard" *

An Interesting Account of Wireless Telegraphy and its Uses in Polar Exploration.

THE inherent curiosity which exists in man has made itself apparent from the earliest ages. The desire for knowledge eclipses every other trait in human character. The ancient Phœnicians with their lust for wealth voyaged westward through the Mediterranean, even passing beyond the Pillars of Hercules, the supposed westernmost limit of the then known world. Historians inform us that records exist proving that these people actually traded with the old Celts, who inhabited the county of Cornwall.

Down through the ages the peoples living in the countries bordering on the Mediterranean Sea developed a keen taste for discovery and exploration; this became very marked during the Middle Ages, and we read with thrilling excitement the exploits of such adventurers as Vasco da Gama, Christopher Columbus, and Prince Henry the Navigator.

As time went on and men's knowledge of the world increased, it was only to be expected that further efforts should be made to visit hitherto untravelled regions. About the beginning of last century these comprised roughly the interiors of the four extra European continents and the North and South Polar regions. How entrancingly interesting is the perusal of the pages of a book such as that under review can only be learnt by experience.

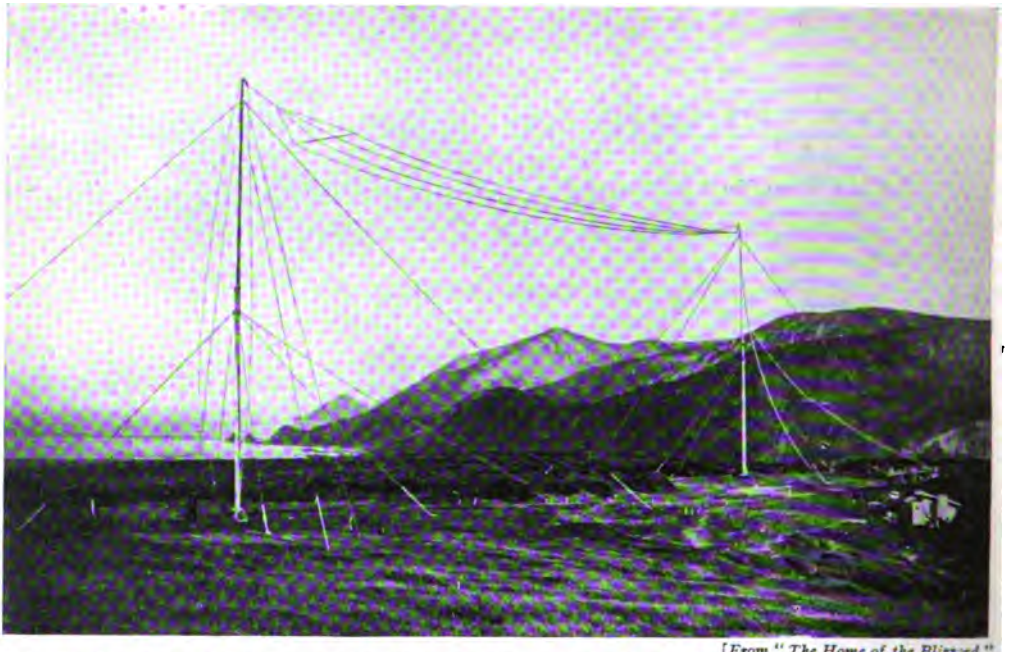
[*From "The Home of the Blizzard."*

The Wireless Cabin at Macquarie Island.

Until within the last ten or twenty years Polar exploration had been confined almost entirely to the districts which encircle the North Pole, but within this period the vast icy wastes of Antarctica have received their due meed of attention.

All our readers are familiar with the gallant deeds of the late Captain Scott and his worthy companions, whose undying fame and imperishable memory will go down to the end of all time. He only missed discovering the South Pole by a few months, the palm of honour in this connection going to the intrepid Norwegian explorer, Captain Amundsen. But the writer of *The Home of the Blizzard*, Sir Douglas Mawson, did not thirst for fame; his expedition to the Antarctic was rather in the nature of geographical and scientific exploration of the lands reputed to surround the Southern Pole. In order to treat the business from a thoroughly practical point of view, Dr. Mawson spared himself no pains in putting the venture on a proper basis. His *modus operandi* was to tackle the situation from Tasmania. Nearly 1,000 miles south of Hobart and about half-way between that port and the nearest Antarctic land lies the wind-swept and cheerless Macquarie Island. It forms the abode of quantities of seals and many millions of penguins, and serves as an admirable base for the whaling expeditions which frequent those seas. Its utility as a species of halfway house evidently did not escape the attention of Sir Douglas, and his choice of it was proved by experience to be a wise one. The inestimable benefits which wireless telegraphy has conferred upon mankind were not overlooked by the enthusiastic explorer, and he established a fully equipped wireless station on the island, leaving a party

* "*The Home of the Blizzard*," by Sir Douglas Mawson, D.Sc., B.E. 2 vols. London: Wm. Heinemann. 36s. per vol. in Great Britain and Ireland.



[From "The Home of the Blizzard."

The masts and aerials of the Wireless Station at Macquarie Island, which was used by the explorers as an intermediary for communicating with Hobart, nearly 2,000 miles from Antarctica.

of men in permanent occupation. It was his intention to set up one or more radio-telegraphic depots on the Antarctic Continent, and thus keep in touch with the civilised world almost continuously. The wireless cabin at Macquarie Island was erected on the top of the hill which was subsequently known as Wireless Hill. It would have been

[Photograph: Underwood.

The kind of "country" the explorers had to negotiate in their travels over the Southern Antarctic Continent.

much handier in connection with the landing of material, and afterwards in operating the installation, had the plant been set up on the beach close to the living hut. But the free outlook and increased electrical potential far outweighed these advantages. Sir Douglas mentions that the ground at the hill-top situation proved to be peaty and sodden, and therefore a good conductor, thus presenting an excellent "earth" from the wireless standpoint. The transportation of the heavy masts, petrol engine, dynamo, induction-generator, and other miscellaneous gear, from the beach to the summit—a vertical height of 300 feet—formed no light task. With the good will of his comrades and their dexterous help, all this work was successfully accomplished. After the party which was to stay on the island had been landed, the wireless installation set up, huts constructed, and everything put in shipshape order, the rest of the band re-embarked and proceeded south on their scientific quest, the while making oceanographical investigations.

On arrival in the region of snow and ice the ship party split into two sections, the Main Base Party, and the Western Base Party. During the whole time the Expedition was in the Antarctic a very close watch was kept on auroral phenomena, with interesting results, especially in their relation to the "permeability" of the ether to wireless waves.

That the utility of the wireless installations was realised to the full by the explorer and his companions is evident from the fact that the first thing undertaken by them on arrival at any particular point was to set up the apparatus. In connection with wireless telegraphy in Polar regions it should be borne in mind that during the summer months wireless communication with the outside world is impossible owing to continuous daylight, this reducing the effective range. In summer the range was only a few hundred miles, and the effective working distance for all times of the day probably did not exceed 100 miles. One contingency with which the explorers had to contend was the difficulty of staying the wireless mast strongly enough to support it during the terrible gales and blizzards which frequently swoop down with tremendous force. The wireless experts, however, were fully alive to this position and in consequence,

[*From "The Home of the Blizzard."*

Wireless Hill in the storm-swept Macquarie Island, shewing general view of the Wireless Station on the abrupt promontory situated at the north of the island.

[Photograph: Underwood.

Explorers prospecting for a favourable place at which to erect the mast of their Wireless Station which was to keep them in touch with the outside world

[From "The Home of the Blizzard."

A member of the expedition receiving time signals from Hobart, Tasmania, which allowed the explorers to calculate with more precision their exact longitude.

therefore, very few untoward incidents occurred.

During the course of the second winter—to be precise, on the night of Febuary 15th—one of the members of the party stationed on the Antarctic Continent suddenly surprised his companions with the exciting intelligence that he had heard Macquarie Island sending a wireless coded weather report to Hobart. The engine was immediately set going, but though repeated attempts were made no answer could be elicited. Each night the darkness became more pronounced and signals were consequently easier until, on the 20th, the call reached Macquarie Island, which immediately responded by saying "Good evening." At this point the insulation of a Leyden jar broke down and nothing more could be done until it was remedied. Later signals were again exchanged and a message was despatched to Lord Denman, Governor-General of the Commonwealth of Australia, acquainting him with the situation of the party and other matters, and through him a message was sent to H.M. the King, requesting the latter's royal permission to name a tract of newly-discovered country King George the Fifth Land.

Wireless communication in one instance was found to be exceedingly difficult owing to the month being very "disturbed," in consequence possibly of the brilliant auroræ.

Radio-telegraphy was used very successfully in the reception of time signals from Melbourne Observatory by way of Macquarie Island, and the meteorologist was thus able to attempt to establish a fundamental longitude.

The two complete sets of wireless apparatus used by the expedition were purchased from the Australasian Wireless Company, and they proved thoroughly satisfactory.

Among the Wireless Societies

Institute of Radio Engineers.

RESULTS OF THE ELECTION OF OFFICERS FOR 1916.—President, Prof. A. E. Kennelly; Vice-President, John L. Hogan, junr.; Treasurer, Warren F. Hubley; Secretary, David Sarnoff; Managers (serving until January 2nd, 1918), Louis W. Austin and John Hays Hammond; (serving until January 3rd, 1917), Robert H. Marriott and Guy Hill; (serving until January 1st, 1919), Edwin H. Armstrong and Capt. W. H. G. Bullard; (serving until January 3rd, 1917), Lloyd Espenschied, John Stone Stone and Roy A. Weagant; Editor of Publications, Prof. Alfred N. Goldsmith; Advertising Manager, Louis G. Pacent.

A very interesting paper was presented by Prof. A. Hoyt Taylor on "Variations in "Nocturnal Transmission," by Prof. A. Hoyt Taylor and Mr. A. S. Blatterman, at the meeting of the Institute, held at Columbia University, on January 5th, 1916.

A discussion followed, and amongst those discussing the paper were Capt. W. H. G. Bullard, head of the United States Naval Radio Service, and Mr. V. Ford Greaves, of the Department of Commerce.

After the meeting at Columbia University, the new Board of Direction for 1916 met at the Holland House, where the three additional directors to serve on the Board for 1916 were appointed, and a general discussion held as to the best methods by which to increase the activities of the Institute, which has shown remarkable progress during the year just ended.

WIRELESS AMATEURS IN HOLLAND.

We understand that a movement is on foot to start a wireless society for Dutch amateurs. There are a large number of keen wireless amateur enthusiasts in Holland, and there should be no difficulty in forming a strong and healthy society. Will Dutch amateurs who sympathise with the scheme kindly communicate with Mr. J. Grootes, of the Rotterdam Wireless Training College? We shall be only too pleased to publish accounts of the meetings in our journal.

Types of Mast for Wireless Aerials.

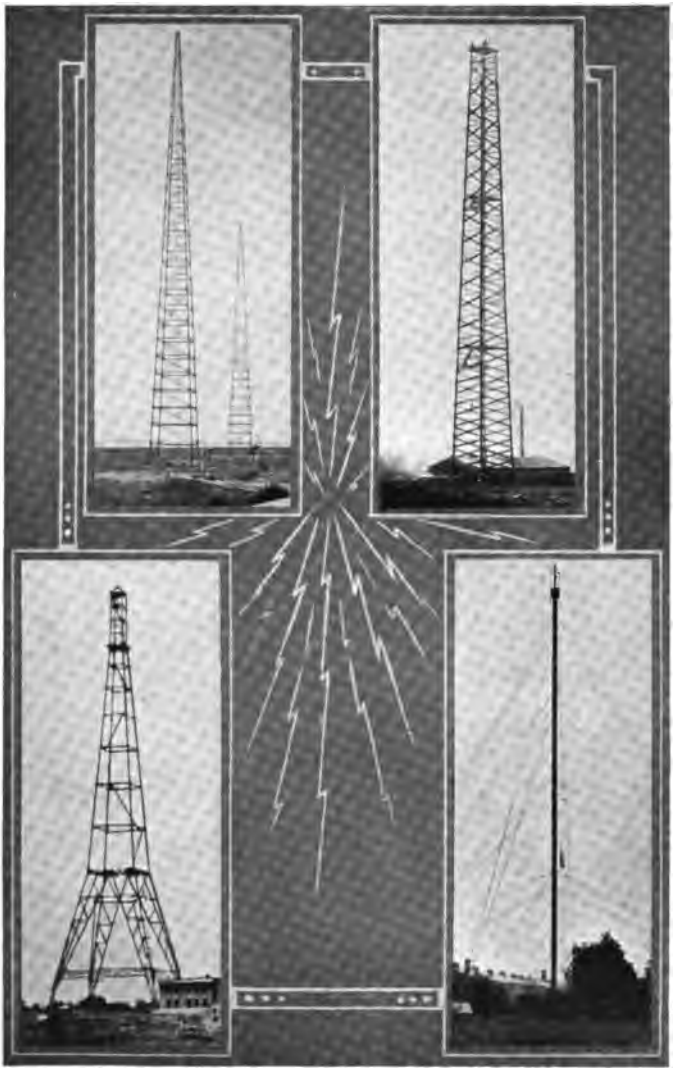
TO an engineer, one of the most interesting features of a modern high-power wireless station is the system of masts used to support the numerous aerial wires. The first stations to be erected, necessarily of low power owing to the primitive state of the apparatus, needed comparatively small aerials, and these were generally supported by a convenient flagstaff or specially erected wooden masts in three sections. It was but rarely that such masts were higher than 160 ft., and as they presented no new features there were but few difficulties to contend with.

The first really large aerial to be erected was that of the Poldhu station, a large collection of wires being supported by a ring of wooden masts each some 200 ft. high. An elaborate system of staying was needed for this ring, but after a short period of working the whole structure collapsed and was supplanted by four wooden lattice towers over 200 ft. high, each provided with a short wooden topmast. The towers were constructed by bolting together a number of planks to form a lattice mast of tapering form as shown in the top right hand illustration. It is interesting to note how the construction of these towers caught the imagination of the public, as for many years artists in portraying wireless coast stations almost invariably showed this form of aerial support.

For some time it was thought that metal towers, by absorbing a considerable amount of the radiated and received energy, would largely diminish the efficiency of transmission and reception. When it was proposed to erect a wireless station in Paris and to use the Eiffel Tower for a support, considerable interest was manifested in the radio-telegraphic world as to what absorption effects would be found. In the case of small metal towers the natural period of electrical vibration of the structure is often high compared with the frequency of the waves it is desired to transmit and receive, and provided the difference between the two periods is large, no very harmful effect demonstrates itself. In the case of the Eiffel Tower, however, being of such an enormous height, it was inevitable that it should have a natural period similar to that of the waves used in practical work, and a number of trials on different wave-lengths had to be made before a suitable wave-frequency was found. As it is there is an appreciable absorption of power by the steel structure which cannot be avoided.

With the growth of high-power stations in various parts of the world and the need for high aerials, various types of mast, mostly of lattice form, came to be erected. The directional aerial used by the Marconi Company can be made suitable for very long wave-lengths without being made of excessive height, but the umbrella aerial used in many stations needs to be of great height to radiate some of the extremely long waves in modern long-distance working. Some engineers, particularly in Germany, endeavoured to overcome the absorption difficulty by making the steel tower part of the aerial system and a number of such high structures, completely insulated from the ground, have been successfully erected.

Perhaps the largest of these is at Nauen, near Berlin, the aerials at this station being supported by a triangular lattice mast approaching 900 ft. in height. The insulating base supports the hemispherical foot of the lattice tower, after the manner of a ball-and-socket joint, allowance thus being made for a slight swaying of the mast in high winds. Steel wireless towers of lattice formation with very broad bases and narrow tops have been erected in several parts of the world, notably in Russia and the United States. One of the towers at the famous Arlington Station near Washington is shown in the lower left hand illustration. Perhaps the most successful of all antenna supports is the steel sectional mast now standardised by the Marconi Company and erected at numerous stations all over the world. These masts, which may be up to 450 feet in height, are made of steel sections bolted together, all sections being the same size. The method of erection is extremely simple. A pair of the sections, which may be termed flanged half-cylinders, are first bolted together to the base, and and a wooden topmast inserted in the tube so formed is used to haul up the next pair of sections. As soon as these two are bolted together and to the first pair, the topmast is raised and used to erect the next sections, and so on. A cylindrical cage surrounding the mast is used in the course of erection. A photograph of one of these masts, some 450 ft. high, erected at the Marconi Company's works at Chelmsford, is shown in the lower right-hand illustration.



The remaining illustration shows one of the steel lattice towers at the Marconi station near Cadiz.

The staying of the giant structures mentioned in this article and the tremendous strains placed upon them by the weight of the wire in the aerials, more especially wind pressure, give rise to many problems, and the successful erection of a large modern aerial and its supports is nothing if not a highly skilful engineering feat.

Administrative Notes

Austria-Hungary.

A copy of absolute and conditional contraband of war communicated by the Austro-Hungarian Government to the United States Embassy in Vienna on November 12th last has been handed to the British Secretary of State for Foreign Affairs by the United States' Ambassador in London. A full English translation was recently published in the *London Gazette*. Amongst the articles put down as conditional contraband are materials for telegraphs, wireless telegraphs and telephones.

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The coast stations at Trieste, Sebènico and Castelnuovo, until further notice, will not deal with private radio telegrams.

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Azores.

By telegram on January 17th the Portugese Government informed the International Telegraph Bureau at Berne that on account of a hurricane the wireless telegraph coast station at Flores is temporarily interrupted.

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Belgium.

The coast station at Nieuport has suspended its service for the present.

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Bolivia.

The International Telegraph Bureau at Berne communicates the following :—

"In a letter dated the 30th October, 1915, "the Bolivian Administration advises us "that by supreme decree of the 21st August, "1915, the Bolivian Government subscribes "to the London International Radio Tele-"graph Convention, and that this fact has "been notified to the British Government. "The Bolivian Administration adds that it "desires its name to be added to the fourth "class as far as its contribution towards the "general expenses of the International "Bureau relative to radio-telegraphic service "is concerned."

* * *

Brazil.

Communication through the Brazilian coast stations, except in the case of distress calls, is forbidden. The Brazilian Government has decided to accept official despatches and also telegrams in plain language passing between ships and passengers of the one part and steamship companies' agents of the other part on condition that telegrams in this latter category deal only with private matters appertaining to the steamship companies or their passengers.

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China.

The International Telegraph Bureau at Berne advises us that the coast station at Foochow was opened on January 1st, 1906.

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Colombia.

The Colombian Government has informed the International Telegraph Bureau that in order to observe strict neutrality during the European war it has suspended the service of the two Colombian coast stations.

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Denmark.

By Article 17 of the Radio Telegraphic Convention telegrams in code (letters or figures) are prohibited. Telegrams in transit are always transmitted without restrictions, as are also all State telegrams. Telegrams for Denmark must be written in German, English, French, or one of the three Scandinavian languages. The text of these telegrams must be intelligible to the telegraphic employees, but may contain commercial marks and commercial abbreviations (these restrictions do not apply to the Faroe Islands, to Iceland, or to the Danish West Indies). The Danish coast stations at Blaavandshuk and Copenhagen are temporarily closed. Telegrams coming from or destined for Denmark, also in transit through that country, may be written in Russian. Private telegrams from or to Denmark are liable to censorship, but not telegrams in transit. Telegrams concerning news regarding military dispositions of Denmark or those evidently incompatible with the neutral position of Denmark are prohibited. Private telegrams sent in contravention of these orders are refused or stopped without notice to the office of origin.

Dutch Indies.

Until further notice the use of radio-telegraphy in the territorial waters of the Dutch Indies is prohibited for belligerent ships. Communication between the ships and coast stations will not be accepted if the ship stations refuse to give the information mentioned in article 28, paragraphs A, B, C and D of the International Radio-telegraphic Service rules. All communication between belligerent ships and coast stations will be prefixed with a request that the steamers shall state where they are, within or without the territorial waters of the Dutch Indies. If no reply be received communication will cease.

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France.

The French coast stations Ajaccio TSF, Boulogne-sur-Mer TSF, Brest-Kerlaer, Cherbourg TSF, Cros-de-Cagnes, Dunkerque TSF, Lorient TSF, Ouessant et Rochefort TSF, are closed to public communication. The coast stations at Bouscat TSF, and Havre TSF, are closed to public communication, but they will accept private radio telegrams addressed to captains of ships from shipping companies or shippers and *vice versa*.

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French Oceania.

We are advised by the International Telegraph Bureau at Berne that French Oceania has subscribed to the London International Radio Telegraph Convention.

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The International Telegraph Bureau has been advised by the Minister of the French Colonies that the radio telegraph station at Tahiti will soon be opened to the public. This station will effect a service with ships at sea, and with neighbouring islands.

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French West Africa.

The working of the coast station at Tabou is temporarily interrupted.

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Great Britain.

The use of radio-telegraphy is prohibited on ships in British territorial waters with the sole exception of British warships. As far as ships outside territorial waters are concerned, the transmission of radio telegrams necessitating the intervention of coast stations in the United Kingdom is prohibited except in the following cases: (1) Radio telegrams sent on behalf of the British Government, or the representative Governments of the British possessions; (2) Radio telegrams sent on behalf of Allied or neutral Governments; (3) Radio telegrams exchanged between the captain of a ship and the agents for its cargo. Radio telegrams sent for the service of neutral Governments or by persons specified in number 3 must bear the address and text in plain language (English or French). These messages are only accepted at sender's risk. They are liable to censorship by the British authorities—that is to say that they may be stopped, delayed, or treated as the authorities think without notice to the senders. No claim for refund of cost of transmission can be entertained by the British Government. It is very important that these radio telegrams should bear the name of the sender at the end of the text, otherwise they will be stopped until this name is communicated by telegram. Registered telegraphic addresses are not allowed in the address or in the signature.

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Greece.

The use of radio telegraphy on ships in Greek territorial waters is prohibited until further notice.

* * *

Italy.

Only telegrams and radio telegrams written exclusively in plain Italian, French or English are allowed on Italian and Italian Colonial lines. They must bear a clear and complete address and also the name of the sender. Addresses and signatures in code are not permitted. Telegrams containing no text are not allowed. The special services of urgency, reply paid, etc., are only allowed in case of telegrams and radio telegrams. They must be expressed in complete words in French and not by the abbreviated indications allowed by the rules. All telegrams and radio telegrams are submitted to censorship and are only accepted at sender's risk. No claim for reimbursement can be entertained. This applies also to special services. Code is only allowed in the State telegrams exchanged between the Italian Government,

the Allied or neutral Governments and the diplomatic missions respectively. No private or State telegrams from or to or in transit through enemy countries are allowed on the Italian or Italian Colonial lines. All Italian coast radio-telegraphic stations and those in the Italian Colonies are closed to private service.

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Japan.

According to the *Shipping Gazette*, the Japanese Government has stated that the new wireless station at Funabashi, near Tokio, is completed and will be ready for trans-Pacific communication soon after the new year. Experimental work between Honolulu and Funabashi has been going on, and it was said recently that reports indicate that the system is working in splendid fashion at both terminals, which are separated by a distance of 3,400 miles.

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Oceania.

The radio-telegraph station at Kawieng (New Ireland) is now open for the transmission of public correspondence. Traffic is sent *via* Rabaul, the rate being fourpence per word plus land-line charges. The hours are 6 to 10 a.m. and 4 to 6 p.m.

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Peru.

The Western Union Telegraph Co. has advised the International Telegraph Bureau of Berne, in a letter dated December 6th last, that the tariff applicable to the following Peruvian Radio-telegraphic offices is 1.25 francs (1s.) per word more than the rate fixed for other offices in the same country—Masisea, Orellana, Requena, Itaya, Iquitos, Puerto Bermudez, and Putumayo (new office). The old telegraph office of Puerto Bermudez, has become, as will be seen, a wireless telegraph station. The same company announces that the existing Peruvian offices at Chala, Ilo, Pisco, may also be used radio-telegraphically from Lima on payment of a supplementary tax of 60 centimes (6d.) per word, and by indicating "Via Lima radio." Ordinary language is now allowed in telegrams through the above radio-telegraphic offices as well as numbers expressed in figures. Telegrams addressed to these offices are also allowed in all languages authorised for international telegraphic service, and they must be written in clear language, but they continue to be accepted only at the sender's risk.

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We are advised by the International Telegraph Bureau at Berne that Peru has subscribed to the London International Radio Telegraph Convention.

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Philippine Islands.

All telegrams, with the exception of American Government messages, for wireless telegraph stations in the Philippines must be written in plain language.

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Russia.

Express radio telegrams are no longer accepted.

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Sweden.

Commercial marks and other incomprehensible expressions are not allowed in private radio telegrams, neither is news relative to the military forces of Sweden or anything that is evidently incompatible with the neutral position of Sweden. Private radio telegrams sent contrary to these restrictions are refused or stopped without notice to the office of origin.

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Turkey.

The use of radio-telegraphy on steamers within Ottoman territorial waters is forbidden.

* * *

United States.

Radio telegrams containing information regarding the situation or movements of the armed forces of a belligerent nation or relative to material or the *personnel* of a belligerent nation will be considered as a violation of neutrality, and will not be transmitted by the radio telegraphic stations placed under the jurisdiction of the United States, except in the case of wireless telegrams in code sent by or destined for representatives of the United States. Any telegram in plain or code language will be transmitted to a ship of belligerent nationality by the coast stations situated in the United States or its

possessions or territory under its jurisdiction. If such radio telegrams are received by the coast stations from ships belonging to belligerent nations they will neither be transmitted nor delivered. No communications whatever will be authorised between the coast stations under the jurisdiction of the United States and warships of belligerent nations, except distress calls, meteorological radio telegrams or telegrams relating to dangers concerning navigation. No radio telegram in plain or code language routed *via* a foreign radio telegraphic station belonging to a belligerent nation will be sent or received by the wireless stations of the United States except through certain stations directly authorised by the Government. Press telegrams in plain language relative to the war, with the authorisation quoted in each, will be allowed between these stations provided that no information is given concerning the movements or situation of war or other belligerent ships. No radio telegram which in any way indicates the position or the probable movements of ships belonging to a belligerent nation will be sent by the coast stations of the United States or placed under the jurisdiction of the United States to a ship belonging to a belligerent nation or any other coast station. Radio telegrams in plain or code language are allowed (1) Between coast stations entirely under the jurisdiction of the United States, (2) Between coast stations of the United States of the one part and ships belonging to the mercantile marine of neutral countries or the United States or neutral coast stations of the other part, provided that, in these various cases, the radio telegrams are not destined for a belligerent subject and contain no information of an unneutral character, such as the situation or movements of ships belonging to belligerent nations. In these radio telegrams code addresses either in letters or figures are not allowed with the exception of those registered before the 1st July, 1914, and of which certified copies have been lodged with the radio telegraphic stations of the United States through which the radio telegrams are to be sent. All wireless telegrams must bear either the name of the sender or a name duly certified and registered which fulfils the conditions of the registration of addresses. Radio telegraphic companies which accept such radio telegrams must prove to the Government censor the neutral character of the messages. All radio telegrams sent or received must be submitted to the censor at the time named by him, which latter will be arranged in such a way as not to cause delay to their transmission. Generally speaking, the officials entrusted with the censoring of telegrams will satisfy themselves that no telegrams violating neutrality will be allowed. In order to ensure that the censors shall be well informed of the contents of the radio telegrams, they shall require if necessary that the messages be presented to them for their information in a language which is understood by them. In every radio telegraphic station where the censor is not present at the time when the radio telegrams are received for retrans mission either radio telegraphically or by any other means they will be sent on without being submitted to the censor if it is clearly seen that they are of a neutral character, but the radio telegraph company will be held responsible for the execution of these instructions by its operators.

* * *

According to the Exchange Telegraph Company's Washington correspondent, the United States is erecting a high-power radio station to be in operation by January, 1917. Communication will be effective at 4,700 miles.

* * *

The Marconi Wireless Telegraph Company of America advises us that, commencing on January 12th, the hours of operation of their Jacksonville, Florida, Station will be from 6 a.m. to 8 a.m., from 10 a.m. to 1 p.m., and from 4 p.m. to 7 p.m., local time.

SHARE MARKET REPORT.

LONDON, *February 23rd*, 1916.

The market has been very quiet during the last month, but the shares of the Parent Company have been particularly firm, rising to 39s. 6d. The Canadian and American Companies' shares have fallen back in sympathy with lower prices in America :

Marconi (Ordinary), £1 18s. 9d. ; Marconi (Preference), £1 15s. ; International Marine, £1 5s. ; Canadian, 6s. 3d. ; American, 16s. 3d. ; Spanish & General Wireless Trust, 5s.

Wireless Telegraphy in the War

A résumé of the work which is being accomplished both on land and sea

WE have all been reading with great interest the romance of the sea which centred round the *Appam*. Few writers of fiction have imagined a more romantic series of incidents than the story of this great liner on her way home to England with a large number of passengers on board, some of them men of high distinction, approached by what appeared to be a harmless tramp, but which when within close range of the vessel drops the screen which gave her her apparently innocuous character and discloses her true identity as a rover with guns grinning threats of destruction. The enemy was aware of the weak points in his armour, and his first orders consisted of a prohibition to utilise the radio-telegraphic apparatus carried by the liner. As soon as the Germans

"S.S. "Appam." Inset, Lt. Berg, who captured her.

sent on board their prize crew, Teutonic operators were stationed in the *Appam's* wireless room, and all through their long voyage the vessel *received* all communications floating through the ether, but entirely refrained from sending any. Strict adherence to this rule enabled the vessel to avoid British cruisers, and the twentieth century privateers were able to conduct the vessel into port in the United States, there to provide one of the most interesting problems for naval lawyers with which they have been recently confronted.

The officers of the *Appam* are alleged to believe that the German vessel was advised by wireless of the movements of British ships on the initiative of vessels flying neutral flags and stationed near neutral ports.

* * *

One of our Yorkshire contemporaries contains an amusing letter written by a soldier from the Island of Lemnos in the Ægean Sea, forty miles south-west of the Dardanelles. Our British warrior describes his voyage as having taken place in

One of the lovely Islands in the Ægean Sea.

An interesting point in connection with the German privateer which captured the *Appam*, whether she be named *Möwe* or *Ponga*, consists in the assertion by Captain Harrison, commanding the Elder Dempster liner, that the vessel whose guns are masked behind hinged ports is "painted black with a single funnel and two masts with unusually high wireless masts." The object of fitting the raider with these unusually high aerials was manifestly that of giving her a wide range of communication. That this object was attained appears to be indicated by the fact that she was able to sink seven ships and capture an eighth within eight days.

"a big liner with a well-known name," and a great deal of his epistle is taken up with incidents in which the "ubiquitous wireless" plays an important part. Whilst the writer was in the Atlantic on his way to Mudros, the vessel, "a wonderful ship in peace time, and great now," picked up an SOS signal from a vessel off the Spanish coast attacked by a submarine. In times of peace every ship within a radius offering a possibility of assistance would have felt it her duty to obey the call of humanity, but under war conditions many considerations come into play besides that of the humanitarian impulse.

Scene in the Isle of Lemnos, the Greek Ægean Isle, the recent destination of many British vessels during the present phase of the World's War.

The enemy has utilised the call for attracting to his own sphere of activity vessels belonging to the Allies which he desires to destroy, and British soldiers on active service are too precious to have their lives risked by over-readiness to heed a possibly bogus appeal. The disregard, therefore, of the humanitarian impulse in such cases is apparent only, and the matter-of-course way in which the soldier accepts it shows he recognises this to be the case.

Later on they themselves appeared to be about to incur the same kind of danger from a similar lurking foe. The wireless operator reported that he had picked up a message informing him of the presence of a submarine at ten o'clock in the morning on a spot which they themselves had crossed five hours before.

We can easily imagine the interest raised by such an announcement and the anxiety with which all on board would scan the sea for possible signs of the presence of the enemy. Our friend describes the commotion aroused by the assertion of someone on board that the periscope was in sight. Great was the general relief when cautious investigation showed that the object was only a chair floating upside down!

A highly interesting article appeared in the January issue of the *United Service Magazine*, contributed by Mr. Hector C. Bywater, under the heading of "A German Corsair." He refers to a series of incidents which have now passed into history; the German corsair having, for the duration of this war at least, practically ceased to exist. But no one who reads the account furnished by Mr. Bywater can fail to be struck with the predominating part played in these operations by *wireless telegraphy*.

The writer describes the career of the *Karlsruhe* from particulars furnished by a German engineer who had served on board, together with the narrative based on the diary of Paymaster Mahlstedt, who formed part of the personnel of the *Kronprinz Wilhelm* throughout her cruise. The junction of the two German vessels was effected under such conditions that neither dared to make use of its wireless apparatus, "as to do so might have betrayed "our presence to the enemy."

In this connection the following further interesting paragraph occurs in the article:

"On November 1st wireless messages were "picked up from a British squadron of five "armoured cruisers, which was in pursuit "of Admiral von Spee's ships. The narrator "observes here that hostile warships re-"peatedly betrayed their presence by using "their wireless, whereas the *Kronprinz* "*Wilhelm* consistently refrained from send-"ing a single message. To this policy Herr "Mahlstedt mainly attributes the immunity "his ship enjoyed for so many months." Our German diarist believes that it is possible "to have too much of a good "thing!"

Mr. Bywater ends, as he starts, by emphasising the shortage of speedy British cruisers available in the early months of the war.

He estimates the value of the prizes sunk by German corsairs at over six and a half millions sterling, and points the moral that "cruisers are cheaper than commerce "destruction."

NOTES OF THE MONTH

THE Imperial Merchant Service Guild, having made representations to the Admiralty concerning free railway passes for their members serving on board transports who are proceeding on leave, have received from the Director of Transports a letter stating that the class of pass which should be issued is as follows: First-class passes to masters and chief engineers; second-class passes to other mates, other engineers, pursers, and, in the case of passenger ships, Marconi operators and chief stewards; on railways where second-class accommodation is not provided, first-class passes may be issued; third-class passes to petty officers and each member of the crew.

* * *

During 1914–1915 it is estimated that the expenditure of the Post Office directly due to the war amounted to £1,237,172. Details of this expenditure, given in the appropriation accounts, include an item of £1,400 for dismantling private wireless stations on the outbreak of war.

* * *

Our article in the February number on wireless telegraphy for women came at a most opportune moment. The daily Press have been full of the growing idea that the service of women in connection with wireless telegraphy might be very materially and usefully employed. Our article will have shown that the idea is not by any means as new as these paper reports suggested. The Women Signallers' Territorial Corps some months ago approached the Marconi Company with a view to making an arrangement for the supply of wireless apparatus, in order that their members might thoroughly learn wireless telegraphy. We do not know what further calls will be made upon our manhood before the present war is ended, and this real attempt on the part of women to acquaint themselves with some of the work previously undertaken by men deserves the highest commendation. It is interesting to note that the British Government has appointed women in charge of the wireless stations at Rathlyn Island and Island of Mull.

* * *

The following is an extract from the *South Wales Daily Post:*

" The undermentioned 'wireless messages' " were received during the evening at the " presentation smoking concert at the Salis- " bury Club, Swansea, on Thursday:—De " Wet: 'Sorry, too dry after 9 o'clock.' " Lord Derby: 'Am busy testing Ramsay " 'Macdonald.' McKenna: 'Counting up " 'conscience money from conscientious ob- " 'jectors.' Beelzebub: 'Busy preparing a " 'place for Wilhelm II.' Jellicoe: 'Still one " 'U boat at the North Pole; must have it be- " 'fore joining you.' Constantine: 'The Allies " 'are making me sit up, so dare not move.'"

* * *

Dr. J. A. Fleming, whose interesting article on the "Resistance of Networks of Conductors" appears in this number, recently addressed the Royal Society of Arts on the subject of the organisation of scientific research. "Unless we wish Germany's crime-stained hands to take back in commerce what she has lost in war," said Dr. Fleming, "we have to create and maintain an entire scientific and economic independence of our own."

* * *

At the annual meeting of the National Home Reading Union at the University of London, South Kensington, early last month, the Librarian, Miss Harraden, quoted some of the orders which have been given by soldiers. The requests varied in taste from Browning's poems to Sexton Blake, and from Thomas Hardy's novels to scientific works. In her report it is interesting to note that Miss Harraden makes special mention of the fact that on more than one occasion text books on wireless telegraphy had been asked for.

WIRELESS SIGNALS FOR THE HOME

A GREAT INNOVATION FOR PRIVATE STUDENTS

The New Marconi Official Disc Records.

OF the millions of men so bravely fighting both on land and sea for the freedom of the world from Prussian tyranny, there are already some thousands whose duties are concerned exclusively with wireless telegraphy. There is no need here to write of the tremendous utility of radiotelegraphy in warfare and in peace—it must be realised by all who peruse this magazine—but we are not at all sure that the British public realise the debt the nation owes to the amateur wireless enthusiast and his part in the present war.

Wireless telegraphy as a hobby was, before the outbreak of hostilities, perhaps the most fascinating pursuit that a young man (or an old one for that matter) could wish to find. Hundreds of aerials reared themselves above the houses and gardens of the United Kingdom, whilst in studies, attics, even cellars, tiny installations, in many cases entirely constructed by the hands which operated them, gave pleasure and instruction to the amateur and his friends. Now, alas! all apparatus has been dismantled and packed away, much of it being carefully stored by the Government authorities. But it must not be forgotten that these amateur installations, often of the most inexpensive nature, have taught their owners the wonders of the ether, and enabled them to take their place with but little training as wireless telegraphists in His Majesty's Forces.

Those amateurs who remain and are either too young or for some other reason prevented from serving can only carry on their hobby by means of theoretical study. No longer can they sit through the dark evenings, telephone receivers pressed closely to their ears, listening to the musical note of Poldhu ringing out the evening news, to the strong rough signals from the Eiffel Tower, or to the piping note of the Telefunken Stations on the other side of the North Sea. The practice they were able to obtain in receiving the Morse characters from these distant stations has been lost to them for considerably more than eighteen months, and only those who have skilled friends able to send both upon a Morse key and buzzer, and the more fortunate ones with access to properly equipped training schools have been able to keep "in form."

GOOD NEWS FOR THE HOME STUDENT.

Now, however, we are able to announce a very welcome piece of news for all who wish to keep in the finest trim as far as this part of the subject is concerned. Bearing in mind the present need for skilled instruction in radio-telegraphic receiving, The Wireless Press, Ltd., and the Gramophone Co., Ltd., have produced a series of splendid records which can be reproduced on any disc talking machine using the ordinary needle method of reproduction, and which give signals in Morse characters of the exact sound heard by a wireless operator when listening to a high-power station. By means of these records amateurs can sit in comfort, with no fear of breaking the Defence of the Realm Regulations, and listen to first-class Morse sending at various speeds on a pure musical note. They will also have the satisfaction of knowing that they are receiving instruction from a first-class wireless operator of many years' experience

HOW THE RECORDS ARE GRADED.

The set of records now being placed upon the market consists of six double-sided discs (any of which may be purchased separately), containing instruction both for the beginner and the advanced student. Each side gives from three to four minutes' instruction, according to the speed at which the record is run, the complete set thus giving up to three-quarters of an hour of first-class

sending. The student possessing these records will have the sending completely under his control, for he can repeat either the whole of the record or a part as many times as he wishes and, within the limits of his particular gramophone, at various speeds. What amateur in peace time, listening to a brief spell of "press," has not wished that the operator would repeat it for him at a slightly slower speed; or even at the same speed perhaps, and what new activities will arise in many amateur societies now that this new means of instruction is at their disposal!

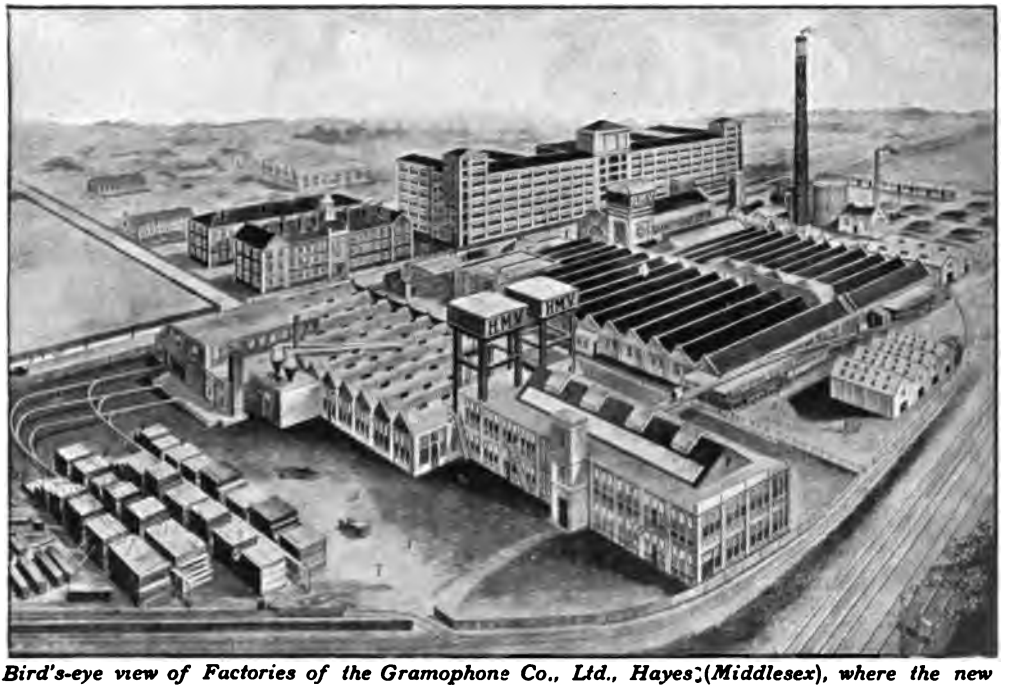
THE MORSE CODE COMPLETE.

The first record, which is designed specially for beginners, and as a standard record suitable for all schools, where even the elements of wireless telegraphy are taught, contains on one side the Morse code, including full figures, abbreviated figures and all signs of punctuation, exactly as printed in the Postmaster-General's Handbook. The characters are sent slowly so that their formation can be readily distinguished by all. On the second side of this record, difficult letters, such as C, Q, Y, etc.—letters which experience has shown give most difficulty to the learners—are picked out, and each sent several times in succession; there then follows a sentence sent slowly and deliberately, containing every letter of the alphabet. For this disc alone we anticipate an enormous sale, for a knowledge of the Morse Code is a valuable asset to practically everyone, whether he or she intends professionally to take up telegraphy or not.

Heads of colleges, schoolmasters and all who are concerned with instruction of the young will, without a doubt, welcome this record as an easy means of providing first-class instruction.

"PRESS" AT DIFFERENT SPEEDS.

The second disc contains on one side "press" at a speed in the neighbourhood of ten words per minute, and on the other similar matter at a speed some 50 per cent. faster. We may take this opportunity of pointing out that practically every gramophone has a speed regulator by which the records can be run either slower or faster



Bird's-eye view of Factories of the Gramophone Co., Ltd., Hayes (Middlesex), where the new Marconi records are made. This picture does not show the additional stories now being built on the Cabinet Factory in the foreground.

as required. The student using the Marconi official records will be able to vary the speed of reception within quite appreciable limits, thus a record whose normal speed gives ten words per minute can be adjusted to give any speed from 8 to 12 or 13 words per minute approximately. Upon receipt of the records the student can easily carry out a test with his own machine and ascertain its limits.

A "His Master's" Voice Gramophone, which may be used for the records of Wireless Signals.

MESSAGES PROPERLY TRANSMITTED.

Both sides of the third Record contain dummy messages properly numbered, timed and counted, just as sent by Post Office wireless stations to ships at sea and *vice versa*. It is a well-known fact that many students, either to save themselves trouble or because they have no proper guide, confine themselves to the transmission and reception of "press" and are totally unable to send and receive in a correct manner an ordinary wireless message. This third disc is specially designed to lead them in the way they should go.

BUSINESS MESSAGES.

On one side of Record Four we find more difficult messages containing figures, fractions, Stock Exchange terms, etc., with the transmission of which every would-be operator must be fully acquainted. In order that the student may understand how mistakes are corrected during transmission one or two errors have been introduced into the message records and immediately "crossed out" in the accepted style. This is one of the points in which the Marconi Official Records are so much better than any clock-work sending device. All of the discs are recorded from first-class *hand* sending, and are thus exactly the same as heard at sea.

CODE AND CIPHER.

On the second side of this record we find the whole of the space is occupied with code words and ciphers, normal transmission being at the rate of 20 words per minute. It is unnecessary to lay emphasis upon the need for practice in receiving such matter, and this disc will no doubt be very popular.

MESSAGES AT 25 WORDS PER MINUTE.

Continuing the progression the student will find on one side of the Fifth Record a collection of messages of various degrees of difficulty, such as are encountered by the operator in the course of an ordinary day. The speed is so timed that normally the message would be transmitted at 25 words per minute. This should prove an excellent practice record even for the expert.

MESSAGES IN FOREIGN LANGUAGES.

In order that the student may become acquainted with the class of message transmitted by coast stations abroad and destined for foreign passengers the reverse side of the Fifth Record has been devoted to a collection of messages in French, Spanish and Italian. These messages are also timed 25 words per minute, the whole record thus being the same speed.

A JAMMING RECORD!

Perhaps the most interesting record of the whole series, and without a shade of doubt one of the most valuable, is the sixth, which has been specially made to include signals from two distinct transmitters on slightly different notes. The home student who has not had access to a wireless installation will now, for the first time, be in a position to hear just what signals sound like when "jammed," and will at the same time be given exceedingly valuable preparatory instruction for the time when he takes up his duties on board ship. Nowadays, when so many wireless installations are working, it is the exception rather than the rule for signals to be heard without at least a slight interference from other stations. Many an operator on his first trip to sea has been hopelessly confused by the jumble of signals reaching his ear from several installations, and it is only after some days of practice that he has been able mentally to select the signals he requires from other sounds. The Marconi Jamming Record contains on one side "press" transmitted at a normal speed of 25 words per minute and jambed by similar matter at a slightly slower speed; and on the reverse side mixed messages at 25 words per minute also jammed by "press." It will thus be seen that this record contains more matter than any of the others, for the student can read either note at will. Both notes are musical and exactly similar to those given by the installations with a disc discharger, the difference between the two notes being sufficient for good reading.

Now that we have explained the contents of the series the reader will realise the enormous utility that such records can give to the thousands of home students and would-be operators. Think what it means to sit in comfort by the fireside with a pad of paper before you and your gramophone reproducing first-class wireless signals which can be repeated a hundred times if you will, not only to you but to your friends who are also wireless enthusiasts and who have come round for the evening. And if you be an experimenter whose installation has been dismantled and packed away under the care of the Post Office will you not welcome again those signals to which you used to listen with such interest, and which were teaching you receiving so well when war broke out and everything had to be put away?

And if you are not a practical man, but one whose interest in wireless has so far been confined to theoretical aspects, do you not think that it would benefit you to understand just what those wonderful ether signals are like and what interference between two stations really means?

PRICE WITHIN THE REACH OF ALL.

Although these records have been specially made for us by the Gramophone Co., Ltd., makers of the famous "His Master's Voice" records and acknowledged to be the finest producers in the world, we are able to offer them at a price of 21s. for the complete set of six double-sided records, or 3s. 6d. each for the separate discs. A charge of 4d. will have to be made for the packing of single records, but complete sets will be packed free. Postage in each case will be extra. A very large demand is anticipated, and orders will be dealt with strictly in rotation. Readers are, therefore, advised to place their orders as early as possible to avoid delay.

PLAYED ON ANY GRAMOPHONE.

The Marconi Official Records can be used on any disc talking machines which reproduce with a needle, and those readers who possess disc machines with a sapphire can purchase at a low cost a needle reproducer, which will enable them to play these records on such machines. The Editor of THE WIRELESS WORLD will be only too glad to give advice to readers with regard to suitable machines, and The Wireless Press, Ltd., the publishers of this magazine, are in a position to supply the standard "His Master's Voice" gramophones at list prices to any readers who require them. All communications on this subject should be addressed to The Wireless Press, Ltd., Marconi House, Strand, London, W.C., and the envelopes marked "Marconi Official Records."

Maritime Wireless Telegraphy

AN EXCEPTIONAL DISTANCE.

THE wireless operator on the Japanese steamship *Toyohashi Marun* has reported that he recently communicated with San Francisco, California, whilst 2,614 miles away. The vessel is equipped with a 120-cycle ½-kw. Marconi set.

* * *

AN AMERICAN SHIP ATTACKED.

According to advice from Athens an unnamed American ship sent out the SOS distress call, stating that she was being attacked by an Austrian or a German submarine, to the south of the Island of Crete. Subsequent efforts to communicate with the vessel, however, were fruitless.

* * *

THE "PEACE" SHIP.

It will be remembered that part of the plans of the peace campaigners was to send wireless messages broadcast whilst the *Oscar II.* was traversing the Atlantic Ocean. One such message, as follows, was sent by wireless to the monarch of each belligerent country in Europe :—

"We do earnestly entreat you and the "rulers of all the other warring nations to "declare an immediate truce. Let the "armies stand still where they are. Then "let the negotiations proceed, so that the "soldiers may be delivered from another "bitter winter in the trenches, and sent back "to their firesides. There is no other way to "end the war except by mediation and dis-"cussion. Why waste one more precious "human life ?"

A wireless message was also sent to Washington asking support for peace action. As was to be expected many newspaper correspondents accompanied the expedition and freely used the Marconi wireless service to send reports of the happenings on board.

* * *

S.S. TYNINGHAME ABLAZE.

A wireless message was received recently by a firm of shipping agents in New York to the effect that the British cargo ship *Tyninghame*, which left Brooklyn for Liverpool with 5,000 tons of sugar aboard, was on fire in No. 4 hold, and was returning to port. The master asked for assistance, and the fire boat *Seth Low* immediately went out in search of her. The freighter was anchored between the Statue of Liberty and Staten Island. When the fire boat went alongside the hatches were removed and several hundred tons of water pumped down on to the burning sugar for three hours until the blaze was subdued. By that time fire and water had ruined several thousand bags of sugar, valued at more than £151,000. Whilst the *Tyninghame* was being loaded in dock for that very voyage a fire started in the same hold, causing £4,000 worth of damage before it was got under control.

* * *

JAPANESE STEAMER IN COLLISION.

A wireless message received at Halifax, Nova Scotia, from the wireless station at Cape Race, states that the oil-tanker *Silvershell* and the Japanese steamer *Tahata Maru* have been in collision 2,000 miles south-east of Cape Race. A further wireless message says that the *Tahata Maru* was still afloat, but that her engine-room was flooded. The *Silvershell* is standing by. No further details are available at present. The *Tahata Maru* belonged to the Nippon Yusen Kaisha, and possessed a tonnage of 6,718. Her value is £95,000, partly insured in London ; that of the *Silvershell* is £15,000, partially covered in London.

* * *

GERMAN PIRATES TRAPPED.

Under dramatic circumstances the first German prisoners in the Balkan Campaign were recently taken. It appears that an accident to the machinery compelled an English cargo boat which had just left Salonika to stop. A short time later a German submarine appeared and fired at the ship. The vessel at once sent out a wireless message asking for immediate help whilst a small boat put off from a submarine, and reaching the cargo boat began to search

her. In response to the wireless message a French destroyer arrived, at the sight of which the submarine immediately dived, leaving the members of its party on board the cargo boat. The latter, escorted by the French destroyer, returned to Salonika with her six prisoners on board.

* * *

TWO STEAMERS LOST.

The White Star cargo boat *Bovic*, from Manchester for New York, on arrival at the latter place reported having intercepted wireless messages indicating that two steamers have been lost, one the British tank steamer *Appalachee* and the other an unknown steamer. The Red Star liner *Finland* rescued the crew of the latter.

* * *

A PREVIOUS WARNING.

In connection with the Board of Trade enquiry which is being held over the loss of the *Persia*, and personal allegations made against her captain, a correspondent of one of our contemporaries desires to say how exercised the late Captain Hall was by the tremendous responsibility on his shoulders. It seems that on a previous homeward voyage, whilst his ship was just clearing from Gibraltar, a wireless message was received from the *Mongolia*, belonging to the same company, to the effect that an enemy submarine was prowling about off Cape Finisterre. Captain Hall never for an instant relaxed his vigilance and went without sleep night and day in order to keep a personal look-out in the dangerous circumstances.

* * *

LOSS OF THE "KING EDWARD VII."

The *Grimsby Daily Telegraph* recently contained a very interesting letter from a survivor of the ill-fated battleship *King Edward VII.*, from which we extract the following :—

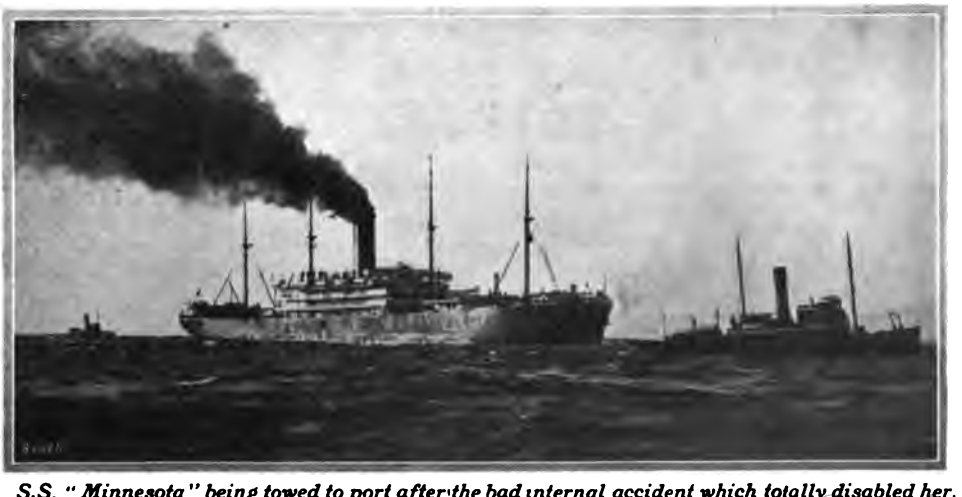
"We struck at 11.45 in the morning, and "she disappeared at 1.45 p.m. There was "a high wind at the time, but a moderate "sea. In response to wireless messages, "destroyers came up and took us in tow, "but before they arrived a collier rendered "valuable service.

"Soon after midday the weather got "worse, and the towing hawsers broke. "The captain gave out the order, 'Every "man for himself.' Some got away in the "boats, and the destroyers took the rest. "The wireless switchboard watchkeeper "performed a fine act of bravery. He "dashed below and turned on the switches, "holding them there until our messages were "answered."

* * *

ACCIDENT TO S.S. "MINNESOTA."

In our January issue under the heading "Maritime Wireless Telegraphy," we gave a few details regarding an accident to some of



S.S. "Minnesota" being towed to port after the bad internal accident which totally disabled her.

the internal parts of the s.s. "Minnesota." By the courtesy of *Syren and Shipping* we are enabled to put before our readers a photograph of the big ship after the accident as she was being towed to port.

* * *

FROM ALTANTIC TO PACIFIC.

Another remarkable achievement in regard to wireless communication is to be recorded. Ships of the United States Atlantic and Pacific fleets exchanged messages across about 2,500 miles of intervening land, and both sides report that the messages were strong and easily read. It appears that unusual atmospheric conditions made this conversation possible.

* * *

STEAMER IN DISTRESS.

The following message has been received from the Spanish wireless station at Cape Finisterre :—

"At 11.30 p.m. the Italian steamer "*America* reported the following to all "stations: Steamer *Pollentia* calling for "help west of the Azores. Inaudible hear "directly. Steamer *San Gugliemo* reported "she was going to assist the *Pollentia*, and "another steamer of the same nationality, "situated 152 miles from the steamer "*Siamese Prince*, reported she was at a dis-"tance of 90 miles and would arrive on the "spot shortly. It was only known that the "*Pollentia* was sinking, but the cause was "unknown. Subsequently the *Pollentia's* "dynamo broke down, but the *San Gugliemo* "reported that she hoped to arrive in time "to save the crew."

A Halifax, Nova Scotia, telegram states that the steamer *Pollentia*, which was in distress for several days 700 miles from Cape Race, Newfoundland, has foundered. All on board were rescued. A later message from Lloyd's states that the Italian steamer *Giuseppi Verdi* took over the crew of the *Pollentia* shortly before the latter vessel sank.

* * *

WIRELESS TO THE RESCUE.

An extraordinary case of lighthouse-keepers being forgotten has just come to hand. Two men, a woman, and three children were found starving in a lighthouse on the Mexican coast by the Ward liner *Mexico*, which arrived at New York from Vera Cruz. One woman had already died of hunger, as the only food for fifteen days had been fish and water, but they had kept the light burning. As the *Mexico* was passing the West Triangle Lighthouse, 150 miles from Progreso, and on the Yucatan coast of the Gulf of Mexico, the captain happened to look towards the light, which was five miles away, and saw a signal flying the international code letters "N.J.," which mean "Need assistance "immediately." The light is on a barren island, and the captain divined that food was needed. The lifeboat was stocked with beef, flour, eggs, and coffee, and, accompanied by the ship's surgeon, was rowed to the light. One of the lighthouse keepers said it was customary for a Mexican tender from Vera Cruz to visit the light every two months and leave provisions, but for some reason no boat had come near during four months. The men and women caught what fish they could, but become so ill and weak that in a few days all would have perished. The *Mexico* wirelessed their predicament to Progreso and waited for the reply that the message was understood before she continued her voyage.

* * *

ATLANTIC LINER DISABLED.

The Lamport Holt liner *Holbein* arrived at Queenstown recently in a very battered condition after having battled for nine consecutive days against Atlantic gales. She was bound from Manchester to New York and encountered severe hurricanes, which caused her to strain heavily. A pipe burst, the forehold almost filled with water, and the wireless telegraphic apparatus was dismantled. In view of all this damage the captain decided to abandon the voyage and return to port.

* * *

LOSS OF H.M.S. "NATAL."

It is unfortunate that the year 1915, which opened with a big maritime disaster, should have also closed with a similar unhappy event. The loss of the ***Formidable***, which was sunk in the Channel by a mine, was announced on New Year's Day, 1915. New Year's Day, 1916, was marked by the advice of the loss of the *Natal*. Again the country will mourn the loss of a useful ship and many valuable lives. In our "Personal" pages of the February number we gave the names of the wireless telegraphists who were on board the ill-fated ship at the time of the explosion.

ENCOUNTER WITH A SUBMARINE.

Reports of the sinking of vessels by hostile submarine craft have of late unfortunately been only too common. It is refreshing therefore to learn that the s.s. *City of Marseilles* whilst on a recent voyage to the East encountered a submarine, from which, however, she escaped. She was off the south coast of the island of Sardinia in the Mediterranean when the submarine was sighted. The latter approached and commenced shelling the ship. As soon as the captain discovered that his vessel was in danger the SOS signal was sent out by wireless telegraphy, and a reply was received from an Italian hospital ship which was not more than thirty miles away, saying that she would stand by and go to their assistance if necesssary. Luckily the submarine did not fire a torpedo, and in the end the merchantman succeeded in escaping.

* * *

STEAMER CHASED.

A wireless message has been received at Soller, Majorca, from the steamer *Tafna*, calling for help and saying that she was being chased by a submarine. A later message received at Barcelona said that she had escaped and had lost sight of the submarine.

* * *

DUTCH STEAMER MINED.

According to various wireless messages picked up by the station at Scheveningen, the Dutch steamer *Maashaven*, 2,609 tons, of Rotterdam, has struck a mine west of the Galloper Lightship. The crew abandoned the vessel, which is still afloat and drifting, with the forecastle afire. Fourteen men of the crew were rescued by the steamer *Goentoer*, which also saved the ship's papers. Eight other men were taken on board the steam trawler *Juliana*.

* * *

OIL STEAMER AFIRE.

The Canadian Marine Department has been notified that the Swedish steamer *Texas*, supposed to be an oil-tanker, is on fire off Cape Race. The information was received by wireless from a steamship of the Head Line.

A subsequent wireless message from the steamer herself, which is on a voyage from New Orleans to Christiania, states that she is steering for Queenstown. The fire is in the cotton for'ard of the bridge, and probably 'tween deck under the bridge.

DUTCH STEAMER BEACHED.

According to a wireless message, the steamer *Prinses Juliana*, from Flushing to Tilbury Docks, met with a mishap on a recent crossing and made water on the starboard side aft. Lloyd's states that the steamer has now been beached at Felixstowe. The *Prinses Juliana* is the well-known mail boat, which runs in the Zeeland Company's service between Tilbury and Flushing.

* * *

ITALIAN STEAMER SUNK.

The Italian steamer *M. Benlliure*, of 2,528 tons, which left Glasgow for Genoa with coals signalled by wireless that she was sinking 40 miles north-west of Scilly; assistance was promptly sent to the distressed vessel.

BRAVERY REWARDED.

THE following is a translation of a letter from the Italian Ministry of the Navy, lauding the action of the Marconi operators on board the s.s. *Ancona* when that ship was recently torpedoed in the Mediterranean :—

"The Committee who had charge of "investigating the circumstances attending "the sinking of the s.s. *Ancona* have felt it "their duty to make special mention of the "efficacious and commendable work done "by the two Marconi operators, Mr. Pietro "Buffa and Mr. Nicola de Crecchio, by "making timely important communications "to the captain of the ship, by the rapidity "wherewith they sent wireless signals of "danger and help so as to enable the French "steamer *Pluton* to arrive at the scene of "the disaster only five hours after the "sinking of the ship; and also because, not "being in a position to continue their work "on account of the wireless station being "destroyed, they saved themselves only on "the last lifeboat that left the ship.

"I am well pleased to bring to your notice "the two above-named operators, who in "this disaster gave proof of serene energy "and a high sense of duty.

"I therefore consider that they deserve "special praise, which you will please give "them in my name.

"Yours faithfully,

"The Under Secretary of State
"for the Navy,
"(Signed) A. BATTAGLIERI."

CARTOON

"Gott Strafe Wireless!"

On the Resistance of Networks of Conductors

By J. A. FLEMING, D.Sc., F.R.S.

SEVERAL correspondents in recent issues of THE WIRELESS WORLD exhibited interest in a certain problem concerning the resistance of a skeleton cube of wire, each side of which had a resistance of 1 ohm.

The problem was to find the resistance of the cube between two diagonal corners. The correct answer is $\frac{5}{6}$ of an ohm. It does not seem to be generally known that I gave, thirty years ago, in a Paper to the Physical Society of London (see *Proc. Phys. Soc. Lond.*, vol. vii., p. 215, 1885), a general rule for finding the resistance of any such network drawn in a plane. Many cases of networks in space of three dimensions can easily be reduced to cases of plane networks. The general rule for plane networks is as follows: Consider any network consisting. say, of five conductors joined as in Fig. 1,

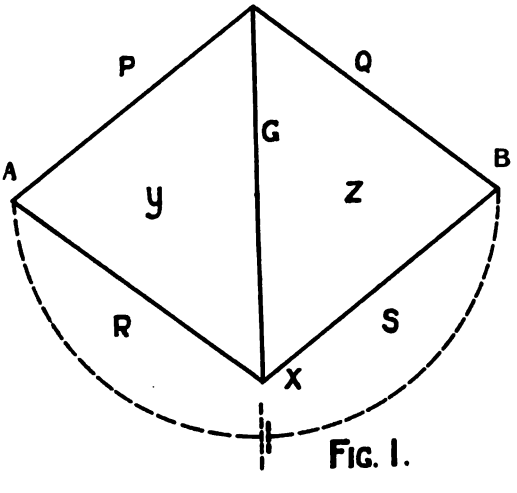


FIG. 1.

Call these resistances P, Q, R, S, G, and let it be required to find the resistance between the points *a* and *b*. Imagine *a* and *b* joined by a conductor of zero resistance represented by the dotted line in which there is an electro-motive force of 1 volt. If we call *r* the total resistance of the network then the current flowing through the network from

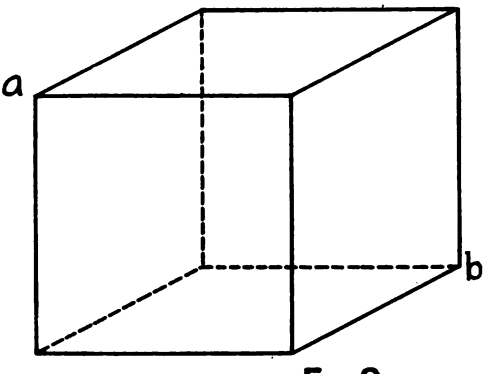


FIG. 2.

a to *b* is clearly equal to $1/r$ of an ampère. Hence the resistance of the network is equal to the reciprocal of the current flowing through the conductor of zero resistance represented by the dotted line under an electro-motive force of 1 volt.

The method of calculating the current which flows through any branch of a network of conductors is given in the author's *Wireless Telegraphist's Pocket-Book of Notes, Formulæ and Calculations*, and is as follows: Give to each mesh of the network a symbol *x*, *y*, *z*, etc., to denote an imaginary current flowing in the same direction round each mesh. Then form a series of equations by multiplying each such symbol by all the resistances which bound that mesh and subtracting the product of each neighbouring symbol, each multiplied by the resistance of the common resistance, and equate that

result to the electro-motive force acting round the mesh. Thus in the case above considered we have the three equations—

$$(R+S)x-Ry-Sz=1$$
$$-Rx+(P+R+G)y-Gz=0$$
$$-Sx-Gy+(Q+S+G)z=0$$

Now by the rules given (see *The Wireless Telegraphist's Pocket Book*, p. 5) for solving such equations by determinants, we have for the value of x,

$$x=\frac{\begin{vmatrix}(P+R+G), & -G\\ -G, & (Q+S+G)\end{vmatrix}}{\begin{vmatrix}(R+S), & -R, & -S\\ -R, & (P+R+G), & -G\\ -S, & -G, & (Q+S+G),\end{vmatrix}}$$

and hence the resistance of the network between a and b is the reciprocal of the above expression. The rule, therefore, for finding the resistance of any network of conductors taken between two points is as follows:

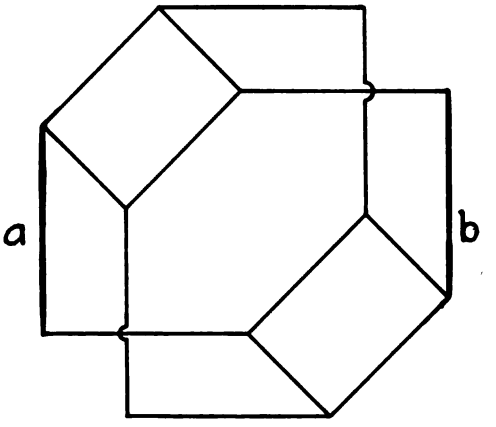


FIG. 3.

Assume the two points joined by a conductor of zero resistance in which there is an electro-motive force of 1 volt, and find the reciprocal of the current in that zero conductor.

Returning, then, to the case of the skeleton cube, it is clear that the twelve 1-ohm wires which from the cube arranged as in Fig. 2 are equivalent in resistance to the arrangement

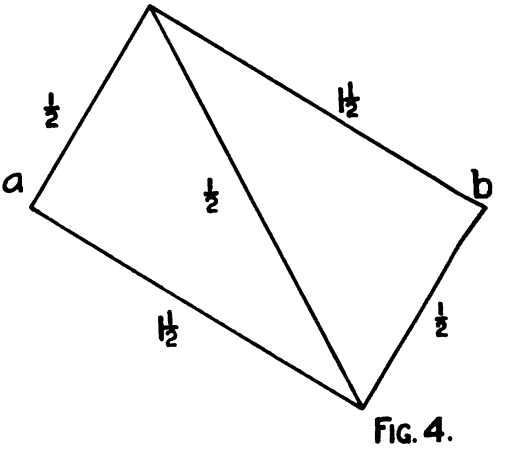


FIG. 4.

shown in Fig. 3, where the bars marked in thick lines a and b have zero resistance.

Again, a little thought will show that the arrangement of twelve 1-ohm wires as in Fig. 3 is equivalent in resistance to the arrangement shown in Fig. 4, where the numbers marked against the sides show the resistances of them.

Now Fig. 4 is the case already considered first, and therefore by the rule given the resistance between a and b is expressed by the quotient of two determinants—viz.:

$$r=\frac{\begin{vmatrix}2, & -1\frac{1}{2}, & -\frac{1}{2}\\ -1\frac{1}{2}, & +2\frac{1}{2}, & -\frac{1}{2}\\ -\frac{1}{2}, & -\frac{1}{2}, & +2\frac{1}{2}\end{vmatrix}}{\begin{vmatrix}2\frac{1}{2}, & -\frac{1}{2}\\ -\frac{1}{2}, & 2\frac{1}{2}\end{vmatrix}}=\frac{5}{6}$$

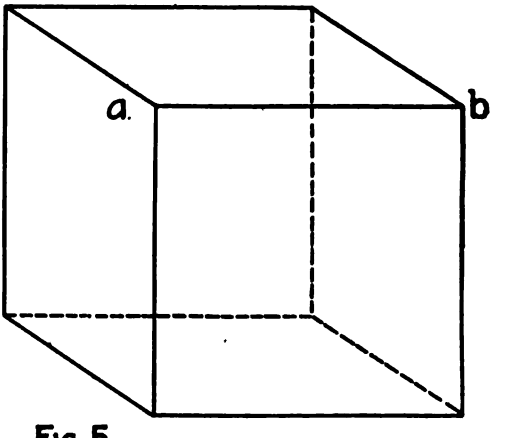


FIG. 5.

The reader will find the rules for calculating out numerical determinants given in Chapter I. §3 of *The Wireless Telegraphist's Pocket Book of Notes, Formulæ, and Calculations* (The Wireless Press, Ltd., Marconi House, Strand, London). They need not, therefore, be repeated here.

As an additional problem the student may take the case of the resistance of the same skeleton cube between two adjacent corners, a and b (see Fig. 5).

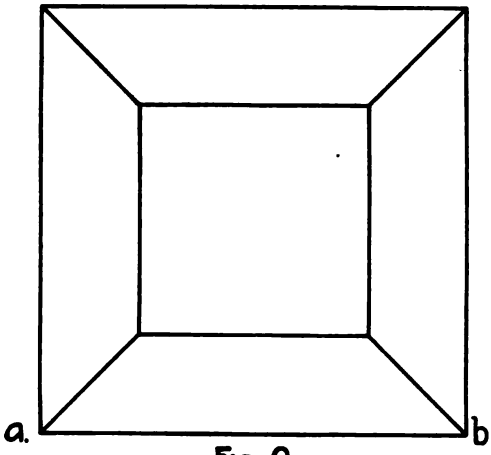


FIG. 6.

Now this is clearly the same as that of the plane network shown in Fig. 6, each branch of which is 1 ohm. Hence, if we supply the zero conductor and the mesh symbols we have merely to find the resistance between a and b of the plane network of 6 meshes, as in Fig. 7.

The mesh equations are then:

$$x-y=1$$

$$-x+4y-u-v-w=0$$

$$4z-u-v-w=0$$

$$-y-z+4u-v=0$$

$$-y-z-u+4v-w=0$$

$$-y-z-v+4w=0$$

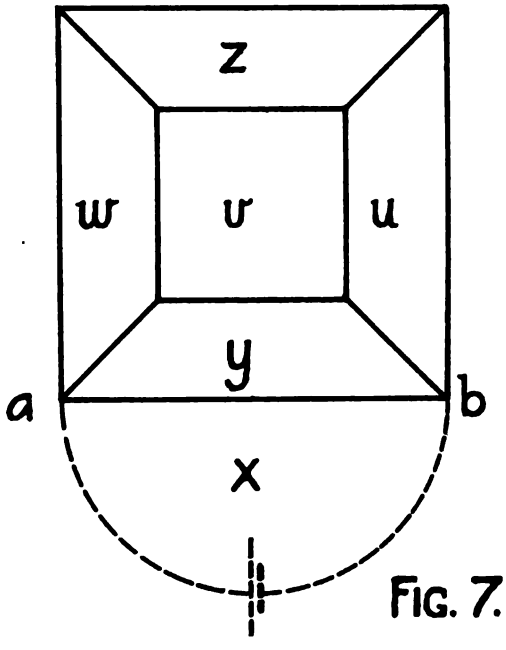


FIG. 7.

Hence the resistance between a and b is the quotient of two determinants:

$$\frac{\begin{vmatrix} 1 & -1 & 0 & 0 & 0 & 0 \\ -1 & 4 & 0 & -1 & -1 & -1 \\ 0 & 0 & 4 & -1 & -1 & -1 \\ 0 & -1 & -1 & 4 & -1 & 0 \\ 0 & -1 & -1 & -1 & 4 & -1 \\ 0 & -1 & -1 & 0 & -1 & 4 \end{vmatrix}}{\begin{vmatrix} 4 & 0 & -1 & -1 & -1 \\ 0 & 4 & -1 & -1 & -1 \\ -1 & -1 & 4 & -1 & 0 \\ -1 & -1 & -1 & 4 & -1 \\ -1 & -1 & 0 & -1 & 4 \end{vmatrix}} = \frac{224}{384} = \frac{7}{12}$$

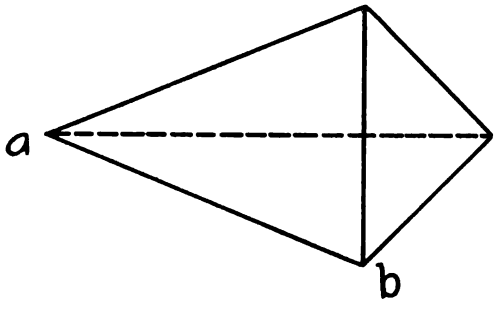


FIG. 8

The working out of these numerical determinants by the rules given in *The Wireless Telegraphist's Pocket Book* may be left to the reader. The answer is $\frac{7}{12}$ths of an ohm.

As a final example, consider the case of skeleton tetrahedron each side of which is a 1-ohm wire. Find the resistance between two adjacent corners.

It is obvious that when a conductor joins two points at the same potential its removal will not alter the resistance of the network. Hence the resistance of the tetrahedron is equivalent to the resistance of the plane network in Fig. 9, each bar of which is 1 ohm. This is obviously, then, $\frac{1}{2}$ an ohm, which is therefore the resistance of the tetrahedron in Fig. 8 between adjacent corners.

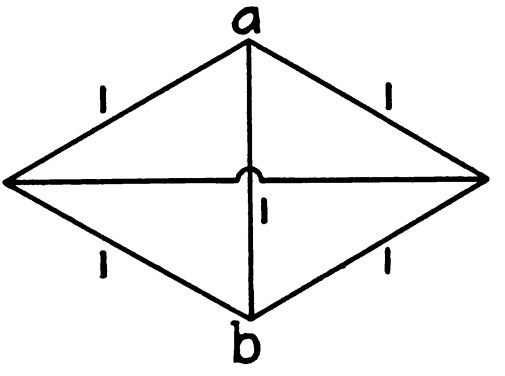


FIG. 9.

The Calculation of Wave-Lengths of Aerials

By W. H. NOTTAGE, B.Sc.

THE wave-length of a circuit in which the inductance and capacity are localised in separate units is given by the formula $\lambda_m = 1885\sqrt{LC}$, the units being metres, microhenries and microfarads respectively.

To obtain the wave-length of a circuit in which the inductance and capacity are distributed over the same unit as they are for an aerial, a different formula must be used, since the effective values differ from the measured or calculated values of these quantities.

When the aerial is tuned to some other than its natural wave-length, by adding inductance coils or condensers, or both, we have a circuit consisting partly of distributed and partly of localised inductance and capacity, the wave-length must be calculated from a formula which takes account of the ratio of the localised to distributed values.

In an article in the *Electrical World* for January 30th, 1915, Dr. L. Cohen has given a formula by which the wave-length of an aerial with an inductance coil in series may be determined for the case of an aerial with *uniformly* distributed inductance and capacity.

The formula, reduced to the usual units of microhenries, microfarads and metres may be put into the form—

$$\lambda = \frac{1885\sqrt{LC}}{Q}$$

where

$$\cot Q = Q\frac{L_1}{L_0}$$

$$Q = \frac{\pi}{2}\frac{\lambda_0}{\lambda_1}$$

By plotting graphs of $y_1 = \cot Q$ and of $y_2 = \frac{L_1}{L_0}$ the points of intersection give the values of Q to insert in the formula for the fundamental wave-length and harmonics, the first intersection being the value for the fundamental.

This formula is evidently suitable when the ratio of the aerial inductance to added inductance is known, but is not so convenient when the inductance of the aerial is not known. Examples of its use will be found in Dr. Fleming's Pocket Book.

By extending the calculations the author has worked out the following table, by which the ratio of these inductances can be determined if the two wave-lengths of the aerial, unloaded and loaded, be measured, the inductance added being known.

From this the inductance of the aerial, and therefore its capacity, is at once determined, so that the method affords a simple method for measuring these quantities with the aid of a wave-meter and a coil of known inductance.

$\frac{L_1}{L_0}$	$\frac{\lambda_0}{\lambda_1}$	$\frac{\lambda_1}{\lambda_0}$	Q	$\frac{\lambda_c}{\lambda_m}$
0·00	1·00	1·00	1·57	1·57
·05	·962	1·040	1·51	1·54
·10	·909	1·100	1·46	1·50
·20	·838	1·194	1·31	1·44
·30	·777	1·29	1·22	1·39
·40	·728	1·37	1·14	1·35
·50	·687	1·45	1·078	1·32
·60	·651	1·53	1·022	1·29
·70	·616	1·62	·968	1·26
·80	·589	1·70	·925	1·24
·90	·568	1·76	·892	1·228
1·0	·544	1·84	·853	1·207
1·5	·468	2·13	·735	1·162
2·0	·414	2·42	·650	1·128
2·5	·376	2·66	·590	1·102
3·0	·347	2·88	·545	1·093
3·5	·325	3·08	·510	1·083
4·0	·302	3·31	·475	1·072
5·0	·278	3·60	·437	1·068
6·0	·252	3·98	·400	1·060
7·0	·235	4·26	·369	1·049
8·0	·220	4·52	·347	1·039
9·0	·208	4·80	·327	1·036
10	·199	5·03	·312	1·033
12	·181	5·52	·285	1·026
14	·168	5·95	·264	1·023
16	·158	6·35	·247	1·021
18	·149	6·72	·234	1·018
20	·141	7·09	·222	1·016
22	·135	7·43	·212	1·014
24	·129	7·74	·203	1·012

In the table L_0 is the inductance and γ_0 the natural wave-length of the aerial itself, L_1 is the added inductance and λ_1 the resulting wave-length; λ_c is the wave-length given by the formula $\lambda = 1885\sqrt{LC}$, and λ_m is the actual measured wave-length.

The second column gives the ratio of the wave-length of the loaded aerial to the natural wave-length of the unloaded aerial, and the third column gives the reciprocal ratio.

In column four the values of Q are given, and in the fifth column the ratio of the wave-length calculated from the ordinary formula to the true wave-length is given.

It will be noticed that as the value of $\frac{L_1}{L_0}$ increases this ratio becomes more and more near to unity, so that for large values of $\frac{L_1}{L_0}$ the wave-length given by the formula is approximately correct.

A similar calculation can be made for the case of an aerial tuned to another wave-length by a series condenser.

In this case the formula is—

$$\tan s = -s\frac{c}{c_0}$$

$$s = \frac{\pi}{2}\frac{\lambda_0}{\lambda_1}$$

(see Eccles Handbook.)

The negative sign for the values of tan s indicates that angles with negative tangents are to be used in the formula.

The values of s and $\frac{\lambda_c}{\lambda_m}$ have not been given as they are not of so much value as in the inductance formula.

It will be noticed that the tables give only the values for the fundamental wave-length to which the aerial will be tuned by the given inductance or capacity, since for the purpose of measurement these are alone required.

The harmonics can be found from the graphs as in the case for the inductance formula. To show the use of the tables we append some numerical examples.

$\frac{C_1}{C_0}$	$\frac{\lambda_1}{\lambda_0}$	$\frac{\lambda_0}{\lambda_1}$
4·0	·917	1·091
3·8	·913	1·095
3·6	·908	1·101
3·4	·904	1·106
3·2	·899	1·112
3·0	·894	1·119
2·8	·888	1·126
2·6	·882	1·134
2·4	·874	1·144
2·2	·866	1·155
2·0	·855	1·170
1·8	·842	1·188
1·6	·830	1·205
1·4	·816	1·225
1·2	·798	1·253
1·0	·774	1·292
·9	·760	1·316
·8	·744	1·344
·7	·727	1·376
·6	·708	1·412
·5	·685	1·460
·45	·675	1·48
·40	·661	1·51
·35	·646	1·55
·30	·630	1·59
·25	·612	1·63
·20	·592	1·69
·15	·571	1·75
·10	·549	1·82
·05	·525	1·91
·00	·500	2·00

Example 1.

An aerial of natural wave-length, 300 metres, gives 924 metres when an inductance of 875 microhenries is connected in series. What is the inductance and the capacity of the aerial?

Ratio of wave-lengths $\frac{\lambda_1}{\lambda_0} = \frac{924}{300} = 3{\cdot}08.$

From the table the ratio of $\frac{L_1}{L_0}$ which corresponds to this is 3·5.

Hence inductance of the aerial is

$$\frac{875}{3{\cdot}5} = 250 \text{ microhenries.}$$

The natural [wave-length] of the aerial is given by

$$\lambda = \frac{1885\sqrt{LC}}{1{\cdot}57}$$

1·57 = value of Q tor $\frac{L_1}{L_0} = 0$, which is the case for the plain aerial.

$$(300)^2 = \frac{(1885)^2}{(1{\cdot}57)^2} \times 250 \times C$$

$$C = 00025 \text{ mfds.}$$

Example 2.

To what wave-length will this aerial be tuned if a capacity of ·0001 mfd. be connected in series?

We have $\frac{C_1}{C_0} = \frac{\cdot 0001}{\cdot 00025} = \cdot 4,$

for which $\frac{\lambda_1}{\lambda_0} = \cdot 661,$

whence $\lambda = 198$ metres.

The formulas and tables are only strictly applicable to aerials of which the inductance and capacity per unit length is constant for the whole length of the aerial, as this forms one of the conditions of Dr. Cohen's mathematical investigation.

There has not yet been published any paper by which corrections in the non-uniformity of the inductance and capacity per unit length can be allowed for, and it is, of course, impossible at present to determine the corrections experimentally for certain standard forms of aerials—an investigation which would be of great use.

* * *

NOTE.—Since the above was written there has appeared, in the *Electrical World* for January 15th, 1916, an article by Mr A. F. Buchstein dealing with the case of two aerials in series.

The equations are very complicated, and it has not been possible to combine the results of this investigation with the present article.

NOTHING DOING.

Under the heading "The Week's Fables" our contemporary, the *Weekly Dispatch*, publishes the following paragraph:

"'Richest and the most powerful nation,' "sputtered the whining German wireless, "'please do let us be friends and have a "'heart-to-heart understanding with one "'another!'

"But in the hot and crackling flame, the "American Wireless flashed back: 'L-U- "S-I-T-A-N-I-A!'"

Doings of Operators

IN THE CAUSE OF HONOUR.

It is with the deepest regret that we have to announce the death whilst on active service of Operator John Kenneth Lush, who entered the service of the Marconi Company in September, 1910. The late Mr. Lush, who was born at Kilmington, was 23 years of age, and first studied wireless at the British School of Telegraphy. On joining the service he entered the Liverpool School, and was soon appointed to the s.s. *Ascanius*, afterwards serving on a number of vessels. At the outbreak of war he volunteered for active service, and proceeded to the Near East, later enlisting in the Australian Force, and eventually landing at the Dardanelles. It was whilst serving in the trenches that he met his death, being struck in the head by a bullet. We understand that his death was painless, as he was killed instantaneously. All those who may have come into contact with Mr. Lush will be grieved to hear of his death, as wherever he was he made himself a popular figure. By his decease the Marconi Company loses the services of a thoroughly gentlemanly and competent operator, and we take this opportunity of expressing to the late gentleman's relatives our deepest sympathy in their time of trouble.

The late Operator Lush

The late Operator Baker.

* * *

DIED IN HOSPITAL.

We also have to announce with deep regret the death of Operator James Robert Baker, who passed away at the General Hospital in Alexandria, Egypt, on January 19th. Some days previous to this the late gentleman had been landed from the steamer on which he was serving suffering from acute pulmonary tuberculosis, his condition being extremely grave. Mr. Baker, who was but 22 years of age, entered the Marconi Company in April, 1913, and in June of that year was appointed to the s.s. *Adriatic*. He later served upon the s.s. *Orissa*, *City of Florence*, *Whakurua*, and a number of other vessels. We are sure all our readers will join with us in extending the deepest sympathy to the late Mr. Baker's relatives in their terrible bereavement.

We have to record still one more death in the operating staff, this time of Charles Christopher Porter, who passed away towards the end of last year. Mr. Porter, who was not quite 21 years of age at the time of his death, received his preliminary training in wireless telegraphy at the Atlantic Wireless College, and entered the service of the Marconi Company in December, 1914. He first went to sea on the s.s. *Manitow*, later transferring to the s.s. *Kenilworth Castle*. After some further service he was taken ill, and proceeded on sick leave in June last. Unfortunately he never recovered, and passed away after five months' illness. We take this opportunity of expressing our sincere sympathy to the late gentleman's relatives in the sad loss they have sustained.

The late Operator Porter.

* * *

THE S.S. "MARERE" SUNK.

We are happy in being able to report that Mr. William Alexander Guy, who was in charge of the wireless installation on board the s.s. *Marere*, recently sunk by an enemy submarine, has been saved. Mr. Guy, who entered the service of the Marconi Company in December, 1912, is 19 years of age, and makes his home at Hampstead. Entering the clerical staff of the Marconi Company, he became interested in the practical side, and after a course of training in the company's evening classes at Marconi House joined the operating staff in August, 1914. Previous to serving upon the s.s. *Marere* he sailed on the s.s. *Rowanmore*. He is to be congratulated upon coming through this exciting adventure without mishap.

Operator W. Guy

* * *

THE FOUNDERING OF THE S.S. "POLLENTIA."

On page 800 we give particulars of the loss of the Cunard liner *Pollentia* off Cape Race. This ship carried two operators, Messrs. Rose and Davies. The senior

Operator Rose.

operator, Mr. Frederick William Rose, is 25 years of age, and resides at Highgate. He received his wireless training at the Marconi Company's evening classes, and was appointed to the staff in October, 1914, since serving on a number of ships. The junior operator, Mr. Alfred Charles William Davies, is a comparatively new recruit to the wireless service, having joined in September last. He received his preliminary wireless training at the South Wales Wireless College, and upon appointment to the staff first served on the s.s. *Aidan*, and thence was transferred to the *Pollentia*. Both gentlemen, fortunately, were saved, and are none the worse for their exciting experience.

Operator Davies.

LOSS OF THE S.S. "NORSEMAN."

The ill-fated s.s. *Norseman*, which was recently reported as sunk, carried two operators, Messrs. Oliver and Browne. The senior operator, Mr. John Robert Oliver, whose home is at Clapham, is 19 years of age, and first studied wireless at the British School of Telegraphy. He entered the Marconi Company's service in May, 1915, making his first voyage to sea on the s.s. *Jose de Larrinaga*. The junior operator, Mr. Francis Thomas Browne, a native of Kildare, received his wireless training at the Irish School of Telegraphy. He is 20 years of age. Since joining the Company in July, 1915, he has served on the s.s. *Nicosian*, *Nortonian*, *Aidan*, and was appointed to the s.s. *Norseman* at the end of last year. Both

Operator Oliver.

men have fortunately been rescued, and we congratulate them upon their escape.

* * *

THE S.S. "APPAM."

Mr. Robert Jones, whose photograph and biographical notes appeared in these columns in connection with the torpedoing of the s.s. *Hesperian*, has again been forced to undergo a most exciting experience by virtue of his position as wireless operator on board the famous liner *Appam*. Upon his return to

Operator Browne.

Operator Robert Jones.

this country he will no doubt have an interesting story to tell, but at present we are unable to publish any particulars of his adventures. For particulars of Mr. Jones's service in the Marconi Company we would refer our readers to page 468 of the October issue.

* * *

SERBIAN GOLD MEDAL FOR WIRELESS OPERATOR.

It is with the greatest pleasure that we are able to report that Warrant Officer Harry Noble is the proud recipient of a Gold Medal bestowed on him by King Peter of Serbia for distinguished services to the Serbian Government. Mr. Noble is 23 years of age, and resides when in England at Saddleworth, Yorkshire. He received his education in his native town, at Oldham Hulme Grammar School, and at Manchester Technical School. Upon becoming interested in wireless telegraphy he took a course at Fallowfield Wireless College, Manchester. Here he received his Postmaster-General's First Class Certificate, and in November, 1913, joined the Marconi Company. After serving on the s.s. *Minnetonka* he was transferred to the s.s. *Palma*, and upon the outbreak of war volunteered for active service. As it may interest our readers, we reproduce below a letter addressed to the Vice-Admiral, Malta, a copy of which Mr. Noble received with the medal. It reads as follows :—

" Belgrade, Serbia,
" 20th September, 1915.

" SIR,—I beg to forward herewith the " Serbian 'Gold Medal for Zealous Service " in War,' which medal his Majesty King " Peter of Serbia has graciously conferred " upon Mr. Harry Noble, Warrant Telegra- " phist, R.N.R., serving under my command " in Serbia until 4th July last, and I request " that steps may be taken for this medal " to be handed to Mr. Noble. In a despatch " from his Britannic Majesty's Minister in " Serbia, dated 18th September, 1915, I am " informed that the King has been graciously " pleased to grant full and unrestricted per- " mission to the officer to accept and wear " this medal.

" I have the honour to be, Sir, your " obedient servant,

" (Signed) E. TROUBRIDGE,
" *Rear-Admiral.*
" Head of British Naval Mission
" in Serbia.

" The Vice-Admiral and Senior
" Naval Officer, Malta."

Operator Noble.

QUESTIONS AND ANSWERS

Readers are invited to send questions on technical and general problems that arise in the course of their work or in their study to the Editor, THE WIRELESS WORLD, *Marconi House, Strand, London, W.C. Such questions must be accompanied by the name and address of the writer, otherwise they will remain unanswered: and it must be clearly understood that owing to the Defence of the Realm Act we are totally unable to answer any questions on the construction of apparatus during the present emergency.*

SPECIAL NOTICE.

Readers are requested to note that save in exceptional circumstances we are unable to deal with queries through the post.

H. H. (The Hague, Holland).—The method of amalgamating a zinc rod by letting it stand in a little mercury is well known. The mercury creeps up the zinc much as you find the liquid in the cell creeping up the side and giving a crust of crystals. (2) The rotary type of variable condenser is used in most cases because its capacity is far larger for a given size than the tubular form. Where only a small capacity is required the tubular type is often used.

PTE. J. F., R.A.M.C. (Brit. Exp. Force).—We cannot express an opinion on the case you mention, but if the applicant writes to the Traffic Manager, Marconi International Marine Communication Company, Ltd., Marconi House, Strand, W.C., his case will receive consideration.

Our contemporary the *Publishers' Circular* prints the following:

"Will the editor of the excellent all-British monthly, THE WIRELESS WORLD, tell us what words the letters SOS stand for, which are flashed out by ships in peril on the sea? Are they used by all nations? They might well stand for 'Send out succour'—as that is their effect—but ours is not the only language heard on the sea."

Answer.—This is a query which has been put to us on several occasions recently, and we have much pleasure in dealing with it here. First of all the international distress signal called SOS is not sent as S.O.S. and is not really SOS at all. The signal transmitted consists of three dots three dashes, and three dots, thus . . . — — — . . . It was chosen because it happened to be a rhythmic signal quite unlike any of the signs for letters, figures, or punctuation used in ordinary wireless correspondence. In the official International Regulations it is never referred to as SOS, but is always printed in the characters above shown. It is popularly called SOS as these letters *sent together without spacing between them* give the signal required, but for that matter so do the letters VTB, SMB, IJS, and many other combinations. The reader will now understand that contrary to the widely held opinion, SOS does not stand for "Send out succour," "Save our souls," "Sink or swim," or any other highly dramatic phrases. Just as the sign "dot-dash" in the International Code stands for the letter A, whatever language is being used, so the signal three dots, three dashes, and three dots stands for a distress call, whether the ship using it is English, French, Spanish, or belonging to any other nationality. It pains us to remove the happy idea relating to "Send out succour," an idea so largely exploited in the daily press, but above are the facts of the case, and we must print them.

F. V. M. (Co. Kerry).—Thanks for your letter. We would not for a moment suggest that you are actuated by any motives other than those of strict patriotism. The cause of our remark was that we did not know whether you were aware that this system was of alien origin. It doesn't do in these times to give your neighbours or associates the idea that you are studying anything German, does it?

H. A. (Junior) (Gibraltar).—You do not state in your letter whether you are a British subject. If so, with the qualifications you possess your services could probably be utilised in His Majesty's Forces. Otherwise you might communicate with Messrs. The Marconi's Wireless Telegraphic Co of America, Woolworth Buildings, 233 Broadway, New York, stating your qualifications and giving full particulars of yourself, at the same time asking whether they have any vacancy which they could offer you. There might also be vacancies for a wireless man in the Official Services of the South American Republics. We have no information regarding the rank and pay of a radio-telegraphist in the United States Navy.

F. S. (Wells, Norfolk).—We are not in the position to answer your first question. In reply to the second query, we understand that in certain cases complete training is given, but if you have a good knowledge of the Morse code, and some acquaintance with the theory, this should be of great benefit. In answer to the third question, if you have well studied the books mentioned by you, you should be well equipped with theoretical knowledge, and we do not know of any volumes of greater use to you.

A. P. (High Lane, Cheshire).—We would advise you to apply to the nearest naval recruiting office for particulars of enlistment in the branch of the service to which you refer. We think, however, that in view of the injury to your forearm you would be unable to qualify for such an appointment. In any case, there is no harm in applying, and we are sure that full information would be given. If you drop a line to any of the wireless colleges advertising in THE WIRELESS WORLD they will send you particulars of fees, etc. Thank you for your kind remarks regarding our magazine, which we trust will continue to be of great use to you.

T. J. H. (Banfield, Vancouver Island, B.C.).—The calculation of capacities of transmitting condensers is fully dealt with in THE WIRELESS WORLD for December, 1914, and January, 1915. We would advise you to obtain these articles if you are interested in the calculation of capacities, as they contain many practical hints and go fully into the subject.

W. H. H. (Goldhanger, Essex).—Thank you for your kind remarks regarding our magazine. We regret we are not in the position of giving you any information concerning the wireless section of the branch to which you refer. We think you will understand that it is not advisable for us to publish such particulars in our magazine.

F. O. R. (Conway, North Wales).—There are several wireless schools in the neighbourhood of Liverpool where you could obtain the necessary training. A line to any of the colleges advertising in THE WIRELESS WORLD will bring you full particulars. A large amount of study can be done at home, particularly with regard to the theory and the new "Marconi Official Records," announced on another page, should prove of the greatest use to you. Certain of the colleges run corresponding courses, and these you will find referred to in our advertisements. If you know nothing whatever of the subject, we would advise you to purchase the "Handbook of Technical Instruction for Wireless Telegraphists," by J. C. Hawkhead and H. M. Dowsett, obtainable from our publishers, price 3s. 10d. post free. This contains all the theory that it is necessary to know in order to pass the Postmaster-General's examination If you have a gramophone, the "Marconi Official Records" will give you an excellent preliminary training in receiving wireless signals. We hope to publish shortly one or more articles concerning home training in sending and receiving, and we think that these will prove of great help to you.

W. S. H. (Leicester), who is very deaf and cannot hear ordinary 'phones even of the best quality, wishes to know of some approximate test so that he may be able to know if a telephone relay which he has invented compares favourably with one made professionally; that is, as far as the volume of sound delivered is concerned when compared with the volume of sound which would be delivered by an ordinary wireless 'phone.

Answer.—We think that the best method in the circumstances would be to connect an ordinary telephone headpiece, as used in wireless telegraphy, to a feeble alternating current supply, so as to give a hum in the headpiece, and then to reduce the strength of the current until the sound is just inaudible to a person of normal hearing wearing the telephones. If then the relay connected in place of the 'phones gives a sound equivalent in strength to what is usually termed "good wireless signals," and provided that it is fairly robust and keeps in adjustment without trouble, it can be considered as an efficient and serviceable instrument. The sensitivity of a telephone varies with the frequency, and so, if possible, tests should be made at the spark frequency most likely to be received. The minimum current which will give a sound depends on resistance, etc., of the telephone, sensitivity of the ear and frequency of note, and hence cannot be given off-hand. We should be very interested to hear the result of the tests, and any further assistance we shall be only to glad to give.

D. E. R. (Treorchy, Glam.).—Submarine signalling is generally carried on by means of vibrations in the water. The transmitter usually consists of a submarine bell, and the receiver is a sensitive apparatus carried on board ship and giving the sound of the bell in telephones, at which the officer making the observations can listen. Two telephones are used, one connected to the port receiving apparatus and the other to the starboard. In order to determine the direction from which the submarine signals are coming, the officer listens alternately to the port and starboard receiving instruments, and if the signals are coming from the starboard side, the signals on that side will be the louder. If the bell is dead ahead the sound will be equal in both receivers.

J. J. M. (Moate, Co. Westmeath).—"The Marconigraph" is incorporated with THE WIRELESS WORLD, and is not kept on as an independent paper. In answer to the second question, once the hammer of an electric bell is removed the instrument becomes a buzzer, and with a little adjustment can be used for practice purposes.

SIGNALLER T. M. (8th K.O.Y.L.I. Transport, B.E.F.).—According to some theories of electricity an uncharged body contains positive and negative electricity in equal quantities. A body is said to be charged positively when the positive electricity is not in excess and negatively when the negative is in excess. Does this give the information you require? If not write to us again. In reply to your second question, prior to the war civilians were allowed to erect wireless stations provided they obtained a licence from the Postmaster-General and complied with certain requirements regarding maximum power, wave-length, etc. The transmitting apparatus had to be tuned to prevent as far as possible interference with other stations. At the present time nothing in the nature of an amateur wireless installation is of course allowed.

H. J. M. (Newcastle, N.S.W.).—We understand that the articles to which you refer contain all the information at present available on the apparatus mentioned by you. We cannot publish detailed particulars and connections of patented apparatus for obvious reasons. We are delighted to hear that you appreciate our publications, and trust that they will be of continued use to you.

A number of queries are unavoidably held over owing to lack of space.

Patent Record.

14422. Oct. 12th. Marconi's Wireless Telegraph Co., Ltd., & I. Shoenberg. Frequency multipliers. (*Provisional.*)

14500. Oct. 13th. Joseph Bethenod & Emile Girardeau. Radio-telegraphy. (Convention date, Oct. 15th, 1914, France.) (*Complete.*)

14696. Oct. 18th. Siemens & Halske Akt., Ges. Spark gap arrangements for oscillatory circuits. (Convention date, Nov. 23rd, 1914, Germany.) (*Complete.*)

14729. Oct. 19th. Arthur W. Long. Arrangements of circuits for the transmission and reception of ether waves—*e.g.*, those used in wireless telegraphy. (*Provisional.*)

14769. Oct. 19th. British Thomson-Houston Co. (General Electric Co., U.S.A.) Wireless signalling systems. (*Provisional.*)

14864. Oct. 20th. John Gell. High-frequency generators. (*Provisional.*)

14918. Oct. 21st. Siemens & Halske Akt., Ges. Production of vacua and means therefor. (Convention date, Nov. 14th, 1914, Germany.) (*Complete.*)

15237. Oct. 28th. British Thomson-Houston Co. (General Electric Co., U.S.A.) Wireless signalling systems. (*Provisional.*)

15713. Nov. 6th. Alban J. Roberts. Relays. (*Provisional.*)

15915. Nov. 11th. Alexander W. Sharman. High-frequency alternating-current relays for radio-telegraphy and the like. (*Provisional.*)

15978. Nov. 12th. Adrian E. Sykes & Solomon Ford. Electro-chemical microphones, principally for use in connection with wireless telegraphy and telephony. (*Provisional.*)

16151. Nov. 16th. Marconi's Wireless Telegraph Co., Ltd., and Raymond D. Bangay. Variometer for use in wireless telegraphy. (*Provisional.*)

17954. Dec. 23rd. Marconi's Wireless Telegraph Co., Ltd., and Charles S. Franklin. Means for controlling the speed of a machine. (*Provisional.*)

18019 and 18020. Dec. 24th. Gogu Constantinesco and Walter Haddon. Signalling by wave transmission. (*Provisional.*) High-frequency wave transmission generator. (*Provisional.*)

18203. Dec. 31st. Charles S. Lenz. Switch for eliminating dead-end effects in wireless receiving apparatus. (*Provisional.*)

Instructional Article

NEW SERIES (No. 7)

The following series, of which the article below forms the seventh part, is designed to provide wireless telegraphists, amateurs, and technical students generally, with clear and precise instruction in technical mathematics, in order that they may be enabled to read and understand the more advanced technical articles which appear from time to time.

45. We have so far only considered the trigonometrical ratios of angles lying in value between 0° and 90° ; in Fig. 20 we have an angle ABC having a value θ, of something between 180° and 270°. In order to get at its trigonometrical ratios we drop a perpendicular CD on to AB produced.

Then for the angle θ, CD is the "perpendicular" or "opposite" side, DB is the "base" or "adjacent" side, and the rotating arm CB is, as always, the "hypotenuse."

Now there are two very important conventions which are adopted in this connection.

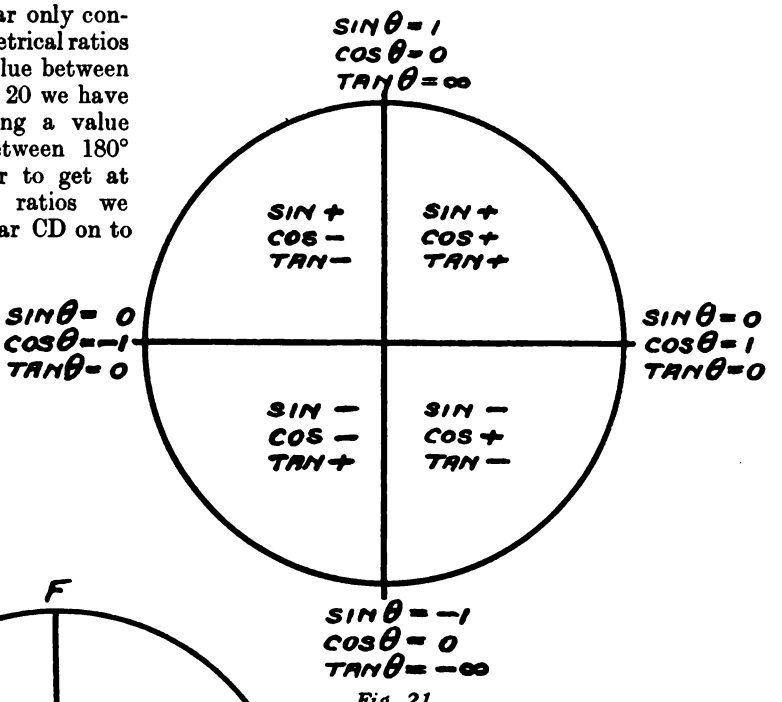


Fig. 21.

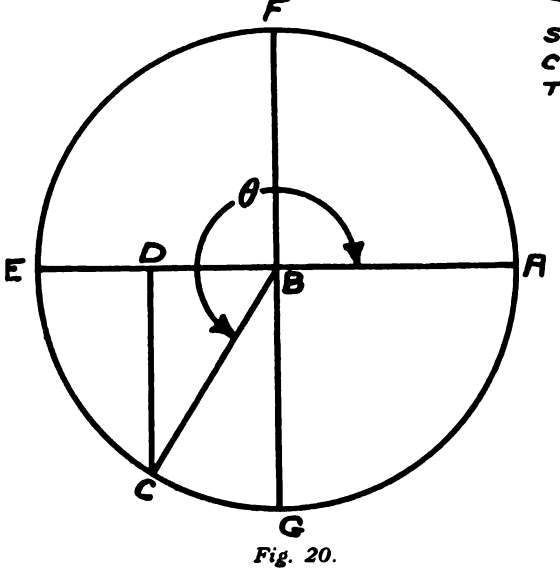


Fig. 20.

46. The first is that the angle swept out by an *anti-clockwise* rotation of the arm is a *positive angle*, and an angle swept out by a *clockwise* rotation is a *negative angle*.

The second convention is adopted in regard to the signs (positive and negative) of the *lines*—*i.e.*, (*a*) the distances (such as DB) along the horizontal ; (*b*) the lengths of the perpendiculars (such as DC), and (*c*) the rotating arm (BC). Let us divide the circle in Fig. 20 into four equal part

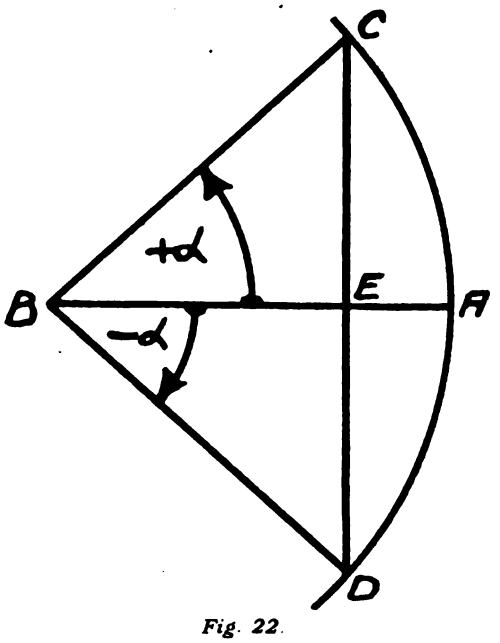


Fig. 22.

or four quadrants, by producing AB to make the diameter AE, and then drawing a diameter FG perpendicular to AE. The convention regarding the positive or negative character of the lines is as follows:

Perpendiculars *above* AE are *positive*; perpendiculars *below* AE are *negative*; horizontal distances to the *right* of FG are *positive*; horizontal distances to the *left* of FG are *negative*, and the rotating arm BC is *always positive*.

Thus, considering the angle θ in Fig. 20, DC and DB are negative, while CB is positive. Thus

$$\sin\theta=\frac{-CD}{+CB} \text{ is } \textit{negative}$$

$$\cos\theta=\frac{-BD}{+BC} \text{ is } \textit{negative}$$

$$\text{and } \tan\theta=\frac{-DC}{-DB} \text{ is } \textit{positive}.$$

Fig. 21 shows the sign (+ and −) for sin θ, cos θ, and tan θ, for all values of θ; all values from 0° to 90° come in the first quadrant, all values from 90° to 180° in the second quadrant, and so on. The actual values of the three ratios at 0° (or 360°), 90°, 180°, and 270°, are also shown.

47. In Fig. 22, if AB sweeps out the angle ABC equal to α in an *anti-clockwise* direction, and then returns and sweeps out the angle ABD, also equal to α, in a *clockwise* direction, then angle ABC is +α, and angle ABD is −α.

As CED, the straight line joining C and D and cutting AB at E, is perpendicular to AB, then,

$$\sin(+\alpha)=\frac{CE}{CB}=\frac{-DE}{DB}$$
$$=-\sin(-\alpha)$$
$$\cos(+\alpha)=\frac{BE}{BC}=\frac{BE}{BD}$$
$$=\cos-(\alpha)$$
$$\tan(+\alpha)=\frac{EC}{EB}=\frac{-ED}{EB}$$
$$=-\tan(-\alpha).$$

48. In trigonometrical tables the values of the various ratios are only given for angles between 0° and 90°. If then we wish to find the value of, say, sin 240°, we must convert sin 240° into some ratio of some angle between 0° and 90°.

The angle ABC, Fig. 23, is an angle of 240°, and so if ABD is a diameter of a circle with centre B, then the angle DBC is (240°−180°) =60°. Thus, if CB be produced, as shown to E, the angle ABE will also equal 60°.

Proceeding as before, we drop two perpendiculars CF and EG from C and E respectively on to AD.

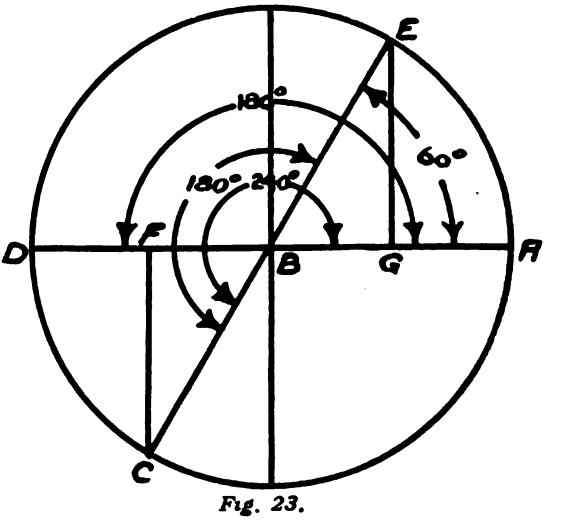


Fig. 23.

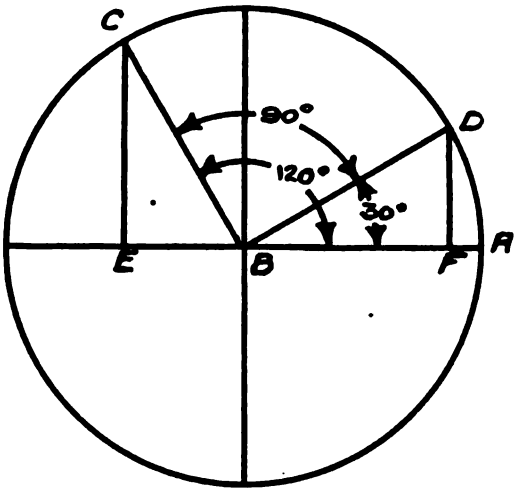


Fig. 24.

Then $\sin 240° = \frac{CF}{CB}$, and is obviously equal to $-\frac{EG}{EB}$ (for FC = −EG and BC = BE).

Thus $\sin 240° = -\sin 60°$

$$= -\frac{\sqrt{3}}{2}.$$

The net effect of drawing the diameter CE and then considering the angle EBG has been to cut 180° off the angle of 240° with which we had to deal.

We have seen that

$$\sin 240° = -\sin 60°$$
$$\sin (180° + 60°) = -\sin 60°$$
$$\text{or } \sin (180° + \theta) = -\sin \theta.$$

49. In Fig. 24 the angle ABC is 120°—between 90° and 180°—and we will suppose we want to find the value of tan 120°.

Draw the radius BD, as shown, perpendicular to the rotating arm BC. Then angle

$$\text{ABD} = \text{angle ABC} - \text{angle CBD}$$
$$= 120° - 90°$$
$$= 30°.$$

Draw perpendiculars CE and DF as shown.

Then $\tan 120° = \frac{CE}{EB}$.

As the triangles CEB and BFD are equal in every way, in place of

$$\frac{CE}{EB} \text{ we can write } \frac{BF}{FD}.$$

Now CE is positive and EB negative, and so tan 120° is negative. As, however, BF and FD are both positive, we must write—

$$\tan 120° = \frac{CE}{EB} = -\frac{BF}{FD}$$
$$= -\cot 30°,$$
$$\text{or } \tan (90° + 30°) = -\cot 30°,$$
$$\text{or } \tan (90° + \theta) = -\cot \theta.$$

Similar arguments apply to the other ratios, and from the results obtained we can make out the following tables:

$$\sin (90° + \theta) = \cos \theta.$$
$$\sin (180° + \theta) = -\sin \theta$$
$$\sin (270° + \theta) = -\cos \theta$$
$$\cos (90° + \theta) = -\sin \theta$$
$$\cos (180° + \theta) = -\cos \theta$$
$$\cos (270° + \theta) = \sin \theta$$
$$\tan (90° + \theta) = -\cot \theta$$
$$\tan (180° + \theta) = \tan \theta$$
$$\tan (270° + \theta) = -\cot \theta.$$

50. We see from the foregoing that the trigonometrical ratios of any angle could be obtained from a table giving the values of the ratios for angles from 0° to 90°.

In Fig. 25 the first quadrant ABC of a circle radius AB has been divided into two equal parts by the radius BD at 45° from AB. ABE is any angle θ, greater than 45° and smaller than 90°. EF is the usual perpendicular from E on to AB.

If, now, we consider the angle ABE or θ we see that $\sin \theta = \frac{EF}{EB}$

$$= \cos \text{BEF}.$$

Now all the three angles of triangle FBE added together equal *two* right angles, and

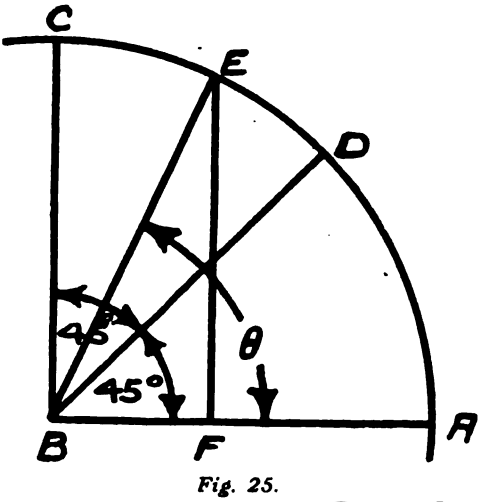


Fig. 25.

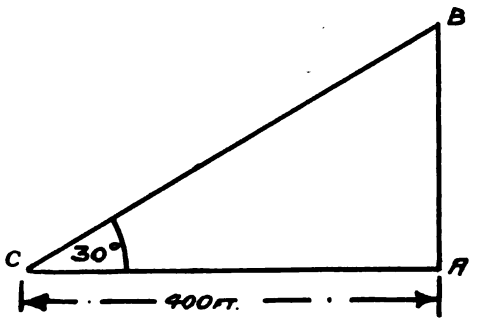


Fig. 26.

the angle EFB has been made equal to *one* right angle (EF being perpendicular to AB). Thus the two remaining angles EBF and BEF are together equal to one right angle or 90°, and as EBF is *greater* than 45°, BEF must be *less* than 45°.

From this we see that the sine of any angle θ greater than 45° and smaller than 90° can be obtained from a table giving the cosine of an angle (90°−θ) smaller than 45°, or sin θ=cos (90°−θ).

Similarly cos θ=sin (90°−θ),
and tan θ=cot (90°−θ).

From the above considerations it will be easily seen that in compiling a table giving sin θ, cos θ, and tan θ from 0° to 90°, we should find that all the values tabulated for angles greater than 45° would have occurred as (different) ratios for angles smaller than 45°. For example, the values for sin 60°, sin 61°, sin 62° ..... would be the same as the values for cos (90°−60°), cos (90°−61°), cos (90°−62°) ..... or cos 30°, cos 29°, cos 28° .....

This is why trigonometrical tables are arranged as we saw in the previous article, the values from 0° to 45° being read off *downwards* and from the *left*, and values from 45° to 90° *upwards* and from the *right*, (see § 44).

A few examples are appended, giving applications of trigonometry to simple problems.

Example 1.

At a point on the same level as the base of a mast, and 400 ft. away from the base, the angle of elevation of the top of the mast is observed to be 30°. Find the height of the mast.

In Fig. 26 AB represents the mast, and C is the point at which the observation is made. AC being horizontal, the angle of elevation is ACB, given as 30°.

$$\text{Now } \frac{AB}{AC}=\tan ACB$$

$$\text{or } \frac{AB}{400 \text{ ft.}}=\tan 30°.$$

$$\text{Thus } AB=(400\times\tan 30°) \text{ ft.}$$

$$=400\times\frac{1}{\sqrt{3}}$$

$$=\frac{400}{1{\cdot}732}=231 \text{ ft.} \quad \textit{Ans.}$$

Example 2.

Find the height of a mast when it is found that, on walking directly towards it 100 ft. along a horizontal line through its base, the angular elevation of its top changes from 30° to 45°.

In Fig. 27 AB is the mast, and C and D are the two positions occupied by the observer when measuring the angles of elevation.

We are told that CD is 100 ft., angle BCA is 30°, and angle BDA is 45°.

Let BD=x ft., and let the height of the mast=h ft.

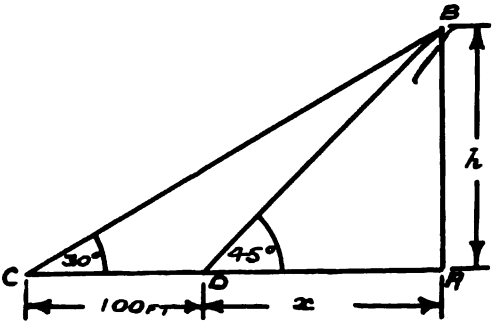


Fig. 27.

From triangle ABD we get

$$\frac{AB}{AD}=\tan BDA$$

$$\text{or } \frac{h}{x}=\tan 45°=1.$$

Thus $h=x$.

From triangle ABC we get

$$\frac{AB}{AC}=\tan BCA$$

$$\text{or } \frac{h}{(100+x)}=\tan 30°=\frac{1}{\sqrt{3}}.$$

Thus $\sqrt{3}\times h=100+x$.

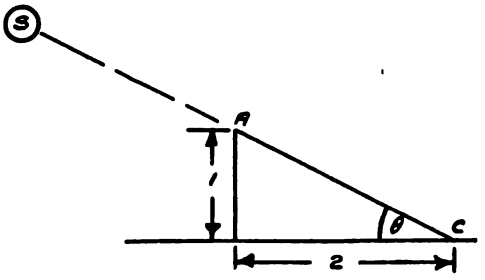


Fig. 28.

But $h=x$, and so

$\sqrt{3}\times h=100+h$

$\sqrt{3}\times h-h=100$

$h(\sqrt{3}-1)=100$

$h(1{\cdot}732-1)=100$

$h\times 0{\cdot}732=100$ or $h=\dfrac{100}{0{\cdot}732}=136{\cdot}6$ ft. *Ans.*

Example 3.

What is the angle of elevation of the sun when the length of the shadow of a pole is twice the height of the pole ?

In Fig. 28 BC is the shadow of the pole AB, S being the sun. We are told that

$$BC=AB\times 2$$

or if $AB=1$

then $BC=2$.

Thus, if we call the angle of elevation of the sun θ, we know that $\tan\theta=\dfrac{AB}{BC}=\frac{1}{2}=0{\cdot}5$.

Now from tables we see that the angle whose tangent is 0·5, or $\tan^{-1}0{\cdot}5$ is nearly 27°.

Thus $\theta=27°$ (nearly). *Ans.*

Example 4.

A lighthouse sends out a fan-shaped beam of light extending over an arc from north-east to north-west. An observer on a steamer which is sailing due west first sees the light when he is 5 miles away from the lighthouse and continues to see it for 45 minutes. What is the speed of the steamer ?

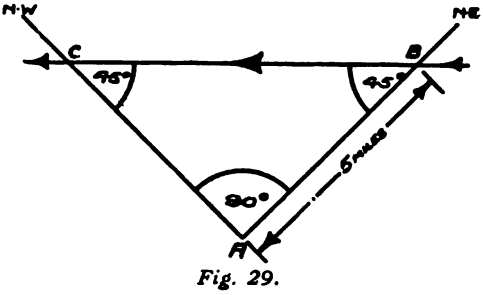


Fig. 29.

In Fig. 29 A is the lighthouse and BAC is the angle covered by the beam of light. BC is the course of the steamer, and as this is due east to west we see that

angle ABC=45°=angle ACB,

and also angle BAC=90°.

We also know that AB=5 miles.

Now $\dfrac{AB}{BC}=\dfrac{\sin ACB \text{ or } \cos ABC}{\sin 45° \text{ or } \cos 45°}$,

and so $BC\times\sin 45°=AB$,

or $BC=\dfrac{AB}{\sin 45°}=\dfrac{5}{\left(\frac{1}{\sqrt{2}}\right)}=5\sqrt{2}$ miles

$=5\times 1{\cdot}414$

$=7{\cdot}07$ miles.

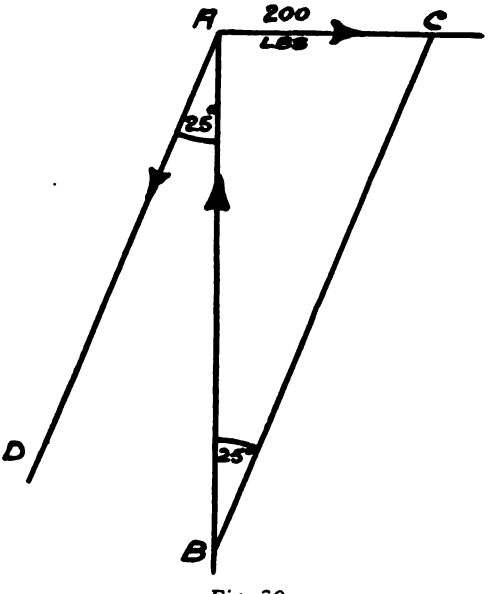


Fig. 30.

Now the steamer covers this distance of 7·07 miles in 45 minutes, and so its speed is

$\dfrac{7{\cdot}07}{\left(\frac{3}{4}\right)}=7{\cdot}07\times\dfrac{4}{3}=\dfrac{28{\cdot}28}{3}=9{\cdot}43$ *miles per hour (nearly).* *Ans.*

Example 5.

Fig. 30 shows diagrammatically the forces acting at the top of a wireless mast. AB is the vertical line of the mast itself, AD represents a stay making an angle of 25° with the

mast, and AC is the horizontal pull of the aerial. We require to find the tension in the stay and also the pressure acting down through the mast, given that the horizontal pull of the aerial is 200 lbs.

In the second series of Instructional Articles (Article 1, May, 1914) it was shown how, by making AC equal to 200 lbs. to any convenient scale, and by drawing CB parallel to the stay AD, the forces acting in the stay and in the mast were given by the respective lengths of BC and BA read off to the same scale as AC.

We will take *any* point C in AC and draw CB parallel to AD. Then angle ABC= angle BAD=25°.

$$\text{Obviously } AB=\frac{AC}{AC}\times AB=AC\times\frac{AB}{AC}$$
$$=AC\times\cot 25°,$$
$$\text{or force } AB=200 \text{ lbs.}\times 2{\cdot}1445 \text{ (cot 25° from tables).}$$
$$=428{\cdot}9 \text{ lbs.}$$
$$\text{Similarly force BC (or AD)}=AC\times\frac{BC}{AC}$$
$$=200 \text{ lbs.}\times\text{cosec } 25°,$$
$$\text{or } 200\div\sin 25°$$
$$=\frac{200}{{\cdot}4226}=473{\cdot}3 \text{ lbs.}$$

Pressure in mast=428·9 *lbs.*
Pull in stay=473·3 *lbs.* } *Ans.*

"THE WIRELESS WORLD" PROBLEMS

DURING the month we have received a very large number of letters from readers giving the answer to our last little problem, the majority of the replies being correct. To write and thank our correspondents individually is, we regret, impossible, and so we take the opportunity of thanking them here.

Readers are reminded that the competition for the *best problem* closed on the last day of February, and the result will be announced in our April number.

Our contemporary the *Electrical Review*, in quoting the cube problem, and in referring to the fact that the answer to the sheet metal part of the problem as given by our correspondent is the same as that given by an *Electrical Review* correspondent says:

"With regard to the second part of the "cube problem, although both solvers "arrive at the same result, we are unable "to agree that the solution is correct. In "point of fact, on consideration of the con- "ditions—a cube constructed of sheet "metal, with current led in and out by "diagonally opposite *corners*—we have "come to the conclusion that the problem is "one of considerable difficulty. The solvers "appear to assume that the resistance of one "side is one ohm, no matter in what direc- "tion the current passes through it, but "this is clearly an inadmissable assump- "tion. It must, of course, be taken that "the sides are in contact along every edge; "and the resistance of each side from edge "to edge is one ohm—if it is taken diagon- "ally it becomes indeterminate."

We have received a very interesting letter on this subject from a correspondent in Rugby, Mr. H. Liddiard, and hope to be able to deal fully with it at an early date. We also regret that space does not permit of our printing a letter from "C. P. S." of New Brighton.

TRADE NOTE

We are advised that Mr. A. J. Greenly and Theodore Denison have taken over Baldwin & Wills' works, St. Albans Road, Watford, and commenced business as manufacturing electrical and mechanical engineers under the style of Greenly & Denison. The offices of the partnership are 37 and 38 Strand, W.C., and in addition to the munition work which they have undertaken they are in a position to quote for small turning, boring, screw-cutting, planing, die casting, and wood-working of every description.

The business known as Greenly Advertising Service will be carried on by Mr. Greenly as heretofore.

VOLUME III.

The present number brings the third volume of THE WIRELESS WORLD to a close. As all our readers know, THE WIRELESS WORLD is the only authentic British journal devoted exclusively to radio telegraphy.

Anybody who desires a complete bound volume can purchase one from the publishers at Marconi House at a cost of 4s. 6d. plus 6d. for postage. Those who prefer to have their numbers bound on their own account can obtain binding cases, including the full index of the volume, for 1s. 3d.

Order your bound volume early as only a limited supply will be available.

Transmission of Weather Reports by Arlington, Va. (N.A.A.).

By HARRY ROBINSON

ALL bulletins begin with the letters U.S.W.B. (United States Weather Bureau), and the weather conditions follow. The first three figures of a report represent the barometric pressure in inches (002=30·02); the next figure, the fourth in sequence, represents the direction of the wind to the eight points of the compass: 1=north, 2=north-east, 3=east, 4=south-east, 5=south, 6=south-west, 7=west, 8=north-west, and 0=calm. The fifth figure represents the force of the wind on the Beaufort Scale, given below.

BEAUFORT SCALE OF WIND FORCE.

Number and Designation.	Statute miles per hour.	Nautical miles per hour.
0. Calm	0 to 3	0 to 2·6
1. Light air	8	6·9
2. Light breeze... ...	13	11·3
3. Gentle breeze ...	18	15·6
4. Moderate breeze ...	23	20·0
5. Fresh breeze... ...	28	24·3
6. Strong breeze ...	34	29·5
7. Moderate gale ...	40	34·7
8. Fresh gale	48	41·6
9. Strong gale	56	48·6
10. Whole gale	65	56·4
11. Storm	75	65·1
12. Hurricane	90 and over	78·1 and over

In order to simplify the code, no provision has been made for wind force greater than 9, strong gale, on the Beaufort Scale. Whenever winds of greater force than 9 occur the number representing them is given in words instead of figures, thus: Ten, eleven, etc.

The points for which weather reports are furnished are designated as follows:

For Atlantic coast and Gulf points—

S=Sydney. H=Hatteras.
P=Pensacola. T=Nantucket.
C=Charleston. B=Bermuda.
DB=Delaware. Breakwater. K=Key West.

For points on the Great Lakes—

DU=Duluth. G=Green Bay.
D=Detroit. M=Marquette.
Ch=Chicago. V=Cleveland.
U=Sault Ste. Marie. L=Alpena.
F=Buffalo.

EXAMPLE OF CODE.

U.S.W.B.—S 96465, T 91674, DB 94686, H 99886, C 01214, K 02622, P 03613, B 00065.

Translation.

United States Weather Bureau.

Station.	Pressure.	Wind. Direction.	Wind. Force.*
Sydney	29·64	SW	5
Nantucket	29·16	W	4
Delaware Breakwater	29·46	NW	6
Hatteras	29·98	NW	6
Charleston	30·12	N	4
Key West	30·26	NE	2
Pensacola	30·36	N	3
Bermuda	30·00	SW	5

* See Beaufort Scale.

U.S.W.B.—DU 95826, M 97635, U 00443, G 96046, Ch 95667, L 00644, D 00842, V 01054, F 01656.

Translation.

United States Weather Bureau.

Station.	Pressure.	Wind. Direction.	Wind. Force.*
Duluth	29·58	NE	6
Marquette	29·76	E	5
Sault Ste. Marie ...	30·04	SE	3
Green Bay	29·60	SE	6
Chicago	29·56	SW	7
Alpena	30·06	SE	4
Detroit	30·08	SE	2
Cleveland	30·10	S	4
Buffalo	30·16	S	6

* See Beaufort Scale.

The LIBRARY TABLE

"THE WIRELESS TRANSMISSION OF PHOTOGRAPHS." By Marcus J. Martin. London: The Wireless Press, Ltd. 2s. 6d. net.

If anything were needed to impress upon us that Senatore Marconi's invention was not only the provision of a new system of telegraphy, but also the foundation of a new science, it is the publication of a book devoted exclusively to "The Wireless Transmission of Photographs." We have already passed the time when the literature of the new science of radio-telegraphy consisted solely of a few treatises and manuals on wireless telegraphy and telephony, and we are now well into the period of specialised handbooks.

Mr. Marcus J. Martin is already well known to readers of this magazine by his excellent series of articles on radio-photography. In this volume these articles have been revised and expanded, and with many new diagrams constitute a comprehensive treatise on a subject of growing importance.

It will come as a surprise to many to learn how much is already known and achieved in connection with the sending of pictures from one place to another by wireless. In Chapter I. the author outlines the earliest experiments, the advantages of radio-photography over transmission by wire and the system invented and demonstrated by Mr. Hans Knudsen. This latter, although very ingenious, has not proved very practicable, and the reasons for this are given. In Chapter II. the many points of difficulty and interest connected with the transmitting apparatus are fully considered, and not many pages will be turned before the reader discovers that Mr. Martin is truly a master of his subject. Unlike many text-books on new applications of science, this volume is not given over to eulogistics of inventors and vague prophesies of what may come; on the contrary, it is full of practical information and records of actual experience. Chapter III. is devoted to receiving apparatus; Chapter IV. to the most important subject of synchronising and driving the motors; whilst Chapter V. consists of a detailed description on Mr. Martin's own apparatus, and results obtained therewith. In view of the extreme importance of a full understanding of selenium, which is largely used in the present methods of wireless transmission of photographs, the author has added an appendix on selenium cells. A further appendix has been added on preparing the metal prints. It is upon the production of these prints that much of the success of the system depends.

Mr. Martin's book is without doubt a valuable addition to the literature of wireless telegraphy and allied subjects. After the war, when private experiments are again commenced, we can foresee that numerous amateurs will be led by this book to take up this fascinating subject, and, may be, in a few years, the London evening papers will contain photographs received by wireless of New York's morning occurrences. Many experimenters will need to do much work before this is achieved, and to these, as to everyone interested in wireless telegraphy,

we can heartily commend this book. A word of praise must be given to the publishers for the excellent way in which the volume is printed and bound. Both letterpress and diagrams are extremely clear, and reflect great credit on all concerned.

* * *

"HISTORIC JAMAICA." By Frank Cundall, F.S.A. London, 1915. West India Committee. 5s. net.

Xaymaca, as the island of Jamaica was known by the old Caribs, the aboriginal inhabitants of the island, is a veritable "earthly paradise." Isolated from the main body of the Antilles, it yet has a future of abundant prosperity in store. The opening of the Panama Canal has already put it on the direct route from the Atlantic to the Pacific, and its prosperity bids fair to become increasingly large. In the opening up of the new route wireless telegraphy has not been in the background, and every coign of vantage from the radio-telegraphic point of view has been seized upon and utilized. In the mind of the majority of people the "New World" seems to constitute quite a modern discovery. But in effect it is now over 400 years ago since Christopher Columbus first set foot on Watling Island and so brought the new vast store of wealth within reach of the inhabitants of the Eastern Hemisphere. Mr. Cundall's historical survey of the island forms excellent reading and offers enlightenment on very many points which have hitherto been enshrouded in obscurity.

* * *

"EXAMPLES IN ALTERNATING CURRENTS." Volume I. By F. E. Austin, B.S., E.E. London: E. & F. N. Spon. 10s. 6d. net.

We often find that much of the knowledge acquired by a student at a technical school is rapidly forgotten through lack of practical application. This book is designed to remedy this by providing a series of problems and examples fully worked out and illustrated where necessary by diagrams. The student who works carefully through these cannot fail to derive considerable benefits therefrom, and much of the information he has gained at technical classes will thus be firmly impressed upon his memory.

For some reason not at all evident to the reviewer, the publisher has thought fit to print this volume in a most irritating green ink, otherwise the book is quite well produced.

* * *

"EGYPT OF THE EGYPTIANS." By W. Lawrence Balls. London, 1915. Sir Isaac Pitman & Sons, Ltd. 6s. net.

The study of peoples and the lands where they dwell forms as interesting a means of recreation as can well be imagined. Although so many books have been written on Egypt and the Egyptians, there is yet an immense field which has not been tapped. Wireless telegraphy has probably done more to open up remote and little-known parts of the world than any other invention of modern times. It is stretching its tentacles into the Arctic wastes surrounding the Poles; it is spreading its feelers into the burning deserts of Africa, Asia and Australia, and it is making its influence felt throughout the swampy jungles of Brazil and other equatorial regions. All our readers should possess themselves of this book.

* * *

"THE BOOK OF THE SEXTANT." By A. J. Hughes. Glasgow: James Brown & Son. 2s. 6d. net.

To the navigation officer skilled in use of the sextant and other instruments of navigation this book will prove of great interest. It should also make an appeal to the general reader, for it tells the story of the progress made with instruments for taking altitudes at sea, commencing with the astrolabe invented by Hipparchus over 2,000 years ago.

A large number of illustrations, excellently drawn, assist the reader in understanding the methods of construction and working, and enable all who peruse this volume to realize how accurately these instruments need to be made and how delicately they must be handled.

The full details regarding the construction and use of the instruments described and numerous hints of the greatest use to the young officer go to prove that the author is a master of his subject and must have devoted the closest attention to the production of this book. It can be recommended to all who for business or pleasure wish to become acquainted with the sextant and allied instruments.

"THE BRITISH DOMINIONS YEAR BOOK, 1916." London: The British Dominions General Insurance Co., Ltd.

The present issue of this interesting annual contains contributions by such well-known writers as Mr. F. T. Jane, Mr. Edward Salmon, Sir Leo Chiozza Money, Sir Laurence Gomme, Mr. J. Ellis Barker, and others. The contents of the book are devoted mainly to matters in connection with the war and include some coloured plates of the medal ribbons of the British Army. The book will not be published in the ordinary way, but will be presented to the public and business men and women in the hope that it may be of service.

* * *

"THE PRACTICAL ELECTRICIAN'S POCKET BOOK AND DIARY, 1916." London: S. Rentell & Co., Ltd. 1s. net.

In these days, when the term "pocket book" is applied to bulky volumes whose size is such that nothing but the largest pocket of an overcoat can contain them, a word of praise must be given for the size of the little volume before us. Although it is crammed with most valuable matter and seems to cover practically all points necessary to be covered by such an annual, it nevertheless measures but slightly more than 5 inches by 3½ inches, and can be quite conveniently carried about in the course of one's work. The contents have been well revised, and although the new issue contains but four more pages than that of last year, much new matter has been included in the space made available by careful condensation of the older matter and omission of material now out of date. Altogether this is a most useful book and one which has already established for itself a firm position in the electrical industry.

* * *

"HAZELL'S ANNUAL, 1916." Edited by T. A. Ingram, M.A., LL.D. London, 1916. Hazell, Watson & Viney, Ltd. 3s. 6d. net.

This well-known and deservedly popular annual scores, as usual, many distinct successes. It has of late made a special feature of giving the personnel of Government offices and important public bodies with greater fulness and detail than many other works of reference, and we notice with interest that the staff of the new Ministry of Munitions is set out, as is the case of the other offices. Other features include the complete list to the recipients of the Victoria Cross, the Roll of Honour, containing the names of those who have lost their lives in the war, a section devoted to the British Colonies and Self-Governing Dominions, tables of warship types, and articles on aeronautical, military and naval matters. It should certainly find a place on all reference book-shelves.

* * *
* * *

"'THE PRACTICAL ENGINEER' ELECTRICAL POCKET BOOK AND DIARY, 1916." London: The Technical Publishing Company, Ltd. 1s. net.

This is a handy little book of convenient size, already well known to electricians by its excellence in previous years. The new edition has, of course, been brought thoroughly up to date, and we notice that sections relating to telephones and first aid have been added. Several of the tables have been recalculated and recast, and the standards of electrical machinery of the Engineering Standards Committee have been revised in accordance with the report issued last October. For the benefit of those concerned with the design of electrical cooking and heating apparatus a description of the simple method of calculating the flow of heat through furnace and oven walls, due to Dr. E. E. Kennelly and Mr. Carl Hering, has been introduced. We must congratulate the editors on providing so much matter of value to electricians in so small a compass.

* * *

"THE POCKET GUIDE TO THE WEST INDIES" (New and Revised Edition, 1914). By Algernon E. Aspinall. London: Duckworth & Co.

This handy little volume has already been reprinted three times, the latter of which (that under review) forms an entirely new and revised edition. The West Indies constitute as delightful a spot as it is possible to conceive. The islands of the Spanish main are jewels set in an emerald sea. Mr. Aspinall's knowledge of each and every one is very wide, as he has travelled considerably throughout that district. The book is profusely illustrated with maps, pictures and diagrams, and should form a useful addition to the reference library of each of our readers.

Foreign and Colonial Notes

Antarctica.

According to the *Hobart Mercury* (Tasmania) no more meteorological reports will be received in New Zealand from the Macquarie Island wireless station, which was established by Sir Douglas Mawson as a branch of his Antarctic expedition, and subsequently taken over by the Commonwealth Government. The Dominion meteorologist reported on December 1st that the station had been closed temporarily, the final message having been received a few days before. It appears that the Commonwealth Weather Bureau at Melbourne has sent away about ten members of its staff in connection with the war and is unable any longer to spare the skilled meteorologist who has been stationed at Macquarie Island. New Zealand has contributed towards the support of the station, which has proved of the utmost importance in the investigation of weather conditions in the Southern Hemisphere. For this reason it is considered to be rather a pity that the station has to be closed at the present time, especially as Sir Ernest Shackleton's expedition is still in the south, and the Macquarie Island plant would have been a most important link in co-ordinating Antarctic conditions with those experienced in lower latitudes. Messages first began to be transmitted to Wellington from the Island on March 12th, 1912.

* * *

Australasia.

The Deputy Postmaster-General advised that wireless telegrams containing the text, "Christmas Greetings," "New Year Greetings," "Compliments of the Season," would not be accepted last Christmas at the reduced rates provided in the wireless regulations. Hitherto such messages were accepted from the public for transmission to New Zealand or to vessels equipped with the wireless apparatus registered in Australia or New Zealand, those to New Zealand being charged for at the rate of 4s. and those to vessels registered in Australia or New Zealand at 3s. each.

Australia.

According to the *Electrician* it is stated that the capital expenditure of the Australian Commonwealth's Radio Telegraph Station at Canberra will be about £18,500.

* * *

China.

China is preparing to install a chain of wireless telegraph stations all along her north-western frontier and in alignment with the Great Wall. In the days when the wall was a real rampart of defence, messages of danger were flashed from it by beacons across hundreds of miles of country. The station of most interest to Britain is that in Shansi, being located at Ningwu-fu, which stands just inside the Great Wall west of the famous Yen-monn Pass, one of the four places in the wall at which the Government still keeps troops. It is a curious thought that the Great Wall of China should now be chosen as the alignment for wireless telegraphy.

* * *

Italy.

A wireless message from Rome recently stated that numerous bodies of men, women and children lost through the torpedoing of the *Ancona* have been picked up on the seashore of Pizzo in Calabria.

* * *

Morocco.

An official message from Ceuta states that at 6.30 on February 5 a hurricane carried off the roof of a building in one of the exposed posts, causing numerous victims. Telephonic and telegraphic communication was interrupted, and the wireless station was rendered useless. The latter has been repaired, and this message is the first radiogram despatched.

* * *

Pacific.

The first wireless message from the station recently completed by the French Government at Tahiti was received in San

Francisco on January 5th. The station is approximately 3,500 miles from San Francisco.

* * *

Sweden.

The Elsinore *Avis* says that persistent and well-founded reports are current that a large German warship has gone down near Fladen Grund in the Kattegat, between the island of Anholt and Sweden. It is stated that the wireless apparatus and other wreckage has been washed up on the coast of Sweden, but the name of the vessel is not known.

* * *

Tasmania.

The Federal Government has decided to improve the facilities for communicating news of vessels in distress and other shipping information by installing a wireless station on Tasman Island, which will enable the lighthouse there to keep in constant touch with Hobart. At present the only means normally available of getting messages from Tasman Island to Hobart is by pigeon post. The plant it is proposed to put up on Tasman Island will be a comparatively small one, and the main purpose for which it will be used will be for communicating with Hobart and with vessels comparatively near at hand. It will probably not solve the difficulty now sometimes found by vessels approaching Tasmania from the westward in getting into touch with the Hobart station, owing to the position of Mount Wellington.

* * *

United States.

According to the *Telegraph and Telephone Age*, the sum of 25,000 dollars was recently sent from Newark, U.S.A., by wireless money order. This sum represented the receipts from a bazaar held in Newark to raise money for the relief of the war sufferers of Germany and her allies.

* * *

On the night of December 24th last, Mr. J. Daniels, the Secretary of the United States Navy, sent a wireless telegram to all ships and naval stations of the American Navy, sending greetings to the officers and men of the service on behalf of the Navy and people.

* * *

Some weeks ago the aerial of an amateur wireless station in Astoria, Long Island, sagged and came into contact with an electric light wire during a storm. A servant in the family of the young amateur, whilst cleaning near the instruments, accidentally touched a wire, receiving the full charge of 2,400 volts. She was instantly killed.

* * *

We made mention in these columns a month or two ago of the part played by wireless telegraphy in keeping the port of Galveston, Texas, which was isolated on account of inundations caused by a hurricane, in touch with the outside world. It transpires now that in order to keep the plant which supplied the current for the wireless apparatus running, boiler water was hauled in cans from an adjacent well, and fuel oil was pumped to the plant from the storage reservoirs by belting one rear wheel of an automobile to the oil pump. A tall chimney stack was used as a wireless tower, after all the other wireless stations had been blown down, and the aerial was stretched from the top of the stack to the nearest pump, the apparatus being set up in a room in the basement.

* * *

According to the *Wireless Age*, arrangements are being made for the organisation of a Motor Cycle Corps to be added to the 13th Regiment, First Artillery of the United States Army. It is intended to have the corps composed of twenty-four listed men, who will be trained in all kinds of signalling such as heliographing, searchlight, acetylene, and wireless.

* * *

The utility of wireless has been very materially demonstrated lately. During a blizzard in the district traversed by the Delaware, Lackawanna and Western Railroad, the ordinary telegraph wires were blown down. Marconi wireless telegraph apparatus was employed for train despatching, the Hoboken, New Jersey, tower keeping in communication with the snowbound trains.

* * *

According to dispatches from Washington, wireless control from an aeroplane of a coast defence torpedo has been developed. The Navy Department has asked Congress to appropriate nearly £200,000 to acquire

the rights. Aeroplane control, navy officers explain, makes it possible for the operator to guide the radio-torpedo through the water from any height, air bubbles from the compressed air motor of the torpedo giving him a certain guide to steer it against a ship's hull.

* * *

The Bureau of Investigation of the Department of Commerce issued a special licence, known as commercial extra first-grade, to radio-operators whose trustworthiness and efficient services entitled them to confidence and recommendation. These licences are given consideration by the Civil Service Commission in examinations for positions requiring knowledge of radio-telegraphy, when experience is stipulated as a part of such examinations. Applicants for this grade of licence must pass a special examination. To be eligible for this examination they must hold commercial first-grade licences, and their certificates of skill in radio-communication must record eighteen months' satisfactory commercial service at sea or at land stations, either or both, during the two years previous to the filing of the application for examination, as shown by endorsement on the licence service records or other satisfactory evidence, and provided that the applicants have not been penalised for a violation of the radio laws and regulations. A speed of at least 30 words per minute continental Morse, and 24 words per minute American Morse (five letters to the word) must be done. The technical questions and the questions on the radio laws and regulations are considerably wider in scope than those for commercial first-grade and a higher percentage is required. All examination papers, including the code test sheets, are marked and forwarded to the Commission of Navigation with the recommendation by the radio inspector or examining officer. Examination papers are marked upon the basis of 100, and licences are recommended only for 80 or better number attained.

* * *

From the January number of the *Radio Service Bulletin* we notice that several amateurs in the Western States have been reprimanded and penalised for violation of the 15th regulation of the Act of August 2nd, 1912, for using a wave-length in excess of 200 metres for the use of fraudulent call signals and interfering with the commercial traffic being handled by public wireless telegraph stations and certain merchant ships. Several amateurs have also been reported for operating stations without proper licence in violation of the Radio Act, and the cases have been referred to the United States District Attorney for prosecution. The maximum penalty for the latter violation is a fine of £100 and confiscation of the radio apparatus unlawfully used.

* * *

During a severe sleet storm on December 29th last the antenna of the wireless station at Sayville, Long Island, was brought down by the weight of sleet. Repairs were made at once.

* * *

During an unusually severe thunderstorm at Astoria recently the marine wireless telegraph station was struck by lightning, slightly injuring the operator on duty. The entire receiving set was burnt out, and considerable work was necessary to repair it. The transmitting apparatus was but little affected. The power line transformer was damaged, and some delay was experienced before the current could be restored. Within twenty-four hours everything was in running order again.

* * *

International conferences on radio-telegraphy were held at Berlin in 1903 and 1906 and in London in 1912. We understand from an American contemporary that the next is to be at Washington, D.C. The regulations adopted have been agreed to by most of the countries of the world.

CONTRACT NOTES

The Marconi Wireless Telegraph Company of America has contracted for the erection of a new station building at Cape May, New Jersey. A tower 140 feet high will also be built.

* * *

The Inland Navigation Company of New York and the Marconi Wireless Telegraph Company of America have entered into a contract whereby the latter company will install wireless apparatus on thirty freight barges which are soon to ply upon the River Mississippi. The agreement provides for two kw. sets having a communication range of 400 miles or more Marconi operators will be supplied, and service with land stations provided as in maritime navigation.

PERSONAL PARAGRAPHS.

We notice in the list of survivors of the ill-fated s.s. *Tara*, sunk in the Mediterranean, the name of Warrant Telegraphist A. Dutton.

* * *

According to the *Boston Guardian*, news was recently received by Mr. and Mrs. Evison that their son George, who is attached to the Royal Flying Corps, is now in hospital at Cairo with synovitis. He was in the employ of the G.P.O. at Alford until last summer, when he enlisted as a wireless operator in the Royal Flying Corps and was sent out to Egypt about three months ago.

* * *

Our congratulations to Corporal Edgar James Jezzard upon his marriage with Miss M. Burnett. Corporal Jezzard joined the Marconi Company in June, 1914, as telegraphist, and upon the outbreak of war was called up to join the Forces. He has already distinguished himself in the field, being mentioned in despatches, and on December 26th last received his promotion from Sapper to Corporal. On January 25th he was able to obtain a few days' leave for his marriage, which took place on the day following at Manchester Cathedral. We wish the newly married pair a very happy future.

* * *

In an Admiralty list of appointments recently published we find the name of Mr. C. K. Chandler, lately in the Applied Science Department of the Sheffield University. From Marconi's Wireless Telegraph Company he has been appointed Sub-Lieutenant in the R.N.V.R., gazetted to H.M.S. *President* for wireless work with the Royal Naval Air Service.

* * *

David Hendry, wireless operator in the Royal Flying Corps, Mediterranean Expeditionary Force, has been wounded.*

* *

Mr. G. T. Vick, of Church End, Finchley, has received information from the War Office that his nephew, Mr. Frederick De Barr, a chief of wireless telegraphy, is missing from the *Natal*. Some mystery exists here, says the *Finchley Times*, as it was supposed that Mr. De Barr was on the *Elizabeth*, and in writing at a period ten days previous to the disaster to the *Natal* he made no mention of any transference.

* * *

The Admiralty announces that the following acting promotion has been approved for service in connection with the capture, on October 12th, 1914, of the German armed vessel *Komet*:

To be Acting-Commander, to date November 23rd, 1915:

Lieut.-Commander John Metcalfe Jackson, R.N.

The *Komet* was a small sailing vessel which had been equipped with a complete wireless installation.

* * *

Flight Sub-Lieut. Harwood James Arnold, R.N.A.S., who has been awarded the D.S.O. for his gallant conduct while observing in an aeroplane during the destruction of the German cruiser *Königsberg*, is a former resident of Bridgewater. He was for some time a wireless operator, serving at the Marconi station on Vancouver Island, B.C.

* * *

Mr. A. Harris, a member of the New Zealand Parliament, has joined the Samoan Relief Force as a wireless operator.

INDEX TO ADVERTISERS.

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The Editor will be pleased to receive contributions; and illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

CONTENTS.

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