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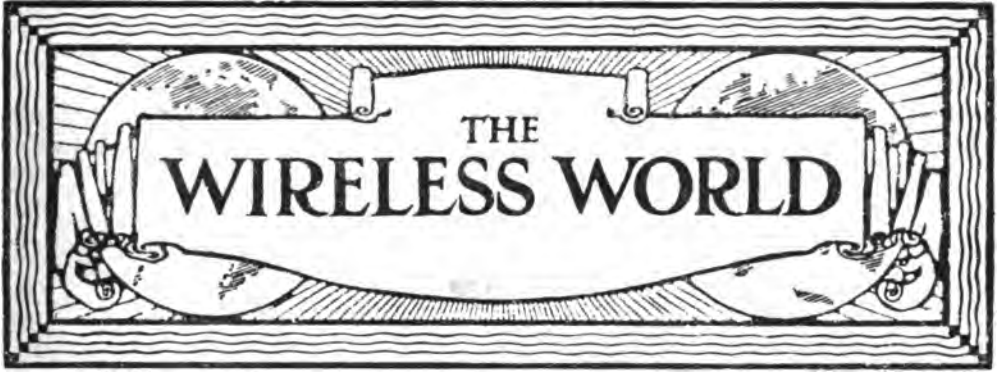
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WE have referred elsewhere and on other occasions to the fact that a very little amount of imagination would enable a thoughtful man to realise what a wonderful amount of disturbances must be going on in the æther caused by the radio waves transmitted under the stress of present conditions. Unfortunately, for the most part, during the last eighteen months, these messages have all, or nearly all, dealt with the subject of warfare and hatred. At this time of year, however, we may be certain that the æther will respond, probably in a vastly increased extent, to the pressure of waves which bear the messages started nearly 2,000 years ago, and which, despite temporary set-backs in the shape of wars and other calamities, are moving humanity, on the whole, steadily forward along the lines of progress towards Universal Love. It has for a good many years past been the habit of commanders of ships and their officers to pass along Christmas greetings to each other and to friends ashore, whilst these greetings are accompanied by all sorts of Christmas messages, which clients in increasing numbers, both afloat and ashore, entrust to this medium for transmission.

The part played by wireless so far has been to distribute military and naval orders and information and news relating to the efforts to carry into practical application rival gospels of hate. Every day sees an increase in its fields of activity, and the application of the principles of radio-telegraphy is constantly being met with in directions never heretofore contemplated. It is in this

extension of *practical* applications that we find solace for the neglect of experimental work, which has perforce been for the last eighteen months reduced to a state of suspended animation.

Moreover, it is not for nothing that the new body of aeronauts, called into being for military purposes by His Britannic Majesty's Government, have received their training in wireless telegraphy. As you extend the number of ingenious human brains at work upon a given subject so will you increase the chances of progress for that subject. This war has had the effect of multiplying manifold the number of persons professionally engaged in the practice of radio work, and the full effect of this increase will only be evident when we reckon up our accounts after restoration of peace.

We wonder whether many of our readers have heard of the pseudonym sometimes bestowed upon wireless telegraphists in the naval service. They are called "Angels," and owe that title to the winged badge which they wear upon their right forearm. A little flight of fancy is permissible even for the gravest and the most matter-of-fact amongst us at this time. May we not connect this title and the vast future possibilities of wireless telegraphy together, as a kind of prophecy that the day will come when "Angels" cease to give out messages whose object is the furtherance of destruction and fulfil the task allotted to the angels who once sang "Peace on Earth" beside a certain cradle in Bethlehem?



THE elderly man leaned back in his club chair and looked down into the street. A good dinner and a choice cigar assisted contemplation.

"A fine car, that!" he remarked, as a luxurious landaulette rolled by. "Not a sound, you notice; smooth running, speedy and comfortable. By Jove! Do you remember the first run we had in that old machine of Mackenzie's in—let me see, when was it? '96, I think."

"Yes, the beginning of 1896," replied the second clubman, smiling. "A fearful old bone-shaker, wasn't it? Eleven times we broke down in four miles. Ah, well! Improvements are always being made, and motors are being put to all kinds of uses. I see from the papers that motor-car wireless telegraph stations are being extensively used at the Front."

"Wireless on motor-cars," said the first man quietly, gazing into a cloud of blue smoke. "Wireless on motor-cars! Two things totally unknown in my boyhood. The novelty of motor-cars has long since passed. Wireless telegraphy is still looked upon as new, but I suppose that it, too, will soon be considered as nothing marvellous. Yet who thought of wireless telegraphy on motor-cars when we went for our first motor ride in '96?"

"I dare say Mr. Marconi and his assistants thought of it," replied the second man. "Wireless telegraphy is a good deal older than you seem to think. Do you know that Mr. Marconi came to England just at the time the old Locomotive Act was repealed, and motor-cars were first allowed to run—if they could!—without a man carrying a red flag in front?"

"No! Really? I had no idea he had been here as long as that. My word, how time flies! Now tell me, what did Mr. Marconi actually do when he first came to England?"

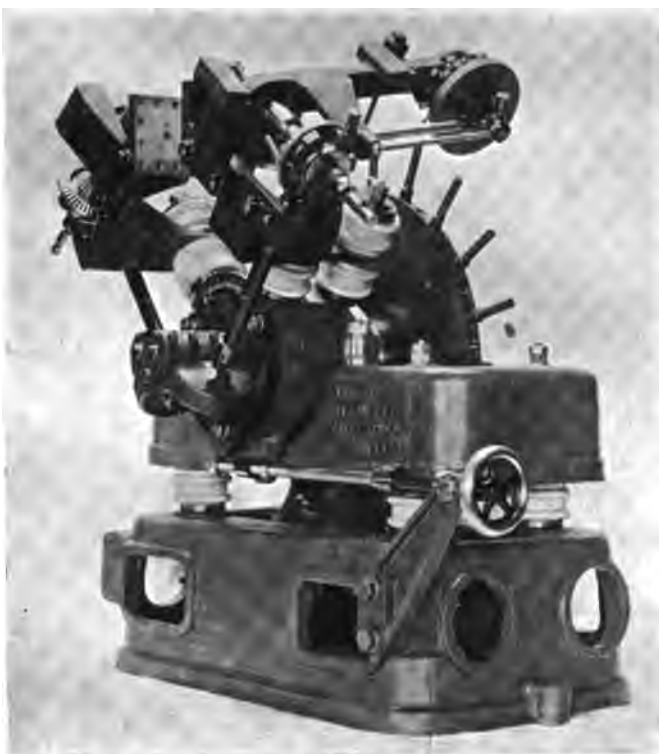
"Well, I don't know much about wireless myself, but there's a man from Marconi's in the club here, whom I know very well. I'll see if I can find him and introduce you."

After a brief absence the second Clubman returned with the Man from Marconi's. The Elderly Man was forthwith introduced, and the three chose comfortable chairs by the Smoke Room fire, whilst a silent-footed attendant brought three glasses, a bottle and

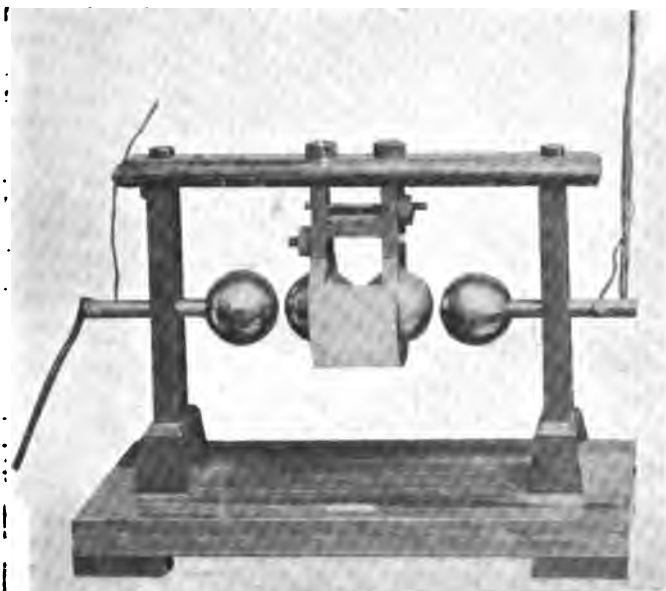
a syphon. Three columns of blue smoke now mingled in the air. After some small talk the Elderly Man turned to their newly-arrived companion.

"Major Smithson was just talking of the early days of wireless," he remarked. "I had no idea that Mr. Marconi had been with us so long. Those first days must have been extremely interesting!"

"Yes, they were certainly interesting!" answered the newcomer, with a far-off look in his eyes. "Interesting and also exciting. I remember the scepticism with which our claims were regarded, and the condescension shown by many men of science towards the youthful Italian. And then, as progress was made and the invention turned out to be really important, I recollect the petty jealousies of people who were angry because they had not themselves thought of it all before. But that was the unpleasant side. We had our happy hours in plenty, such as when first signals were transmitted over a mile or two on Salisbury Plain. When I think of the great wireless stations of to-day, with their giant steel masts and miles of aerial wire suspended hundreds of feet above the ground; their great boiler rooms, with stokers feeding the flames of roaring furnaces; the humming turbines and dynamos which produce the current, and the whirling discs with their dazzling blue-white sparks, I cannot help smiling at the old apparatus we used to carry about with us from place to place in wooden boxes.

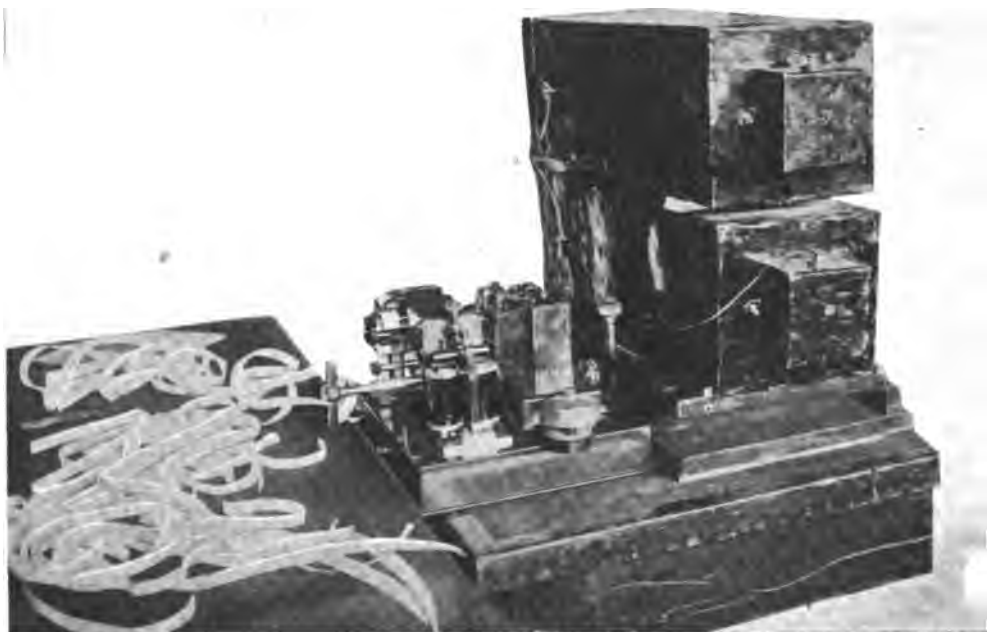


Modern Rotary Discharger.



Early Form of Discharger.

But that was the unpleasant side. We had our happy hours in plenty, such as when first signals were transmitted over a mile or two on Salisbury Plain. When I think of the great wireless stations of to-day, with their giant steel masts and miles of aerial wire suspended hundreds of feet above the ground; their great boiler rooms, with stokers feeding the flames of roaring furnaces; the humming turbines and dynamos which produce the current, and the whirling discs with their dazzling blue-white sparks, I cannot help smiling at the old apparatus we used to carry about with us from place to place in wooden boxes.



Early Tape Recorder and Coherer Set.

We used flag poles or anything else of convenient height, to suspend our aerial wires then, but later, of course, we built special masts, and now, as you may know, we construct masts of any required height from sections of steel."

"When was the Marconi Company formed?" enquired the Elderly Man.

"The first Marconi Company came into existence under the name of the 'Wireless Telegraph and Signal Company, Limited,' in 1897," replied the Man from Marconi's. "Somewhat earlier in the year we had successfully transmitted signals across the Bristol Channel, up to a distance of about nine miles. A couple of months after the Company was formed Mr. Marconi managed to establish communication over a distance of 34 miles, which, of course, marked a big advance.

"The first big achievement was, of course, the transmission of messages across the English Channel. This happened in March, 1899, with apparatus fixed up at the South Foreland Lighthouse and Wimereux, near Boulogne."

"What apparatus did Mr. Marconi use in those days?"

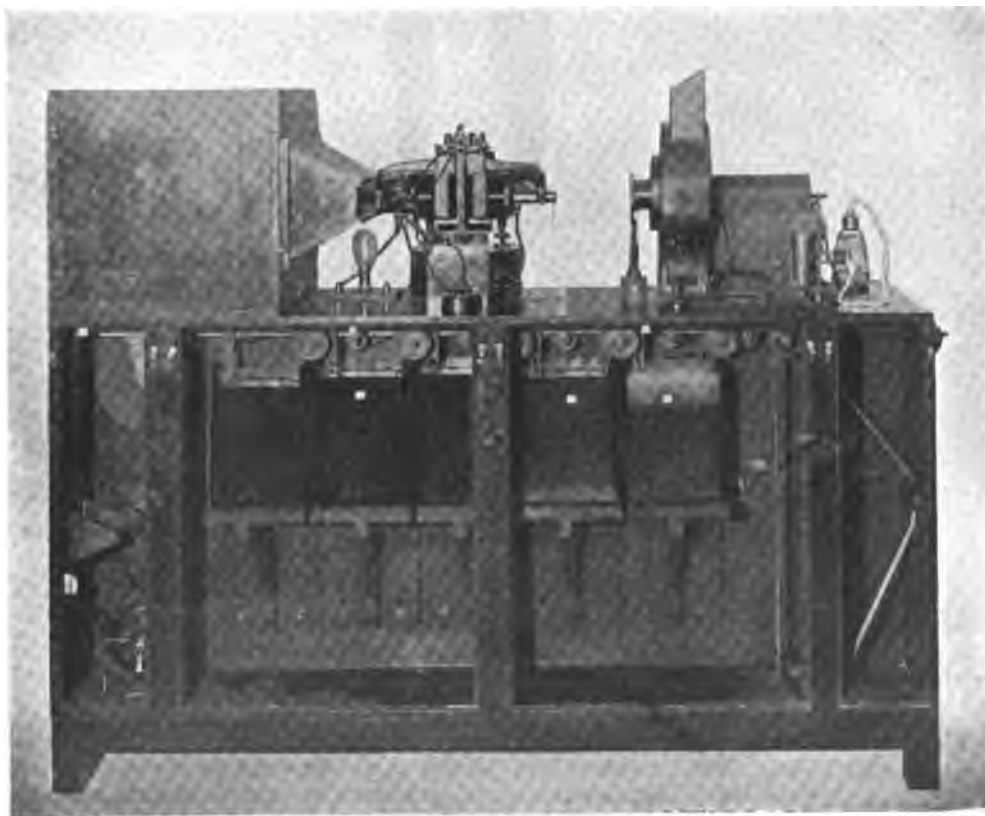
"Well, it was very simple compared with the elaborate mechanism to be found in a modern wireless station. The aerial wire was merely ordinary electric lighting cable attached to an insulated metal canister or sheet of netting at the top of the mast. The transmitter was nothing but a large induction coil with a make and break key in circuit. The receiver contained a coherer, relay, dry cells and a Morse Inker which recorded the signals on paper tape. The whole outfit would easily fit on an ordinary dining-room table."

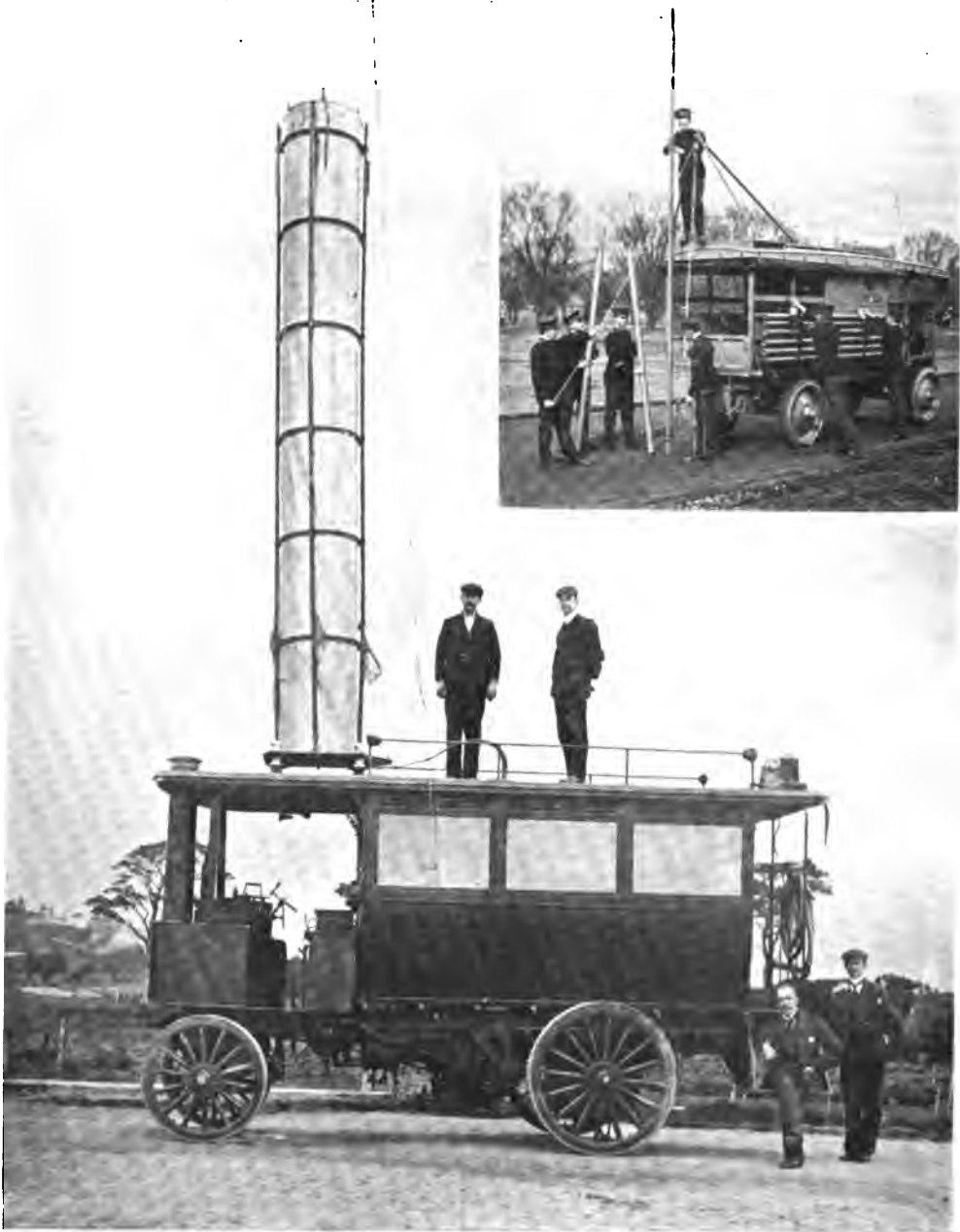
"You speak of tape," said the Elderly Man. "The last time I was on board ship the Operator told me that it was not possible to record the signals satisfactorily. I understood that there was trouble from interference and something he called 'atmospherics.'"

"Well, as far as ordinary ship working goes his statement was correct," answered the Man from Marconi's. "The position with regard to recording is this. The early

apparatus of which I have been speaking was, compared with the modern, very insensitive. In good conditions, when atmospheric electricity caused no false signals, the receiver yielded good readable messages in Morse characters on the tape. If there chanced to be atmospheric trouble, such as near or distant lightning flashes, or other similar electrical disturbances in the atmosphere, false signals mingled themselves with the true signals and the record became unreadable. Also, if another station happened to be working at the same time the two sets of signals would become inextricably mixed. The invention of tuned or synchronised apparatus by Mr. Marconi eliminated to a large extent this last trouble, and lessened the atmospheric bother, but there still remained a good deal to contend with after this. A little later much more sensitive receivers were invented, but these, unlike the coherers, were unable to give enough current to work

the relay, and were used with telephone receivers, in which they gave a buzzing noise. As soon as telephonic reception came into use a great advantage showed itself. It was found that the operator could distinguish readily by sound between the noise caused by an atmospheric discharge and that given by a wireless station. In many cases, too, it was possible to pick out the station wanted from those which quite unintentionally were interfering. Again, the operator was able to write down the message word for word as it was received, and so no time was lost. When it was decided at an international conference that only two wave-lengths were to be used by commercial ship stations many of the advantages of tuning were lost, however, and while the operators had not much difficulty in mentally selecting the station they wished to hear owing to its having a slightly different sound, the jumbling of signals in recording apparatus quite precluded the use of tape.





One of the First Motor-car Installations (Senatore Marconi standing at rear, with Dr. Fleming seated). Inset: Modern American Motor-car Station.

“ During the last few years the receiving apparatus has been perfected, and now it is possible to record even weak signals when it is thought necessary, but the apparatus is

very complicated and unsuited for use on board ship. On large trans-ocean stations where automatic transmission and reception are used, recording apparatus is frequently

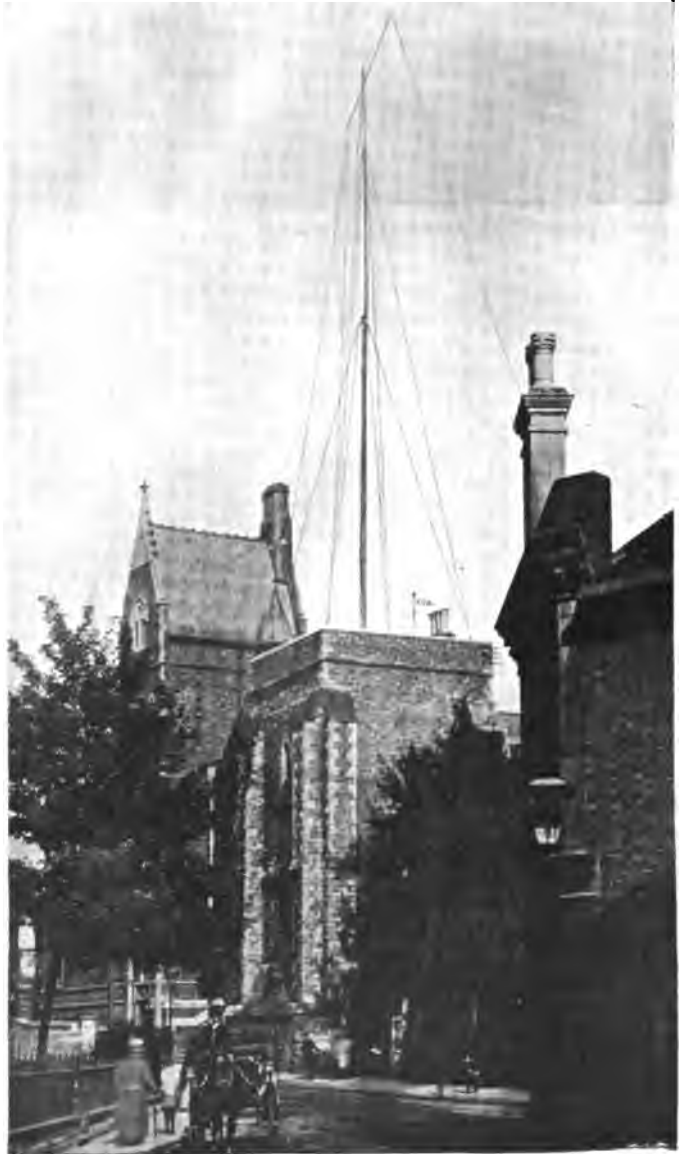
installed and is capable of receiving messages at a very high rate of speed—far higher than is possible without the use of automatic apparatus.”

“Tell me, in what way does a modern short-distance wireless station differ from those first put up?”

“Well, perhaps the most important difference is that the transmitters and receivers are tuned; that is to say, a pair of stations working to one another on one adjustment will not interfere with another pair working on a different adjustment. A good example of the value of tuning is afforded by the working of the high-power station at Poldhu, which sends out the news each night to ships at sea. At the proper hour each operator who has to receive the news tunes up his apparatus to Poldhu’s adjustment and can then hear nothing but that station, notwithstanding the fact that many other stations well within his range are working their ordinary traffic on a different adjustment.

“Then again, the modern station has apparatus which is far more sensitive; that is to say, with a given power at the transmitter, signals can be read over far greater distances now than in the early days. Efficiencies also have gone up all round, so that the wastage of power has been cut down very considerably. The coherer, with its complicated tapping mechanism, relay adjustments and the like, and the cumbersome Morse inker, have long since disappeared,

to be replaced by a neat box with ebonite facing and top, studded with many terminals and handles. A pair of small telephone receivers fixed to a head-band are worn by the operator, his two hands thus being free for writing and adjustment of the instruments. The transmitting key on which he sends the dots and dashes is no longer an unwieldy piece of apparatus difficult and



Wireless Mast at Dover Town Hall, 1899.



Modern Steel Wireless Masts, Aranjuez.

slow to manipulate, but is designed for speedy and comfortable working without risk of shock. Where large and dangerous currents have to be broken the operator's key works a relay key which handles the main working current. The transmitter is now no longer a large spark coil with a vibrating spring interrupter, but an alternating current machine with a transformer and a battery of condensers similar in principle to the old Leyden jar. The spark which used to deafen us and which at first occurred between the knobs of the induction coil, is now placed in a silencing box where it takes place between rotating studs and yields a note which resembles that of a flute, except no one but a giant could raise so much noise from a flute!"

"The Marconi staff must be pretty large now!"

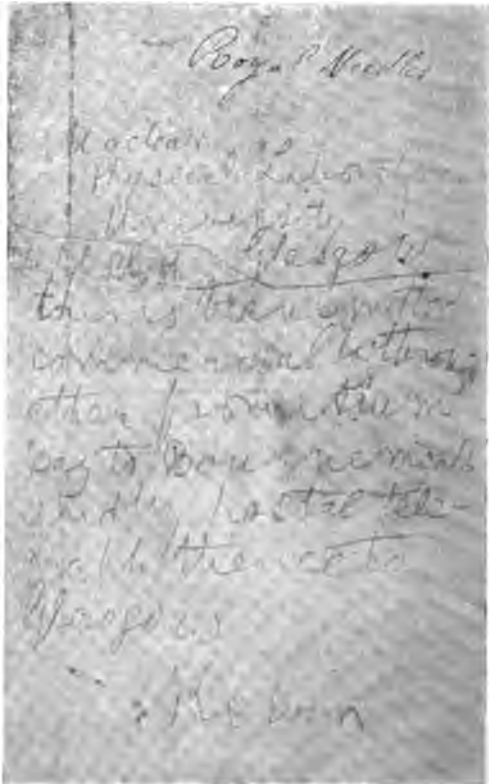
"Yes, it can well be called that. In the operating side alone there are two or three thousand young men at work in different parts of the world, and the combined engineering staffs of the associated companies must reach a very high figure. At the works at Chelmsford there is also a large staff, whilst if we include all the clerical staffs there must be quite an army."

"When was the first wireless message sent? I don't mean the first tests and so on, but the first message that was accepted on a commercial basis."

"The late Lord Kelvin was the first man

to send a paid wireless message. This telegram is still preserved by the Marconi Company and it was shown to me only the other day, together with one from Lord Tennyson to his son at college. These marconi-grams were transmitted from a station erected at the Needles, Isle of Wight, to a similar station at Bournemouth, fourteen or fifteen miles away. This happened in June, 1898, and shortly afterwards a wireless installation was fitted up on the Royal Yacht Osborne. By means of

this and another set of apparatus at Ladywood Cottage, Osborne, Queen Victoria was



The First Paid Wireless Message, sent by Lord Kelvin in 1898.



**STAFF OF THE WIRELESS TELEGRAPH AND SIGNAL COMPANY, LTD.,
IN 1898.**

Large portrait (left), Mr. (now Senator) Marconi; large portrait (right), Col. H. Jameson Davis (first Managing Director); top row (left to right), Messrs. T. Bowden, A. A. Cahen, Dr. Erskine-Murray, Mr. Elliott; extreme left, Mr. G. L. Bullocke; extreme right, Mr. W. W. Bradfield; in centre (top), Mr. G. S. Kemp, (below) Mr. Glanville; bottom row (left to right), Messrs. H. W. Allen, C. E. Rickard, J. Cave, P. W. Paget.

kept in communication with the Prince of Wales—afterwards King Edward, you know—who was ill at the time.”

“So wireless telegraphy in England has served under three sovereigns already—Queen Victoria, King Edward and King George? I’m sure many people do not realise the fact. Some of my financial friends in the City constantly make use of the Marconi Transatlantic Service and have expressed their high appreciation of it—in fact, several have stated that it is better than the Cable Service. This, with a saving of 4d. a word, comes as a consideration in modern business.

“Yes, the transatlantic business is growing

very large. Of course it has taken years of painstaking and costly experiment to evolve the present commercial service. It is just fourteen years since Senatore Marconi crossed to Newfoundland with kites, balloons and other apparatus for the purpose of attempting to receive signals from the then new station at Poldhu. The assistants who had been left behind were instructed to send the letter ‘s’ at short intervals until the programme was completed. You can easily imagine the excitement and suspense in Cornwall, where the Poldhu station lay miles from anywhere, and the assistants, fighting with sleep, kept



An Early Wireless Cabin on Board Ship.

sending the three dots which form the letter 's,' and the little building nestling at the foot of the ring of masts almost shook with the crash and roar of the blinding spark. And the tension was no less exhausting in Newfoundland, where Senatore Marconi and his little group of helpers struggled with the great kites which held aloft the tall wire forming the aerial. At last, after anxious waiting, the three dots were distinctly but faintly heard, and the Atlantic was bridged for the first time by the ether waves."

"But the transatlantic work is not now carried out between Cornwall and Newfoundland, is it?"

"No. After the experiments were completed arrangements were made to build a large station in Nova Scotia, at Cape Breton Island. This station is known as "Glace Bay," and was built at the special request of the Canadian Government. Still later a special transatlantic station was constructed at Clifden, County Galway, and now these two stations are given

up to this work alone. As soon as the war is over new stations at Carnarvon and New Jersey will be opened, thus giving direct communication between England and the United States."

"What is this I heard about wireless communication being best at night? Someone told me that the big distances which can be traversed at night cannot be achieved in daytime. Is this so?"

"It is true to some extent, but not entirely. Working on what we call short wavelengths, as ordinary ships do, much longer distances are sometimes, but by no means always, covered at night. Take, for instance, a ship which has a normal range of two hundred and fifty to three hundred miles. In certain conditions at night her range may reach two thousand miles, and quite frequently in southern waters, such as the Indian Ocean and South Pacific, ships will easily send and receive messages over a thousand miles during the dark hours. Strangely enough such conditions rarely prevail on the North Atlantic. No real

explanation has been found for these "freak" communications, as they are called. When you come to deal with long wave-lengths, such as those used by the great trans-ocean stations, this difference between day and night ranges is not nearly so marked, and in fact daytime signals across the Atlantic between Ireland and Nova Scotia are frequently stronger than the night signals. There is certainly no truth in the statement sometimes made that all the transatlantic work is done at night."

Major Smithson, who had been enjoying his cigar and listening to the conversation without making much contribution to it, now took up the interrogation.

"It's very good of you to sit and let us question you in this way, but really it is so seldom one meets an expert that you must pardon the liberties we are taking. Now I'm interested in the military side of wireless, as you know. I see from the papers that extensive use is being made of wireless telegraphy on all the fronts. This is the first time that wireless has been used in actual warfare, isn't it?"

"Oh, no! In the Balkan imbroglio all the belligerents made good use of it on land

and sea. The Italians in the Tripoli campaign found it very useful, and in the Russo-Japanese War some use was made of this form of communication. It may surprise you to hear that so far back as 1899 the War Office adopted Marconi apparatus for use in the field in South Africa, and six of the Marconi staff went out there with the apparatus. Satisfactory results were obtained, too, which is remarkable when we consider how young wireless was in those days!"

"That's one against you, old man!" said the Elderly Man to the Second Clubman. "You caught me in the beginning over motor-cars and wireless, now you have been caught over field sets!"

"Oh, well, that's one each!" replied the Second Man, smiling. "I'm sure most of our fellows would be caught in the same way. It's very instructive to compare the old and the new in a science, even if the 'old' is but twenty years of age, eh?"

"Yes, one gets a much better perspective that way," replied the Man from Marconi's. "We speak of wireless being in its infancy, but perhaps we might better say 'in its boyhood,' for there are many young wireless operators who were born in the year that



Marconi Modern Transmitting Apparatus on a Spanish Battleship.



Senatore Marconi seated by 15 k.w. Installation.

Senatore Marconi came over here, and I suppose they would object to be called infants !”

“ Suppose they would,” said the Captain, and then the conversation drifted off into another channel.

The Measurement of Decrement

By W. H. NOTTAGE, B.Sc.

IF electric oscillations be set up in a suitable circuit by any means, such as the discharge of the condenser across a spark gap in the circuit or by induction from a second oscillating circuit, it is found that the amplitude of the oscillations continually diminishes until they at length cease, except where the source of the oscillations is *continuously* supplying fresh energy to the circuit, as in the case where a continuous wave producer is acting on it.

This decrease in the amplitude of the oscillations is due to the loss of energy in the circuit either through its ohmic resistance or by the transfer of some of the energy to another circuit by induction, or to the ether by radiation.

A knowledge of the rate of this decrease in the amplitude of oscillations, therefore, gives valuable information as to the losses in the circuit.

The curve of Fig. 1 represents the current wave form of a train of oscillations in a circuit, the ordinates K_1Q_1 , K_2Q_2 , etc., giving the maximum value of the amplitude for each half wave.

In a circuit which does not contain a spark gap such as an aerial or a closed non-radiating oscillatory circuit it can be shown, both by theory and actual experiment, that the logarithm of the ratio of the successive maximum values is a constant quantity, which is denoted by δ or d , and is termed the logarithmic decrement of the circuit.

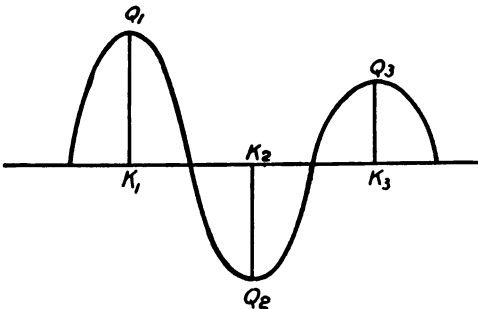


Fig. 1.

The logarithms are those termed natural, Napierian or hyperbolic logarithms, which occur in many mathematical functions and investigations, but it is to be noted that, since the natural logarithm of a number is 2.3026 times the common logarithm, the common logarithm of the ratio gives the same value of δ .

Thus --

$$\delta = \log_e \frac{K_1Q_1}{K_2Q_2} = 2.3026 \log_{10} \frac{K_1Q_1}{K_2Q_2}$$

This definition of the decrement is that used by British authors. Continental and American authors, however, define the decrement as the logarithm of the ratio of two successive maxima in the same direction--i.e.,

$$d = \log_e \frac{K_1Q_1}{K_3Q_3}$$

which gives a value twice that given by the formula quoted in the last paragraph. This fact must be kept in mind.

If we can measure the ratio of successive maximum amplitudes we obtain the logarithmic decrement of the oscillations in the circuit.

This, although possible in many cases, is not so convenient a way of determining decrement as the following method, which is almost universally used.

If a closed oscillatory circuit be brought near a circuit in which oscillations are taking place it will have oscillations induced in it, and the R.M.S. value of the current due to these oscillations may be measured by suitable instruments.

The strength of the induced current will vary with the coupling between the circuits, and the relative wave-lengths to which they are tuned.

If the measuring circuit be kept at a fixed distance and position with respect to the oscillating circuit, the coupling will be constant, and by varying its natural wave-length a curve may be plotted of the current induced in it for various wave-lengths.

It will be found that the maximum current is obtained when two circuits are



Marconi Long-wave Decremeter and Wavemeter.

adjusted to the same wave-length or are "in resonance."

From this curve the combined decrements of the oscillating and measuring circuits can be calculated by a method due to Bjerknes, the formula being

$$d_1 + d_2 = \pi x \sqrt{\frac{J_1^2}{J_m^2 - J_1^2}}$$

where

d_1 = decrement of the oscillating circuit.

d_2 = decrement of the measuring circuit.

J_m = current in the measuring circuit at resonance.

J_1 = current in the measuring circuit when tuned to another wave-length which does not differ more than 5 per cent. from that of the oscillations.

The quantity x is the value of the expression $(1 - \frac{n_1}{N_\gamma})$ where N_γ is the frequency of the oscillations and also of the measuring circuit at resonance n_1 is the frequency to which the circuit is tuned when out of resonance.

The formula is only true when x is small — i.e., not greater than .04 or .05: for this case, since the wave-length is inversely proportional to the frequency, we have

$$x = (1 - \frac{n_1}{N_\gamma}) = (1 - \frac{\lambda_\gamma}{\lambda_1})$$

where λ_γ = wave-length at resonance and λ_1 = wave-length of circuit when out of tune.

If the decrometer circuit be tuned to these two frequencies or wave-lengths by a change

in the inductance keeping the capacity constant, then

$$\text{since } \lambda_\gamma = 1885 \sqrt{L_\gamma C_\gamma}$$

$$\lambda_1 = 1885 \sqrt{L_1 C_\gamma}$$

$$x = 1 - \frac{\sqrt{L_\gamma}}{\sqrt{L_1}} = \sqrt{\frac{L_1 - L_\gamma}{L_1}}$$

which is approximately equal to $\frac{1}{2} \frac{L_1 - L_\gamma}{L_1}$

for the range of x for which the decrement formula is correct.

If a complete resonance curve be plotted the total decrement can be calculated, using a number of values for the difference in frequency or wave-length, and the mean taken; but in actual practice this method is found to be inconvenient, as it is very difficult to keep the oscillations at a constant intensity for a sufficient length of time to enable the complete curve to be plotted.

In the Marconi Decrometer the following method is used for taking sufficient readings to calculate a decrement quickly.

The instrument consists of an inductance coil, by which it may be coupled to the oscillating circuit, and a variable condenser by which its wave-length can be adjusted to that of the oscillations.

A small inductance is contained in the instrument and so connected that by means of a key it is cut out of the circuit when the key is depressed, being in circuit when the

key is up. A change-over switch is provided so that these operations can be reversed.

The value of this inductance is such that on cutting it out of circuit the wave-length to which the decimeter is tuned is reduced by a known amount, about 4 per cent.

On reversing the switch and again tuning to the wave-length of the oscillations the decimeter wave-length is increased by 4 per cent. on depressing the key.

The currents for the resonance wave-length when the instrument is 4 per cent. out of tune can, therefore, be very quickly obtained and the decrement calculated from the above formula.

It is necessary to measure the decrement of the instrument in order that it may be deducted from the total value obtained.

For an instrument such as a decimeter the whole of the loss of energy (to which its decrement is due) is caused by the ohmic resistance of its coils with any measuring instrument such as a thermo-junction or sensitive hot wire ammeter used to measure the current. Any losses in the condenser will increase the decrement, but these are always small compared with those due to resistance.

The decrement of a circuit with a total resistance R is given by $d = \frac{R}{4nL}$, where the quantities are in absolute units and n the frequency of the oscillations and

$$d = \frac{8.33 R \lambda}{L} \times 10^{-4};$$

or $\frac{R \lambda}{1200 L}$

for resistance in ohms, inductance in microhenries and wave-length in metres. The inductance of the coil can be measured and its value supplied with the instrument. The resistance is that for oscillations of the actual wave-length in use, which is always larger than, and sometimes several times, the continuous current value.

If a fine wire of such a diameter that its high frequency does not differ appreciably from its continuous current value be connected in the circuit, the latter may be measured and the decrement due to it calculated from the above formula. The total decrement of the circuit can be obtained

exactly as in the first case, so that we have

$$d_1 + d_2 + d_3 = \pi x \sqrt{\frac{J_1^2}{J_3^2 - J_1^2}}$$

where d_3 = additional decrement due to resistance and J_3 is the current at resonance and J_1 the current at the other wave-length.

The value of d_2 , the decrement of the decimeter, is calculated from

$$d_2 = \frac{Y d_3}{\left(\frac{J_m}{J_3}\right) Z - Y}$$

where

$$Z = d_1 + d_2$$

$$Y = d_1 + d_2 + d_3$$

and J_m, J_3 are the currents at resonance for the two cases.

For measuring the current in the decimeter circuit a sensitive thermo-junction and portable galvanometer may be used, but in one pattern of the Marconi Decimeter another method is used, which, although perhaps not so accurate, allows the decrement to be read directly on a scale. This method is as follows:—

In series with the main coil L_1 and detuning coils L_2 , described above, another inductance, L_3 is connected. This consists of from 30 to 60 turns of bare wire, wound in an open spiral on a long ebonite former. A sliding contact is provided, the pointer of

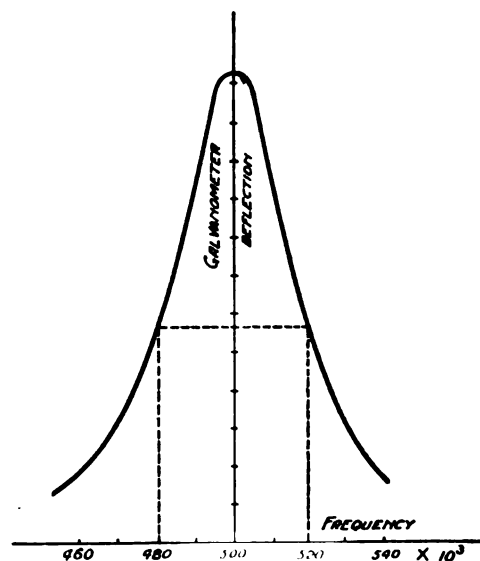


Fig. 2. Digitized by Google

which moves over a graduated scale. An ordinary carborundum crystal and head telephones are used.

The instrument is first tuned up to the wave-length to be measured, just as a wave-meter. On now depressing a key provided, the instrument is thrown 4 per cent. out of tune, as previously described, and the carborundum crystal is tapped off the whole of the inductance. When the key is normal the crystal is tapped off a variable number of turns, according to the position of the sliding contact, which is moved till the sound in the telephones for these two cases is the same. When this is so the current through the crystal, and hence the voltage across the respective turns of inductance in the two cases, is the same. A table supplied with each instrument gives the value of the total decrement for each scale division.

Any wave-meter can be used as a decremeter if a thermo-junction or sensitive hot

wire ammeter can be inserted in its circuit. The Fleming cymometer, for instance, is provided with a special fitting for this purpose.

In using a thermo-junction and galvanometer it must be noted that, since the galvanometer deflection is proportional to the heating effect of the current which passes through the heater of the junction, and this heating is proportional to the square of the current, the deflections of the galvanometer are proportional to the squares of the current in the measuring circuit, hence the ratio

$$\sqrt{\frac{J_1^2}{J_\gamma^2 - J_1^2}} = \sqrt{\frac{D}{D_\gamma - D}}$$

where D =deflection of galvanometer. Where other forms of hot-wire instruments are used, if especially intended for the purpose, the scales are frequently divided so as to read the squares of the current directly.



Marconi Direct-reading Portable Decremeter.

It can be seen from the formula

$$d_1 + d_2 = \pi x \sqrt{\frac{J_1^2}{J_{\max}^2} - J_1^2}$$

that if instead of keeping x or $\frac{\lambda\gamma - \lambda_1}{\lambda\gamma}$

constant, we keep the ratio $\frac{J_1^2}{J_{\max}^2}$ constant the sum of the decrements is proportional to x . If, for example, we make $J_1^2 = \frac{1}{2} J_{\max}^2$, we obtain $d_1 + d_2 = \pi x$.

Hence, if instead of altering the wave-length by a fixed percentage we alter it by such an amount that the square of the current is half its value at resonance the decrement is proportional to π times the amount out of tune.

Keeping the inductance of the decremeter constant and varying the capacity, we have

$$\frac{n_1}{N_\gamma} = \frac{\sqrt{C_\gamma}}{\sqrt{C_1}}$$

where C_γ = capacity of the condenser at resonance and C_1 when out of tune.

Therefore

$$\left(J - \frac{n_1}{N_\gamma}\right) = \frac{\sqrt{C_\gamma} - \sqrt{C_1}}{\sqrt{C_1}}$$

which is equal to $\frac{C_1 - C_\gamma}{2C_1}$.

(See *The Wireless Telegraphist's Pocket Book*, page 182.)

Therefore if the capacity of the condenser is known for all points of its scale, the decrement can be determined by noting the scale readings for the maximum galvanometer deflection and for the point when the deflection is proportional to $\frac{1}{2} J_{\max}^2$.

The decrement is then given by

$$d_1 + d_2 = \frac{\pi}{2} \frac{C_1 - C_\gamma}{C_1}$$

By making the condenser vanes of a special form, so that, instead of the capacity increasing by an equal amount for each scale division (as it does for the ordinary semicircular vane condenser), it increases by a constant percentage of the capacity at that point, then the decrement is proportional to the number of scale divisions of the condenser between the points which give J_{\max}^2 and $J_1^2 = \frac{1}{2} J_{\max}^2$.

This principle is used in the Kolster decremeter described in the *Bulletin of the Bureau of Standards*, U.S.A., vol. 11, No. 3.

As an example, we will calculate the value

of the decrement of the resonance curve shown in Fig. 2.

The ordinates represent the deflections on a galvanometer in circuit with the thermo-junction of the decremeter, and are therefore proportional to the squares of the actual current in that instrument.

The wave-length at resonance is 600 metres, for which the frequency is 500,000. The deflection at resonance = 12.3, and at a frequency of 480,000 = 5.7. Hence

$$d_1 + d_2 = \pi \left(1 - \frac{480,000}{500,000}\right) \sqrt{\frac{5.7}{12.3 - 5.7}} \\ = \pi (0.4) \sqrt{\frac{5.7}{6.6}}$$

which gives $d_1 + d_2 = .117$.

To separate the decrement of the circuit from that of the decremeter we require to know the inductance of the latter, and also the amount by which the maximum deflection is reduced when a known resistance is inserted in the circuit.

Assume the inductance to be 50 microhenries and that the maximum galvanometer deflection is reduced from 12.3 to 8 when a resistance of 3 ohms is connected.

The extra decrement due to this resistance is given by

$$d = \frac{R\lambda}{1200L} = \frac{3 \times 600}{1200 \times 50} = .03.$$

We can now calculate d_2 from the formula

$$d_2 = \frac{Y d_1}{\left(\frac{J_m}{J_s}\right)^2 Z - Y}$$

where $Y = d_1 + d_2 + d_3 = .117 + .03 = .147$

$$d_2 = \frac{.147 \times .03}{\frac{12.3}{8} \times .117 - .147} = \frac{.00441}{.180 - .147} \\ = \frac{.00441}{.033} = .13.$$

Therefore $d_1 = .104$.

In addition to circuits of the type discussed in the previous paragraphs—i.e. circuits which do not contain a spark gap and in which oscillations of only one frequency are flowing—it is of course important to know the decrement of circuits which include spark gaps, and also of coupled circuits where the oscillations have the two coupled wave-lengths.

With regard to circuits which contain a spark gap, an important paper by Mr. J. S.

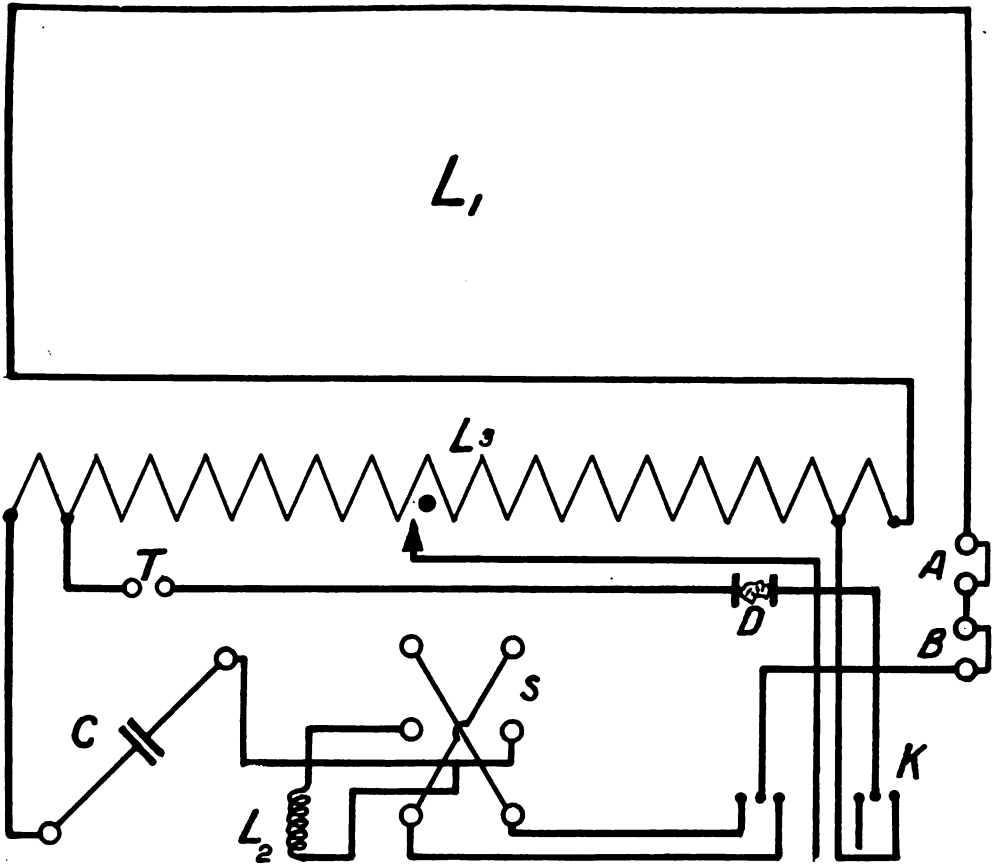


Fig. 3.

DIAGRAM OF CONNECTIONS OF THE MARCONI DECREMETER

L_1 =main inductance; L_2 =detuning inductance; C =condenser; S =change over switch; K =double pole key; A B =terminals for thermo-junction and resistance; L_3 =inductance with sliding contact; D =crystal; T =telephone terminals.

Stone will be found in the *Proceedings* of the Institute of Radio Engineers, vol. ii, No. 4, December 1914, where he points out that the initial resistance of the spark gap is large compared with the ohmic resistance of the conductors forming the circuit, or at least is comparable thereto.

The resistance of the spark is not constant, but increases as the current flowing across it decreases; and due to this the oscillations in the circuit have a decrement which does not follow the logarithmic law. In this case it is the difference between the successive maximum amplitudes which is constant -i.e. $J_1 - J_2 = \text{constant}$.

It is not, therefore, possible to obtain the theoretically correct value of the decrement of such circuits by the method described,

but as there is no other convenient method available, it may be used for obtaining data by which such circuits may be compared among themselves.

For coupled circuits in which the two wave-lengths are so far apart that the resonance curve has two distinct peaks, the decrement for each of them may be calculated in the usual way. Where the two waves are close the distance between the peaks is smaller, and it will not be possible to obtain such accurate measurements as in the other cases. The actual decrement is also larger than that obtained by the usual calculation (see Fleming's *Principles of Electric Wave Telegraphy*, 2nd edition, page 291, which describes a method for obtaining the decrement of such circuits).

Digest of Wireless Literature

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

SCIENCE AND THE WAR.

In an introductory lecture delivered at University College in October, Dr. Fleming gave many interesting particulars of the scientific aspect of the present conflict of nations. Turning to the application of science in the great war, said Dr. Fleming, we can mention four chief departments of it under the headings—Chemical, Mechanical, Electrical, and Physical, which cover such appliances as high explosives, aeroplanes, dirigibles, submarines, wireless telegraphy, and range-finders. The lecturer went on to say that he would not attempt to discuss the details of a fraction of all these applications, but just touch briefly on two departments which happened to occupy his own attention during the vacation—viz., range-finders and wireless telegraphy from aeroplanes. He then described the various methods of range-finding, and the principles on which they are based. Coming to wireless telegraphy in connection with aeroplanes and airships, Dr. Fleming said that this was another marvellous application of science to war. The difficulties connected with it are however considerable, and it has greater limitations than the uninitiated would suppose. In the case of aeroplanes, the first of these is the weight of apparatus. The military aeroplane is already loaded to its fullest extent. In addition to the pilot and observer and the bomb ammunition, it carries in nearly all cases some gun equipment. Hence any wireless apparatus must be made as light and compact as possible. A wireless transmitter of the so-called spark type involves three elements: (1) Some source of electro-motive force, such as a battery or dynamo; (2) an induction coil or transformer for creating a high electric potential or pressure; and (3) some form of condenser or Leyden jar which is charged and discharged across a spark-gap, thus creating rapid movements of electricity called electric oscillations. These oscillations

are then caused to create others in a long wire called the aerial wire.

In the case of aeroplanes and airships, the source of electromotive force is generally a small dynamo or alternator which is coupled to the engine, and the voltage or pressure is raised to 30,000 volts or so by a small transformer sealed up in oil in a box. The condenser consists of metal plates, sandwiched between sheets of glass or ebonite, and the spark balls between which the spark passes are also enclosed. The weight of the whole apparatus has to be kept below 100 lb., and such apparatus has been designed having a weight of not more than 30 lbs. The French use a set weighing about 70 lbs. One of the difficulties is to dispose of the aerial wire conveniently and safely. It is sometimes made of aluminium and stretched on insulators carried by light supports on the wings, but the difficulty is to obtain in this way sufficient length. One plan adopted is to coil the wire on a reel, which the observer can uncoil and let it float out behind the aeroplane. The wire must be connected to the reel by a safety catch, so as to be released at once if it catches in trees or buildings. By this means an aerial wire of 100 feet in length can be employed. The observer has near his hand a key by which he controls the spark discharges, and so sets up in the aerial wire groups of electric oscillations which create electric waves in the ether and signal the message in Morse code.

In this manner there is not much difficulty in equipping aeroplanes with transmitters which will send messages 30 miles or so to a corresponding earth station. These latter are military portable motor-car or pack stations, the details of which were described in a lecture last year at University College, entitled "Wireless Telegraphy in War."

The receiving arrangements on aeroplanes comprise a head telephone, which is worn

by the observer, associated with some simple form of detector, such as a carborundum crystal, aided by which the observer hears the signals sent to him in Morse code as long and short sounds in the telephone.

The noise of the aeroplane engine and that of the rush of air renders this method of aural reception a matter of great difficulty, especially as the messages must be sent in secret code, and the observer must therefore hear every letter distinctly if the message is to be intelligible. Great efforts have been made to devise methods of reception, which shall appeal to the eye by a visual signal rather than by the ear, but the exceedingly small electric currents set up in the aerial wire by the arriving waves make this a matter of extreme difficulty, and the problem has not yet been completely solved. There is then the difficulty caused by "jamming." If the signals from an aeroplane are picked up by a hostile station, this latter at once sends out powerful but unmeaning signals, the object of which is to blur and drown out the reception or sending of signals by this aeroplane. Moreover, the sending of wireless signals by an aeroplane reveals its presence to hostile earth stations before it can be seen by the eye. Hence wireless telegraphy may be a means of revealing the enemy's scouts, and it involves a certain kind of war in the ether as well as war in the air.

In the case of airships, there are other difficulties as well, and it is interesting to note that there are special difficulties in connection with Zeppelins. These aerial monsters are, as everyone knows, constructed with a framework of aluminium containing in its interior the eighteen or twenty balloons inflated with hydrogen. Now, as we rise upwards in the air, the electric potential increases rapidly, and if a conducting body at a height gives off water drops or products of combustion it is rapidly brought to the potential of the air at the place where it is. In the case of Zeppelins, this equalisation is no doubt brought about by the escape of products of combustion produced by the engines. When the conducting body is brought down suddenly to earth again there may be a great difference of potential between it and the objects on the earth. If it is a good conductor a spark may pass, and if it is, as in the case of a Zeppelin, a conducting

body containing a highly inflammable gas, leakage of which cannot altogether be prevented, this spark may cause an explosion and destruction of the airship. Again, the violent electric oscillations created in all metal objects near powerful radiotelegraphic apparatus may cause sparks to jump between metal parts, and hence may inflame a hydrogen leak. It has, therefore, been recognised that there are special electrical difficulties in connection with the working of wireless on rigid airships with metal frames, and also in connection with the use of spark apparatus. However carefully the actual working spark is enclosed, there is always risk of induced sparks.

There is room, therefore, yet for much research and experimentation in connection with the use of wireless telegraphy on aeroplanes and airships, and the practical problems are by no means completely solved.

* * *

AMERICAN WIRELESS EQUIPMENTS.

The October issue of the *Wireless Age* includes an article on the new American Marconi Standard Equipments, which is of much value to those who are interested in comparing American with British practice. One of the new sets described consists of a 2-kw. 500-cycle installation mounted on a panel, much space thus being saved on board small coasting vessels and the like, where cabin accommodation is at a premium. The complete set consists of a transmitting and receiving apparatus and various switches and appliances for manipulating the equipment. The transmitter has all of the regulating and manipulating appliances mounted on the front of the panel, so that they are easily accessible. Means are provided so that three wave-lengths—300 metres, 450 metres, and 600 metres—can be transmitted, the change of wave-length being accomplished by throwing a switch to the desired position. The control of the switch adjusts all circuits, so that the wave-length wanted can be transmitted immediately. This enables the operator to handle traffic with a minimum amount of interference when in congested zones.

On the front of the panel is mounted a watt meter, which indicates the amount of energy consumed at the terminals on the transformer; a radiation meter, which

indicates the current flow in the aerial circuit; a motor field rheostat, which enables the speed of the motor generator to be varied; a generator field rheostat, which permits the variation of the generator voltage; an aerial inductance handle, which permits the variation of inductance in the aerial circuit and indicates the amount in turns; a wave-length switch, which permits the change of transmitted wave-lengths; a handle, which permits the variation of coupling between the closed and aerial circuits, and a low-power switch, which permits transmission at extremely low power in order to reduce interference to a minimum.

Beneath this panel is another panel which contains the quenched spark-gap. The latter panel is mounted on hinges so that it can be opened from either side for the purpose of removing and replacing the condenser jars. The quenched gap is cooled by an air blast delivered from the combined rotary gap and blower mounted on the end of the motor generator. Beneath the quenched gap is placed the starting panel, on which are mounted all the starting appliances, control switches, and protective devices. An automatic starter permits the motor to be started from a distant point by means of a single-pole switch. There are no fuses or other protective devices in the A.C. circuit, as the characteristics of the generator are such that it can be short-circuited without an abnormal flow of current. On the top of the generator are mounted the devices which protect the machine from the excessive potentials developed, due to the close proximity of the high-frequency circuits. An iron cover overspreads the protective devices and the machine terminals. The protective devices consist of six condensers, each of which has one terminal grounded on the motor-generator frame, the other terminals being connected to a terminal of the motor. The condensers have a capacity of such value that there can be no excessive rise of potential at the terminals of the motor generator. The armature shaft is extended at the generators end to permit the mounting of the rotary spark-gap. The latter is of the synchronous type, and has the same number of spark terminals as the generator has poles. The stationary spark terminals permit a discharge to take place between them and the terminals on the motor.

A convenient switch enables a rapid change to be made from the quenched to the rotary gap. When using the rotary a much looser coupling must be made between the closed and aerial circuits. The transformer, which is of the closed-core type, is enclosed in an iron case. The windings are completely immersed in transformer oil, which is solid at ordinary temperatures.

The elements of the high-frequency circuit are mounted at the back of the transmitting panel and supported on insulating rods. The inductance coils are of spiral form, and consist of an insulating slab having a spiral groove cut in one face. Into the spiral groove is fitted a strip of copper of the desired number of turns. This form of inductance has been found very convenient and economical from the standpoint of space. It also permits contact at any desired point on the spiral.

The receiver consists of a tuner with crystal detector. An antenna switch while in the receiving position throws the receiving circuits into operative condition, and at the same time opens the primary circuit of the transformer and generator field and stops the motor generator. When the switch is in the transmitting position the last-named circuits are closed, and the motor generator is started. The receiving circuits are automatically short-circuited in order to protect them from the transmitter.

Great care has been taken in designing the apparatus to provide a large factor of safety in order to do away with all causes of trouble. The equipment is complete in every detail, and only a very short time is required to install it on shipboard. In the majority of installations a storage battery is used so that the set may be operated independent of the ship's power.

* * *

WIRELESS TELEGRAPHY IN THE DARK CONTINENT.

Mr. M. E. Pelgrims, in the *Popular Science Monthly* for October, writes an instructive article on wireless in the French Colonies of Central Africa. Near Lake Tchad, says the author, seven wireless stations are in daily use, operated by the French Government. In 1911 it was decided by the French Minister of Colonies, M. Messiny, to connect the military territory of Tchad with Ouadai.

As it was impossible to run wire lines between the two territories because of the dense vegetation, the wild animals, the high cost of the miles of wire required and, most important of all, incessant wars with the natives, wireless was chosen as the most practical means of communication. It was no easy task to install the radio stations. The engineers decided to erect six stations, from 125 to 200 miles apart, and scattered throughout the Tchad district. The stations were finally built at the following points: Nguigmi, Mao, Musoro, Ati, Abeshr, Faya and Fort Lami. The first difficulties were encountered when the party, consisting of Captain Chaulard, head of the expedition, a captain of the Colonial Artillery and ex-chief of the radio service of Madagascar, a lieutenant and twenty-five men of the Signal Corps, were disembarked on the African coast and had to start on their difficult journey through the tropical forests. All the apparatus had to be carried on men's backs for hundreds of miles. Later on in the journey oxen and canoes were used on land and water to carry the materials and apparatus. The party had to be divided into two separate sections, one going by way of Lagos (Nigeria) and Zinder, and the other through French Congo, Oubanghi and Chari.

The stations to be installed consisted of two steel masts 90 feet high, a 5 h.p. kerosine motor, driving an alternator of one-thousand cycles frequency, .05 mfd. condensers, and musical note spark-gap, and other pieces of apparatus, all of which were packed in steel waterproof boxes of about 155 lb. each. One night the tent of the party was flooded and upset, and on more than one occasion they were seriously annoyed by the wild animals of the jungles.

Then came the technical troubles. The sets were first tuned to a 1,500 metre wave-length, but the results were very poor, only 95 miles being covered. The wave-length was lengthened to 3,500 metres, and 10 feet more added to the masts. This resulted in increasing the range to a trifle over 400 miles. At the present time the Fort Lami station communicates regularly with Abeshr, a distance of about 300 miles. The constructors were also handicapped by the impossibility

of securing a good ground connection at first. Finally, one of them conceived the idea of burying the steel boxes in which the apparatus had been packed, and connecting the ground wire to them. This proved to be an ideal ground, and the results were still more satisfactory.

The conquered wilderness soon avenged itself upon the invaders. The men were stricken by the malarial fever, and the lieutenant and several of the men had to be sent back to France in order to save their lives. Captain Chaulard and the other engineers, however, stuck to their posts, and while the other men were helplessly ill, he, shaking with fever himself, kept in constant communication with the other stations. This self-sacrifice nearly cost him his life on two occasions, but his courage inspired the other men, and some time later they succeeded in establishing the seventh station 250 miles northward, thus connecting Borkoo with Ouadi. Later on, when he was able to communicate between Faya and Fort Lami, a distance of about 454 miles, the French Government decided to award him the decoration of the Legion of Honour in recognition of his services.

In this manner has the French Signal Corps invaded the darkest corners of Africa and established wireless stations which permit of communication with the outside world.

KITE-SUPPORTED AERIALS.

Further Experiments by the United States Army.

THE Signal Corps of the United States Army, in the course of their recent manœuvres, experimented with aerials formed by a string of kites, the heights of which attained an altitude of 6,600 ft. By utilising these instead of the ordinary mast aerials for their standard field radio-telegraphy set, they found they could increase the transmitting range from 25 miles to 150 miles. This method also resulted in great improvement in reception, and it is the intention of the authorities to institute further extensive tests. The data available at present point to the likelihood of increasing the range of the radio sets by this means from 6—16 times.

Wireless in the Far North

Seasonable Radio-telegraphic Notes

BY the time this number of our magazine reaches the hands of northern readers the countryside will once again be well within the grip of winter with its severe frosts, and it may be with a covering of snow upon the land. The attractions of the fireside will once more make their great appeal, and exercise outdoors will need to be vigorous if any measure of comfort is to exist. The wireless amateur in the warmth of his study will perhaps give a thought to his professional confrères, whose duties take them hither and thither across the oft-time storm-tossed wintry seas, and they on their part may think again of their brothers working at their instrument in land stations on bleak promontories and amid the snows and blizzards of the northern regions.

We need scarcely mention that the ubiquitous radio-telegraph has long since established itself as far north as any trader has yet cared to venture for regular business ;

indeed, wireless has already been used in regions where little has been achieved beyond circum-polar exploration. In the far south the Mawson expedition made good use of this means of communication, as most of our readers will remember. One of the most dramatic incidents of the whole journey was the founding of the isolated station on the wind-swept island of Macquarie. So great was the torment of the eternal silence to which the operator was subjected that after a period he had to be removed, his mental efficiency being greatly impaired.

On the western coast of North America, as far north as the bleak regions of Alaska, the wireless telegraph penetrated even so long ago as 1903, when the United States Signal Corps, under the direction of Captain Leonard D. Wildman, erected a pair of stations at the opposite sides of the Norton Sound, one at Nome and the other at St. Michael. This latter place is the terminus of the long wire telegraph which runs south



Unloading Stores.



Sault Ste. Marie Station.

for 1,300 miles to Fort Liscum. It had been found impossible to span the Sound by a cable on account of the ice, whilst the frequent blizzards and storms which swept the coastline prevented the erection of the ordinary wire telegraph. A distance of 107 miles separated the two wireless stations, and the conditions under which the work of installation had to be carried out called forth all the skill and endurance that this pioneer party possessed. As soon as the difficulties had been mastered, wireless communication was established, and it is satisfactory to relate that in the annual report of the Chief Signal Officer of the U.S.R.B. for 1905 it is stated that on August 6, 1904, the wireless completed a year of uninterrupted service. During this time it had dealt without intermission with the entire telegraphic business of Nome and the Seward Peninsula—no mean achievement—for Nome itself is the most important centre in the north-western district of Alaska. Not only is it the most populated place in the whole of Alaska, but it also forms the centre of a large fishing and gold-mining district, with which the usual means of communication are only open during a very few months of the year. It may surprise many who are unacquainted

with the commercial conditions prevailing in that part of the world to hear that more than one million words were sent during the year, many thousands being in code. Another district in which wireless has rendered yeoman service is Labrador, the north American Peninsula of the North American continent lying between Hudson Bay and the Gulf of St. Lawrence. It is said that it was given its name "Labrador" by a Portuguese navigator, Cortereal, who seems to have visited it in the year 1500, the name meaning "Labourers' Land." The Atlantic coast on which the many wireless stations are chiefly situated is wild and precipitous, entirely destitute of vegetation and pierced by many narrow fjords, bearing in

this way a resemblance to the coast of Norway. The value of wireless in these regions will be readily understood when it is considered that the great wealth of Labrador is its fish. As many as 30,000 fishermen in search of cod, salmon, herrings and trout visit the magnificent fishing ground adjacent to its coast in the course of the season. The value of the fish taken during the year amounts to more than £1,000,000, and, as much depends



Battle Harbour from the Hill.

upon arriving at the right moment, wireless communication is of immense value to these toilers as they dredge the seas. We have already dealt in THE WIRELESS WORLD with the commercial value of wireless telegraphy to fishermen (see page 696 of the February issue), and we need scarcely remind our readers that the ability to advise the owners some hours in advance just what catch is to be brought to the market may enable the whole of the cargo to be disposed of at a far more favourable figure than if the ship had first to arrive in port and then perhaps precipitate an enormous catch upon an unexpected market.

It is now some years since the first wireless stations were erected on the Labrador coast, and they possess an ever-increasing usefulness. It is only necessary to consult the wireless map of the world in *The Year Book of Wireless Telegraphy* to see that an unbroken chain of stations stretches from the Gulf of St. Lawrence to a very northerly point on the coast. Here, as in Alaska, many difficulties present themselves in the maintenance of the ordinary wire telegraph, which is liable at any moment to be swept away by the gales and blizzards which so frequently sweep across the land. The wireless stations thus take the place of wire telegraph as well as serve the fishing vessels which visit the adjacent waters. It should not be forgotten that in Labrador many trappers hunt the fur-bearing animals—bears, wolves, foxes, martens, otters, beavers, and several others—and accumulate during the season a large store of pelts, which in due time find their way to the furriers' luxurious establishments in London, Paris, New York and other centres. The trappers do their business through agents, and these in turn have other agents with whom they deal, so that a considerable amount of correspondence, mostly by telegraph, takes place in connection with this industry. Of course, out of the season there is no business either in the fishing or fur industry, and during this time the stations are closed down, a small steamer collecting the *personnel* along the coast.

In dealing with wireless in Labrador we must not omit reference to the considerable sealing industry and the radio-telegraphic communication of which it makes so frequent use. This was dealt with in our magazine some time ago.

The vast expanse of northern territory



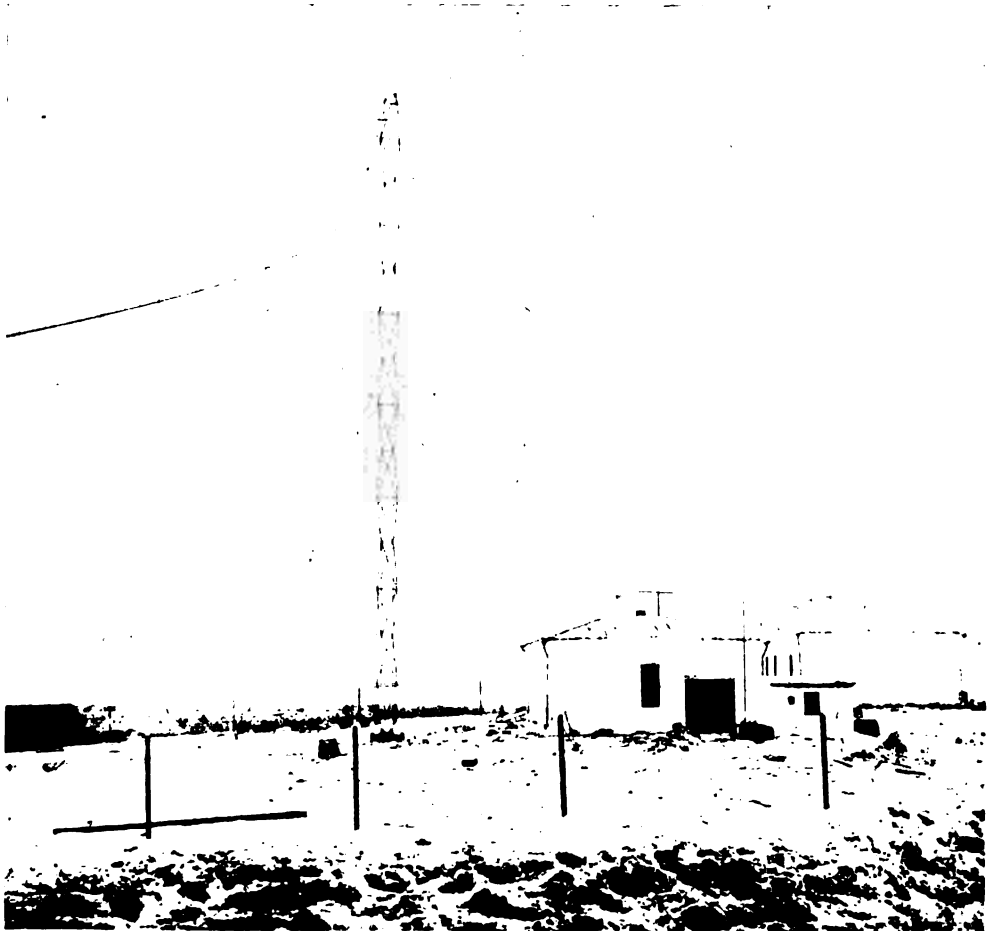
Cape Bear Station.

which comes under the rule of the Czar of All the Russias, and which is associated in the minds of many of us with the stories of driving snow and utter solitude—Siberia—has more recently than Labrador adopted the new form of communication. Perhaps the Siberia of which we hear so much in stories of political exile is far too frequently depicted as a country wholly barren and snow-bound. It is only in the northern

portions of this vast territory that such conditions exist; in the central and southern portions the richness and fertility of the soil support a vast colony of industrious farmers and graziers. It is this latter domain which the Trans-Siberian railway has tapped, and from which is drawn no inconsiderable portion of the world's grain supply. We can expect in the great era of regeneration which will follow the present conflict that a vast network of wireless stations will be erected throughout those fertile regions and, in fact, throughout the whole of Russia. For reasons both of economy and efficiency the radio-telegraph outrivals the old wire system, and is, of course, immune from the many local troubles, such as falling trees, gales, snow-drifts and the like, which play

such havoc with the chain of telegraph poles supporting a fragile wire across great tracts of country.

In the northern regions wireless has already gained a firm hold, and a large station at Archangel transacts an ever-growing volume of traffic with the many ships which sail to and from that Arctic port. Other stations at Vaigatch, Yugorski-Char, and Mare Sale on the Kara Sea, take their share of business. Of the new wireless stations in northern Russia and Siberia which have been constructed owing to the exigencies of the war we are, of course, unable to say anything here, such matters being under the veil of secrecy, which now enshrouds all naval and military arrangements of the Allies. We need only say that



The Station at Cape Mare Sale, Siberia.



Supply Steamer at Belle Isle (white Marconi mast just left of steamer's after mast).

the Russian Government is fully alive to the value of the new means of communication, probably much to the discomfiture of the Germans.

Although not so far north as some of the stations of which we have made mention, the wireless station at Belle Isle, at the mouth of the St. Lawrence river, is subjected during a fair portion of the year to weather which may well claim to resemble that of the Arctic regions. A station was also erected some years ago at Reykjavik in Iceland, where conditions are sometimes very trying. Considering the quite appreciable volume of trade between this large island and Europe we can foresee radic-telegraphic developments in this district also. And now that practically every trading steamer finds its Marconi installation as essential to its proper navigation as many other fittings, and as these ships go ever further afield, wireless coast stations must in the very nature of things spring up on the shores of every navigable sea and channel throughout the world.

It is interesting to conjecture the uses that might be made of the Wireless Direction Finder in Polar exploration. The difficulties with which relief parties have to contend are known to every reader of books of travel in the Polar regions. To explain what we mean, let us imagine that the lost party has a wireless installation and is capable of sending out signals, although they are unaware—through loss of instruments, perhaps—of the location to which they have drifted. A search-party equipped with direction-finding apparatus would soon be

able to reach the exact spot, as the radiogoniometer would indicate the line of march to be taken for the rescue.

And, just as Senatore Marconi's invention has thrust its tentacles even into steaming morasses and baking sands of Central Africa, so has it thrown its arm even across those frozen and glittering wastes where only recently the polar bear, the walrus and sea fowl reigned together undisturbed.



The Old Station at Reykjavik, Iceland.



The Troubles of a Snowbound Station.

AMONGST the many lesser-known problems of the radiotelegraph engineer is that of guarding against the injurious effects of extreme cold, ice, snow and sleet which prevail in extreme northern and southern climes. Already there have been erected a considerable number of stations in regions which are either snow-bound throughout the whole year or else have such lengthy winters that similar conditions are the rule. Quite apart from the technical difficulties with which the engineer and operator must contend, there are questions of living accommodation, food, and the like, which make work in these parts very difficult. With this side of the question, however, we do not propose to deal here.

Presuming that a station of low or moderate power is to be erected in a partially or completely snow-bound region, the question of site has first to be decided. A satisfactory situation is not always readily found, particularly where a tall and heavy mast has to be erected. Transport of materials and the obtaining of suitable labour are also questions which have a most important bearing on all wireless plans in these ice-bound regions.

With regard to the masts themselves, such structures in countries where blizzards are prevalent must be exceptionally strong and well stayed. Extreme cold often causes metals to become brittle, so that wire stays, bolts, and other metal work have to be suitable for such conditions. Earth connections may present difficulties where the station is built on rocky soil, and under such circumstances it is usual to cut trenches in

the rock in which the earth-wires are laid. It is interesting to note that ice and snow are themselves insulators, so that particular care must be taken where these substances cover the ground. A series of symmetrically arranged radiating wires is usually adopted where there is a considerable depth of snow or ice. These wires terminate in buried metal plates which form a ring round the station. Sometimes, in the case of small stations, wire netting is spread on the ground round about the mast, this acting as a balancing capacity for the aerial wires.

One of the most frequent troubles on a wireless station in cold regions is the collapse of the aerial system due to an accumulation of sleet or snow sufficiently heavy to break down the wires. The writer well remembers a voyage on an ice-breaking steamer when communication with the land was of the utmost importance. The only station with which communication could possibly be established had been warned to expect messages from the ice-breaker, and in fact had no other communication to expect for several weeks. Frequent calls elicited no reply, and as a result the ship was much inconvenienced. On arrival in port it was learned that the lonely operator, after living on a frozen island for some weeks without hearing a signal from any ship whatever, had awakened the morning that communication with the icebreaker was expected to find that his aerial, mast and all, had collapsed in a blizzard which had raged the night through. Several weeks elapsed before everything was in working order again.

In recent times most stations erected in districts where such trouble may be expected have their aerial leading-in wires so arranged

that by changing over a switch the wires can be connected directly to the main power supply and a strong current passed through them. This current is sufficiently powerful to create an appreciable heat in the wires, with the result that any ice which may have accumulated immediately melts away and drops to the ground. Such an arrangement at the Punta Arenas station was described in THE WIRELESS WORLD for January, 1915 (p. 624).

Inside the station building there are many problems. The selection of a prime mover has to be undertaken in the light of local conditions. Steam is rarely used except on large stations; on smaller plants oil engines take the foremost place. A heavy oil engine connected to a dynamo either directly or by a belt provides the current for charging a battery of accumulators. As the wireless apparatus works off the accumulators, the engine is only run at intervals, and care has to be taken that it is protected from injury when starting up, particularly in cases where a lamp is used to start vaporisation. The sudden application of heat to icy cold metal may cause cracking and a consequent breakdown of the engine. The accumulators, containing as they do a liquid that will readily freeze, have to be arranged in a room where the temperature is not likely to drop below a safe figure, as a frozen accumulator would most likely burst its container.

In the transmitting room there is usually not much trouble to contend with, except, in very rare circumstances, the solidification of unsuitable oil in the condensers and transformer. In buildings artificially heated considerable moisture may accumulate on the walls and roof, and sometimes drip on to the apparatus with injurious effects on the insulation, resulting in "sparking-over" and similar annoyances. The leading-in insulator, if made of porcelain, may crack owing to the extreme cold outside and the warmth inside, this difference in temperature between the two ends of the insulator giving unequal expansion. It also frequently happens that the outside of the insulator will become coated thickly with snow and ice, but this is not harmful provided the temperature keeps low, for the reason given above—namely, that ice and snow are insulators. When a thaw sets in there may be considerable trouble from sparking-over, and sliding

masses of snow from the roofs may carry away the projecting portions; but care and attention will prevent much of this.

As far as the aerial itself is concerned, insulation troubles do not often occur, for so long as a snow or ice-covered insulator remains frozen it will withstand very high voltages without breaking down. How perfect an insulation frozen snow affords may be judged from the fact that in Northern Canada a telephone line, made of bare copper wire, recently collapsed, and lay on the snow for a distance of eighteen or twenty miles without any noticeable effect on the conversation, which throughout this time was carried on uninterruptedly!

Whilst we have mentioned above the main problems which are encountered in wireless stations in the far north and south, yet there may be many others which must have occurred to those of our readers whose duties have taken them into these white lands. We, therefore, invite them to send us their experiences in this connection, so that we may publish them for the benefit of others.

Suspension of Operators' Certificates of Proficiency in Radiotelegraphy granted by the Postmaster-General.

IT has been officially suggested to us that, for the purpose of bringing home to operators the importance of adhering strictly to Government regulations, we should give prominence in the WIRELESS WORLD to the fact contained in the following communication received from the G.P.O.:

We have recently found it necessary to suspend the Certificate of Proficiency in Radiotelegraphy held by a wireless operator on board ship for the offence of carrying on a private conversation with an operator at a land station.

Operators are well aware of the necessity of adhering at all times to the Radiotelegraphic Regulations, and that any disregard renders them liable to penalties. But under existing circumstances the seriousness of the consequences involved in any breach of regulations is considerably enhanced. It is, therefore, hoped that the warning we are asked to convey will be taken to heart by all operators, most of whom, we believe, are numbered amongst our clientele.

Administrative Notes

Argentina.

With reference to the notice in the *Board of Trade Journal* of February 18th last relative to regulations drawn up by the Argentine Ministry of Marine for the working of the wireless telegraph service of the Republic, the *Boletín Oficial* (Buenos Ayres) of 30th September contains a decree modifying those regulations as regards wireless installations on vessels registered under the Argentine flag.

The *Boletín* containing the text of the above-mentioned decree (in Spanish) may be consulted by United Kingdom shipowners interested at the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, London, E.C.

* * *

Australia.

The Sydney *Daily Telegraph* of September 28th contained the following paragraph:—

“The transfer of officers of the wireless branch of the Postmaster-General’s Department to the Navy Department, which will in future have control of all radio-telegraphic operations, is to be made on October 1st.”

* * *

Oceania.

The *Radio Service Bulletin*, Washington, of November last contained the following paragraph:

“The radio station now being built by the French Government on Tahiti Island, Society Islands, will be ready to receive and transmit commercial messages before the close of 1915.

“The temporary station, now in course of erection, will be followed by a much more powerful plant. The plans of the temporary station contemplate a 10-kilowatt installation of the type used by the French Government with a wave length of 600 meters. The towers, two in number, will be 100 meters in height. The station will be expected to reach Awanui, New Zealand, Suva, Fiji, and the Samoan Islands.

“Immediately upon the completion of the temporary station, work will begin on a permanent station of much greater power. This permanent 300-kilowatt station will be operated by a 500-horse power gasoline engine, and will use a wave length of 2,500 meters. There will be eight towers, each 100 meters high, erected in parallel rows of four towers. The space between the towers will be 250 meters, and 200 meters between parallels. There will be two antennæ, one of 600 meters wave length, and the other of 2,500 meters.

“With the permanent station it is expected that communication will be established with stations in Cochinchina, South America, Honolulu, Hawaii, San Francisco, Cal., Sydney, Australia, and even in Martinique and Guadeloupe, West Indies. All material used in the construction of these stations is supplied by the French Government and is shipped from France.

“Call letters have not been assigned to the station, and rates are not obtainable at the present time.”

* * *

West Indies.

A wireless station has recently been erected at St. Lucia, and the rate for ships’ telegrams has been fixed at tenpence per word. Messages may be sent from ships at sea by way of this wireless station and cabled to all parts of the world at rates obtainable on board.

MARTIAN RADIO-TELEGRAPHY.

A Contemporary’s Brilliant Suggestion.

Now that we are able to telephone by wireless thousands of miles, why not turn our attention to communicating with the planet Mars by wireless telephony?—
Telegraph and Telephone Age.

For the Common Weal

The Efforts of members of the Belgian Marconi Company

BRITAIN has always nurtured friendly feelings for her small neighbour across the Channel. We speak of Belgium, that brave little country whose fair fields and pastures are sodden with the blood of her children. But a closer and a keener *rapprochement* will exist henceforth. Belgium promised, fruitless though it seemed, to preserve her integrity by all means at her disposal. Her word was her bond. So when the ruthless Hun descended with all his brutal barbarity, bludgeoning her old men and ravishing her maidens, there arose a mighty wave of indignation which traversed the kingdom from end to end, and found response in the hearts of everyone—from the King himself to his lowliest subject.

Although Belgium has a standing conscript army, and although her reserves for many years past were called out, yet these were not sufficient to stem the tide of invasion by the Prussian hordes, and many and many a volunteer was gratefully accepted by the Belgian military authorities.



Second Lieut. P. Thomson.



Second Lieut. G. Vincent.

Amongst those who were in Brussels on the outbreak of hostilities and who are now performing duty with the allied forces were several members of the staff of the Belgian Marconi Company, and we have pleasure in reproducing here photographs of a few of them. Second Lieut. G. Vincent is an engineer in the Belgian Company, and has been occupied with the Belgian Army. On the outbreak of war he immediately took service for his country as a simple private, and we congratulate him on his promotion to commissioned rank. Second Lieut. P. Thomson is a member of the Belgian Company's Traffic Department. When it was useless remaining in that country any longer Mr. Thomson proceeded to London and enlisted in the Sportsman's Battalion. His progress was rapid, and we now have to convey to him our best wishes on hearing



Lance-Corporal R. Newcomb.

that he has been allotted a commission in the Devonshire Regiment.

Lance-Corporal R. Newcomb was wireless officer in charge of the s.s. *Lapland* when war was declared, but being a member of the British Territorial Force, he volunteered for foreign service with the troops. He was recently wounded in action, and has just



Private V. J. N. Rigaux.

been home for a short rest. We trust that he will soon be restored to complete health.

Private V. J. N. Rigaux, who was previously in charge of the wireless installation on the Belgian Training Ship *L'Avenir*, had just returned from a short trip on the s.s. *Samland* when war began. He at once offered himself as a volunteer to the Belgian Army, and has been on active service for the last twelve months.

Adjutant J. H. Spiritus is a member of the Traffic Department of the Belgian Company, and being on the reserve was called out at the beginning of hostilities in Belgium to rejoin his former regiment, the Royal



Adjutant J. H. Spiritus.

Engineers. Since then he has been at the front doing excellent work, and for an act of great bravery has been decorated with the Order of Leopold. On the termination of the war we hope to be in a position to present to our readers an account of the individual acts of bravery which the rigours of the censorship prevent our doing now.

We take this opportunity of offering to these very gallant gentlemen our sincere felicitations, and trust that they may be spared to continue their good work in the cause of justice and liberty.



Being the Story of a Christmas Eve spent in Queer Company.

By WILLIAM LE QUEUX.

"THEN the whole affair is still a complete mystery—eh, Reggie?"

"Absolutely. I can see no daylight at all," was my reply.

Marjorie Harland, my well-beloved, placed her elbows upon the little *table-à-deux* at which we were seated at lunch in the upstairs room of the old-fashioned "Sun Inn" at Hitchin. She rested her pointed chin upon her hands, a habit of hers, and fixed her soft brown eyes upon mine in deep seriousness.

"You speak in a very hopeless tone, dear," she said. "Surely you don't intend to give up the puzzle?"

"Not in the least," I hastened to assure her. "You know me, Marjorie, by this time, I think. And you also know that when once I set myself to solve a problem I never relax my efforts unless I am compelled to acknowledge myself beaten. In this case—the extreme gravity of which you well know—I confess that I am completely baffled to-day. Yet I investigated another case equally mysterious, and have the satisfaction of knowing that the guilt has been fixed upon the culprit."

"I know, Reggie. Your success in the affair at Cleethorpes was simply astounding," my *fiancée* declared. "My complaint all along is that you would not allow me to assist you, until now."

"Quite so, dearest. Not because I did not believe in your capacity for keeping a secret, or your eagerness to act for the

country's safety, but because—well, I hesitated to allow you to run any personal risk."

"I'm quite willing to share any risk with you," she declared, as she gazed straight across the flowers at me. "I have no fear whatsoever—so long as I can be of assistance to the country."

"You have already been, Marjorie," I answered calmly. "In this very difficult case—one which the authorities have unfortunately treated so lightly—you have been of the greatest assistance. Yet the problem is as far from solution as it ever was."

"And your leave will be up on the last day of the year," she sighed, "and you will go to sea again."

"I must," I said. "This long leave I've had is quite unusual, therefore I ought to think myself very lucky."

"Well—you had a narrow escape when the *Amblemore* went down."

"Yes, I did," I admitted with a smile, for, truth to tell, the Red Circle Liner *Amblemore*, of Liverpool, upon which I, Reginald Muir, had been first-class Marconi operator, had struck a mine thirty miles west of St. David's Head, and, though I had called instantly for assistance, she had gone down beneath us with a loss of one hundred and fourteen souls. We had been outward bound for the Mediterranean when, on the fourth of November, 1914, the disaster had happened. My own escape had



"Marjorie, my well-beloved."

been almost by a miracle, but that is another story. Indeed, there seems a special providence which watches over Marconi operators at sea.

Well, I had come ashore, and, finding myself with long leave, I at once went to London and joined Marjorie who, with her father and mother, lived out at Sydenham. Mr. Harland, who was a retired stockbroker, lived in a large detached house not far from the Crystal Palace, and kept a car, which Marjorie frequently drove, and sometimes in it she took me for a spin.

I arrived in London on November 6th, the day on which the spy, Carl Lody, was shot at the Tower. I read the fact in the paper, and it caused me deep thought, because of certain facts which had, quite accidentally, come within my knowledge.

Briefly they were as follow: About two years before, I had been on the Cunarder *Pandorania*, sailing between Liverpool and New York, when on one of our outward trips we carried, as saloon passengers, two Dutchmen named Klaassen and van Oordt. They were both men of considerable means, merchants of Utrecht, doing trade with America, as the radio-telegrams which during the voyage I sent and received for them plainly showed.

Both men spoke English extremely well

for Dutchmen and, as they often sent messages, I frequently chatted with them in my cabin. It was in summer, and late one night I was on deck with a cigarette, prior to turning in—for we were then only thirty-six hours off Sandy Hook—when suddenly I overheard in the darkness two men conversing in low tones in Dutch. Next second I recognised the voices of Klaassen and his friend van Oordt. The former was of the stout, thick-set, stolid type of Hollander, while the other was a thin, lantern-jawed, deep-eyed man, who dressed in a somewhat exquisite manner, and wore rimless *pinx-nez*.

I halted, and, holding my breath, listened to their conversation. As my father had been a British consular officer at Rotterdam, and all my youth had been spent in Holland, I knew the Dutch language about as well as my own, and as I listened I stood aghast.

Strange and amazing things were being whispered calmly in cold blood—a plot, it seemed, though by what I overheard I could not exactly decide what was intended. Certain high explosives were discussed, those which were the latest invention of scientific destruction, and van Oordt, who seemed to be an expert chemist, was explaining the relative force of certain compounds.

That conversation puzzled me so much that I mentioned it to the captain, and watch was kept upon the pair until their arrival in New York, when, of course, they went ashore—not, however, before we had informed the police. The latter seemed but little concerned, and as the Customs officers found nothing suspicious in their baggage they were not detained.

I had mentioned this to Marjorie and to Mr. Harland on my return to England, after which the matter had entirely passed out of my mind. I was appointed later on to another ship, and afterwards to a third, until at last, two years later, I found myself upon the ill-fated *Amblemore*.

But on the evening of our departure from Liverpool, at about six o'clock, it being quite dark at the time, I suddenly encountered among the bustling crowd on the promenade deck a thin, well-dressed man in a heavy overcoat and grey plush Tyrolese hat. As he passed beneath a lamp I fancied that his pale countenance was familiar. In

a second I remembered those deep-set eyes and lantern jaws. It was the mysterious Dutchman van Oordt.

I turned back after him quickly and, following him through the crowd, saw him pass ashore with a number of friends of passengers who had been on board to take farewell. As I leaned over the rail I saw that when he had reached the shore he went quickly along the edge of the landing stage, where he stood beneath the lamp gazing up at the ship, his eager eyes as though in search of someone on board.

Apparently he did not see me, or if he did, he probably would not recognise me. Was his friend Klaassen on board, I wondered.

To my recollection there came vividly that strange conversation I had overheard in Dutch two years before, and, as at last we cast off, and slowly dropped down the Mersey, I stood watching the mysterious man in the grey plush hat. Examination of the passenger-lists an hour later did not reveal Klaassen's name, and, though I searched, I could find nobody in the least resembling him. Therefore I dismissed the matter from my mind as a merely curious meeting.

It was not until later on, in that heavy sea off St. David's Head, when in the darkness there was a sudden blood-red flash and a deafening roar as the vessel rose and then

fell heavily back into the trough of the sea, that I again reflected.

"Gad, Muir! We've struck a mine!" cried Bennett, my assistant, who had the phones on, and was at that moment in the act of taking in a message, while I had been putting some papers in order.

An instant later there was a second deafening and more terrible explosion, which seemed to tear the very vitals out of the vessel.

He sprang up in alarm, but in a moment I had my hand on the key calling for assistance and giving our call-letters and our whereabouts.

Meanwhile the vessel was already listing badly; shouts were heard everywhere, passengers, pale and scared, came up in their night attire, yet above all the terror and confusion could be heard the captain's voice calmly giving orders through his megaphone.

As long as I could I continued to send out the distress call, but at last the captain gave orders for all to save themselves as best they could. Next second I found myself in the sea, swimming away from the doomed ship lest I should be drawn under when she sank. And then—well, I have already told you the rest.

Two days later I was back in London with Marjorie, full of grave thoughts. Had the *Amblemore* really struck a mine: or had that mysterious Dutchman been on board with some evil purpose just before she sailed?

The newspapers were full of the disaster, and it now came out, for the first time, that we had been carrying a quantity of munitions and high explosives consigned to a Mediterranean port for the use of our Allies.

At Marjorie's suggestion I made a statement to the London manager of the Red Circle Line, but my story was, I saw, regarded as a highly improbable one, and I confess that I felt very indignant that notice was not taken of the grave suspicion resting upon the thin-faced Dutchman, for the company did not even trouble to communicate with Scotland Yard.

I was spending my leave in London with Marjorie, and we were enjoying ourselves together and looking forward to a pleasant Christmas, notwithstanding the general de-



"Klaassen. . . the short, thick-set, stolid type of Hollander."

pression consequent upon the war, when, on the evening of November 10th, a curious thing happened.

Marjorie had come up from Sydenham, and we were about to enter a cinema in Oxford Street when there went in, just in front of us, a man wearing a grey Tyrolese hat which, in an instant, attracted my attention.

I hastened forward and glanced at him. My heart gave a bound. It was the mysterious van Oordt!

I saw him pay for a balcony seat, and after he had ascended the stairs I whispered the truth to Marjorie, who instantly grew excited and suggested that we should watch him.

This we did. For an hour we sat behind him in the half-darkened cinema, and when at last he put on his grey hat and again rose, we leisurely sauntered out after him.

He walked as far as the corner of Tottenham Court Road, where he hailed a taxi. In a moment we were in another, I having given the man orders—with a promise of double fare—to follow the cab in which the Dutchman was riding.

We followed him to the main-line station at Waterloo, where he passed the barrier and entered the Portsmouth train due to start in five minutes.

In a moment I had obtained for Marjorie a platform ticket from one of the slot-machines, telling her to follow him and watch into which compartment he entered, while I went and obtained two tickets for Portsmouth, not knowing, of course, at which station the Dutchman might alight. Then, when I rejoined my well-beloved, she indicated where he was, and we entered a compartment further to the front of the train.

From the guard we obtained the information that the train stopped first at Woking, then at Guildford, and afterwards at all stations to Portsmouth.

On arrival at Woking Marjorie drew up the blind, looked out and reported that he had not alighted. But at Guildford van Oordt got out, and when he had walked along the platform to the subway, we followed. Outside the station he halted, turned suddenly, and went to the parcel office. As I passed I heard him inquiring about a parcel, and then, when he had dis-



"As we cast off, and slowly dropped down the Mersey, I stood watching the mysterious man in the grey plush hat."

appeared along the dark station-yard, I went up to the parcels clerk and asked what was known of the inquirer.

"Oh! That's Doctor Weiss, sir," replied the man.

"Does he live near here?"

"About a mile and a half away, sir—out near Shalford—a cottage called Bonner's Corner. He's a professor of languages."

"Has he lived there long?" I asked.

"About a year, I think."

And with this information we were content that evening, for it was growing late, and I had to see my *fiancée* back to Sydenham.

At least we knew where the man with the velour hat was residing.

Early next day I was again down at Guildford and, walking out on the Portsmouth road to a point near Shalford—perhaps a mile and a half from the town—I found a long, low-built, comfortable-looking cottage, which had recently been modernised, and which, upon its gate, bore the words "Bonner's Corner."

As I sauntered past, apparently taking no interest in my surroundings, I cast a covert glance into the garden, where I saw a man in blue serge strolling, smoking a briar pipe. I looked again. Yes, my eyes had not deceived me. It was none other than van Oordt's friend Klaassen!

I called at a little old-fashioned inn in the vicinity and ordered lunch. To the good woman who served me I told how I was in search of a country cottage, and asked if she knew of any to let around Shalford or Bramley.

"No, sir," was her reply, "I don't."

"I want something like a place I've just passed—it's called 'Bonner's Corner,' isn't it?"

"Oh, yes, sir. 'Bonner's Corner'—that's Mr. Meaken's. It was let furnished about a year ago, and Doctor Weiss has it now. He's a very nice gentleman, though he is a foreigner—Swiss, they say, like the friend who lives with him, Mr. Picot. They both come in here and chat sometimes."

"What is Mr. Picot?" I asked, knowing that she was referring to the man who, before the war, was known as Klaassen.

"I think he's something in the jewellery trade, in London. He's often away travelling, but Doctor Weiss is generally here, as he gives lessons in languages."

"To whom?"

"Well—to anybody who wants them," replied the stout, homely landlady. "He goes down into Guildford most days. I think he goes to one of the schools."

"I suppose he took over the servants when he rented the house, didn't he?"

"Oh, no. Mrs. Thornton, who was Mr. Meaken's housekeeper, was very sick about it. She told me how, when the doctor arrived, he brought his own housekeeper, Swiss like himself—a little dark-haired woman who is very short-sighted and wears spectacles. She's the only servant the two gentlemen have."

Then, in order to allay any suspicion that might be aroused in the good woman's mind, I began to talk of the war, and to gossip about trivialities.

It struck me as very curious that the two men should be living in that rural Surrey village under fresh names, for I could discern no reason for it. Since war had broken out we wireless operators had been taught

to distrust both the *soi-disant* Dutch and Swiss as dangerous, and here was presented to me a very curious and puzzling problem, one which Marjorie was most eager and keen to assist in solving.

That dull, misty November day I spent around Shalford, the small scattered village about the winding Wey, situated in the hollow of the Surrey hills, through which both rail and road ran from London to the south coast. Three times I passed the dwelling-place of the pair who had, on that memorable voyage, been passengers with us to New York.

It was certainly quite a comfortable house, and as I stood in a hedge near by at five o'clock in the evening while the mist was rising, I watched a light in one of the windows, and distinctly saw van Oordt cross one of the ground-floor rooms.

When it grew quite dark I took tea in another local inn which I had noted, and then returned to my vigil until seven o'clock, after which I returned to Guildford and thence took train to Waterlon.

Next morning at eleven I met Marjorie at Charing Cross, and told her all that I had discovered.

"But surely it is very mysterious, Reggie!" she exclaimed. "What can those men be up to?"

"Some devil's work, I believe," was my reply. "I recollect the end of the *Amblemore*, and the more I think over it the more certain I feel that the mysterious Dutchman had a hand in that disaster."

"Then you don't think the vessel struck a mine at all?"

"No. I certainly don't. There were no other mines at that spot. Mine-sweepers have been at work ever since, but not a single one has been found. I heard that when at the office the day before yesterday," was my reply.

Marjorie grew thoughtful, then, as we walked up St. Martin's Lane to the little Soho restaurant where we so often lunched, she suddenly turned to me, and said:—

"Look here, Reggie. You're home on leave till the end of the year. Why not watch these people? Let me help you. Hitherto you've been unkind, because I know that you are loth to trust a woman with a secret. But surely you know that, with me, any secret of yours is sacred!"



"A sudden blood-red flash and a deafening roar as the vessel rose and fell heavily back into the trough of the sea."

I turned and, on looking into her big, trustful eyes, I saw that honesty and truth were mirrored there.

"Very well, dearest," I replied, gripping her arm. "Yes, we will; you and I will act together and endeavour to solve the mystery."

Truth to tell, I had never seen her looking so smart and pretty as on that morning. Neat, yet daintily, dressed, with a short blue serge pleated costume, as was the *mode* of the moment, and slimly shod in black silk stockings, with patent leather shoes, her close-fitting hat admirably suiting her small features, and her white fox furs around her throat, she walked beside me laughing and chatting gaily, while I, on my part, strolled on full of the very acme of contentment.

Personally I dearly love a problem, and I had now approached this particular one with

careful consideration, eliminating all chance of success, and only looking for possible failures—which is, after all, the proper spirit in which to seek success in any subterranean inquiry.

The November days passed. Each day I went down to Guildford, and on most days I walked out to Shalford to reconnoitre. One night I slept at the Lion Hotel in Guildford, and just after nine next morning waited at the railway station for the non-stop express to Waterloo.

As I had calculated, van Oordt, alias Doctor Weiss, arrived and entered a first-class compartment. I went into a third at some distance away, but on arrival at Waterloo I was near him, and, in addition, Marjorie, who had been awaiting me on the platform amid a crowd of men in khaki, followed me in all her loving enthusiasm.

Outside the station he entered a taxi, but

not before crossing to the slope of the Loop Line, and in a moment we were both in another taxi, determined to follow him.

We did so, to the City first, where he called at a firm of stationers. Then he went to a bank in Newgate Street, and afterwards drove westward to a shop close to Oxford Circus, where he made some purchases. At noon he went to a house in Portman Square, the number of which we noted, and then to Prince's, where, in the vestibule, he met a well-dressed, middle-aged woman, with whom he lunched.

Marjorie lunched at another table, but alone. When we met later, at the corner of St. James's Street, she told me hurriedly how the Dutchman and his lady friend had grown most confidential, and while they were having their meal he had drawn some diagram or other on the back of a letter and had handed it to her.

At first the woman seemed puzzled, but a few seconds later her eyes had opened widely in astonishment, and she had held her breath as though in awe. It was as if he had put before her some proposition which had both astounded and terrified her.

The woman was certainly a foreigner: fair-haired, plump, and plainly dressed.

To me, it was a curious fact that Klaassen was never seen with his friend van Oordt. Time after time Marjorie urged me to go to the police and consult them, but I hesitated, well knowing the reluctance with which the authorities approached the question of the enemy alien. I preferred to make my own inquiries, because such inquiries were matters after my own heart. Every Marconi operator has had the detective spirit stirred within him since the war. And I was no exception.

The days passed—dark days for our dear old country. We made an air raid upon the Zeppelin factory at Friedrichshafen and nearly destroyed it; we bombarded Zeebrugge and destroyed the harbour works and locks, yet, on the other hand, the Turks were marching to the Suez Canal, and the *Bulwark* had been mysteriously blown up at Sheerness.

December was ushered in by the fall of Antwerp, and then came the daily up-and-down balance of the war, good news one morning and bad the next, intervals of brightness and of winter gloom as Christmas approached.

Marjorie was tireless in her vigil upon those two mysterious Dutchmen. From the Surrey County Constabulary I had learnt that the two men were registered as aliens, but being Swiss were therefore neutrals, and besides they being perfectly honest and open regarding their affairs, no suspicion whatever attached to them. Even the letters they had received from Berne had been opened in the postal Censor's office, but nothing in the least suspicious had been discovered.

In vain did I point out that I had known the pair as natives of Holland; in vain I declared that they could not be genuine Swiss subjects. Yet the official view was unshakable and, after many inquiries, it was declared by the police that the two men living at "Bonner's Corner" were above suspicion.

It was in consequence of what I had been told at Whitehall that morning that I had declared to Marjorie, as we sat together at lunch at the old inn at Hitchin, that the problem was as far off solution as ever.

After my call in Whitehall my well-beloved had driven me in the car up the Great North Road for a spin, it being a bright, crisp morning, and at Hitchin we had decided to have our mid-day meal.

"It certainly is disheartening, Reggie," she declared. "Nobody believes you. They still declare that the *Ambemore* struck a mine, I suppose?"

"Of course. They never believe that the dear kind German could do any such cruel thing as to blow up a ship the cargo of which is munitions of war."

"That's just it, dear," Marjorie declared. "We're far too kind to the enemy. Therefore I don't wonder that, knowing what you do regarding those two mysterious Dutchmen, you are disheartened. But never mind, Reggie. Let's renew our efforts, and see whether we cannot get sufficient evidence to compel the authorities to take notice."

"I don't blame the police in the least," I declared. "If there is no suspicion, why should they act? It is the whole system which is at fault. But you're quite right, dearest, we will renew our efforts, and with your aid I hope that we may ultimately have success."

That same evening we were down in Surrey again, Marjorie having driven me in the car, which we left at St. Catherine's Mews, on the Portsmouth Road, beyond Guildford, and



"I did not know how near to death I had been at that second." Digitized by Google

then, in the fading twilight, we walked together towards "Bonner's Corner." It was dark when we arrived there; hence we were able to take cover in the shadow of a high hedge close to the house, at a spot from which I had kept observation on several previous occasions.

The house was in total darkness, but we had not waited long before we heard a woman's footsteps, and into the gate passed a female figure, that of the spectacled Swiss housekeeper. She entered the house, and soon in two of the windows there showed lights.

Twice before, while I had watched, the woman had returned to the house at nearly the same hour; I therefore surmised that she had friends in the locality, and that the house was often left locked up between the hours of four and five-thirty. It was van Oordt's habit to return about six, while Klaassen's movements seemed to be much more erratic. Two or three other facts I had established only served to increase the mystery. One was that whenever the two men went to London together they posed as complete strangers to each other, travelling in separate compartments, making no sign of recognition, and leaving Waterloo separately. Klaassen usually carried a well-worn and rather heavy leather bag, of the kind used by jewellers' travellers. Once Marjorie had followed him for a whole day in London, but, though he visited the house in Portman Square which van Oordt had also visited, he never called upon any jeweller. Next day I met him at Waterloo by his usual train and kept observation on him.

From a stall in the Farringdon Road he purchased some second-hand pieces of ironmongery, though I could not get near enough to ascertain what they were until the woman who kept the stall had wrapped them in paper, and I could not stay behind to make inquiry, as I wished to keep track of his movements.

So the December days crept on, each bringing my leave nearer to its close. By watching constantly Marjorie discovered that both men were in the habit of receiving correspondence addressed to a small tobacconist's shop in the Kingsland Road, and that they took away parcels from there, and conveyed them down to Guildford.

Christmas was approaching. The shops

were making a brave show of "Business as usual," yet for thousands of bereaved ones it was foredoomed to be a sad festival, the saddest in all the thousand years of Britain's history. Loving hearts do not heed a nation's sorrow; therefore, with Marjorie beside me in those few brief days before I should be compelled to go afloat again, to listen on the 'phones and scribble on the pads, to take in Poldhu and Paris, and listen to the high-pitched Telefunken lies, I remained supremely content, yet at the same time puzzled and perplexed.

It was Marjorie's influence, and that alone, which set me more thoroughly determined. On a dark, foggy day—December the eighteenth, to be exact—I went alone again down to Guildford in the afternoon, in order to put into execution a plan which I had had in my mind throughout the previous fortnight.

In the grey mist I walked out towards Shalford, and, having called upon my stout landlady at the inn, I obtained from her a corroborative statement of what I had obtained in another quarter—namely, that the Doctor's housekeeper was on very friendly terms with a woman in the village, and that almost daily she went to take tea with her, returning in time to light up for her master's homecoming.

The evening mist grew thicker as, on leaving the inn, I returned to "Bonner's Corner" to take observations. Armed with an electric torch, a revolver, and a short iron crowbar, I waited at my favourite spot beneath the hedge.

Of passers-by there were many—men going home from work on cycles, while near me was a letter-box in a wall to which people came, dropped in their letters, and flitted away again.

Darkness had fallen and, by the look of the house, nobody was in. Dare I risk it, and boldly investigate?

I reflected. But few days were now left to me in which to solve my problem. I remembered Marjorie's encouraging words—words of a true honest Englishwoman—and they decided me. In the gloom I crept forth and, getting through a thin hedge at the end of the garden, made my way stealthily, but fearlessly, towards the house.

My observations had led me to the knowledge that to most of the downstairs rooms were casement windows, opening outwards.

To force a door would be to arouse suspicion when the housekeeper returned. Therefore I decided upon a window, one of a row of five facing the little ill-kept lawn.

Without a second's delay I approached it, inserted the forked end of my crow-bar and, with a single wrench, opened it. In less space than it takes to write, I climbed into the room, and, holding my torch pointing to the ground, made rapid investigation.

To my surprise I saw upon the floor a row of electric accumulators, all joined up with professional precision. The place was a kind of half sitting-room and half workshop, for on a wooden bench in a corner there lay a quantity of pieces of electrical instruments of all sorts, from coils of cheap electric bells and tangles of wires, to a Brown relay.

Sight of these caused me to pause. My suspicions were undoubtedly confirmed. To my surprise, I noticed that from the accumulators a lead ran beneath the door, and away to some unknown spot. In addition, a strong, pungent, but not really unpleasant, odour greeted my nostrils. It was of some acid, I believed, but, knowing little of chemistry, I, of course, failed to identify it.

My next thought was to pass out of the room in order to investigate further, but just as I was in the act of opening the door I heard the sharp click of a key in the latch of the front door and, at the same moment, a man's cough.

I had heard that cough before, and knew the comer to be van Oordt!

To be caught there would, I knew, spoil all my chances of success. Therefore, next instant I had climbed out of the window, closed it softly behind me, and escaped across the lawn into the road.

The latch of the window had been broken, but in such a manner that it would not arouse suspicion. I had examined it on entering and found it to be much worn, and as only the nut had been forced from the bolt, it would be thought that the nut had become dislodged by wear.

One fact caused me to reflect. If any secret operations were in progress in that house—such as the manufacture of explosives or of time-bombs—it seemed hardly feasible that the place would be left so entirely unguarded. I recollected, too, that row of accumulators, and wondered.

For two days I remained away. Then I

revisited the place at the same hour, and, finding that the latch of the window had not been repaired, I easily entered the little room. Switching on my torch, I passed the accumulators and, opening the door, found myself in the long, narrow entrance-hall, in which were four closed doors, with a fifth at the extreme end.

I walked towards the end door, determining to examine the whole place thoroughly. The closed house reeked with the odour of some chemical—that same pungent smell that I had experienced before.

I had my fingers upon the door-handle of that end room, and was about to turn it and enter when, to my chagrin, I again heard a key in the front door and was compelled to fly and make my escape.

And none too early, either, as you will later see. I did not know how very near to death I had been at that second. Perhaps, for me, my ignorance was a fortunate fact.

At any rate, the knowledge that I had gained was sufficient to arouse at last the interest of the authorities at Whitehall, and I was at last given assistance in my investigations.

With three officers of the Special Department of Scotland Yard, and accompanied by Marjorie, we kept watch during the following days, when, on the morning of Christmas Eve, van Oordt left Guildford, carrying that brown bag usually carried by Klaassen. On arrival in London he crossed to Euston, and there bought a ticket for Liverpool.

He had, it seemed, set out upon another desperate mission, but this time he was closely shadowed.

We saw him go on board a certain vessel of the Red Circle Line which was about to leave for the Mediterranean, and followed him below among the bustling passengers and their friends. We watched him leave his bag at a spot which had evidently been prearranged with some fellow-conspirator—perhaps a labourer engaged in stowing away cargo—and then followed him as he moved off ashore again.

The bag was quickly seized, and the Dutchman as quickly arrested.

Examination of the bag revealed what I had all along suspected. Concealed within was a beautifully constructed piece of clockwork set to detonate a quantity of high explosive forty hours later, when the vessel got to sea.



"Ere we could realise what had happened the house was blown into the air."

We brought him up to London, in custody, and his temper was violent, as you may imagine, when he recognised in me the wireless operator who had sent his messages two years before.

"Bah!" he cried to me in defiance. Then he added in German, laughing grimly, "It will be you that will suffer—*you!* not me!"

At the time we did not understand the meaning of that remark. On that same night, when we arrived back in London, we at once went down to Guildford and, having surrounded "Bonner's Corner," one of the men approached, and knocked at the door.

The woman in spectacles appeared at it, but on the detective asking for Mr. Picot, she denied that he lived there.

"Oh, yes, he does," the officer declared. "Now, is he in—or not? Answer me quickly!"

His attitude alarmed the woman, where-

upon she shouted down the passage, in German, "Be quick! *The police!*"

In a moment Klaassen appeared, white and alarmed, in his shirt-sleeves, but only for a second, as next instant he dashed down the passage to the room at the end.

He tore at the door and opened it, but as he did so there was a bright flash and, ere we could realise what had happened, the house was blown into the air, most of us being thrown down by the violent concussion.

When we recovered from the shock we found that the place had been utterly demolished, and was on fire. Klaassen and the woman had both been blown to pieces, while the unfortunate detective standing at the door was lying stunned bleeding and unconscious.

Then, for the first time, as I gathered my senses, I realised how I had been twice within an ace of death, because—as van Oordt afterwards admitted at his trial by court-

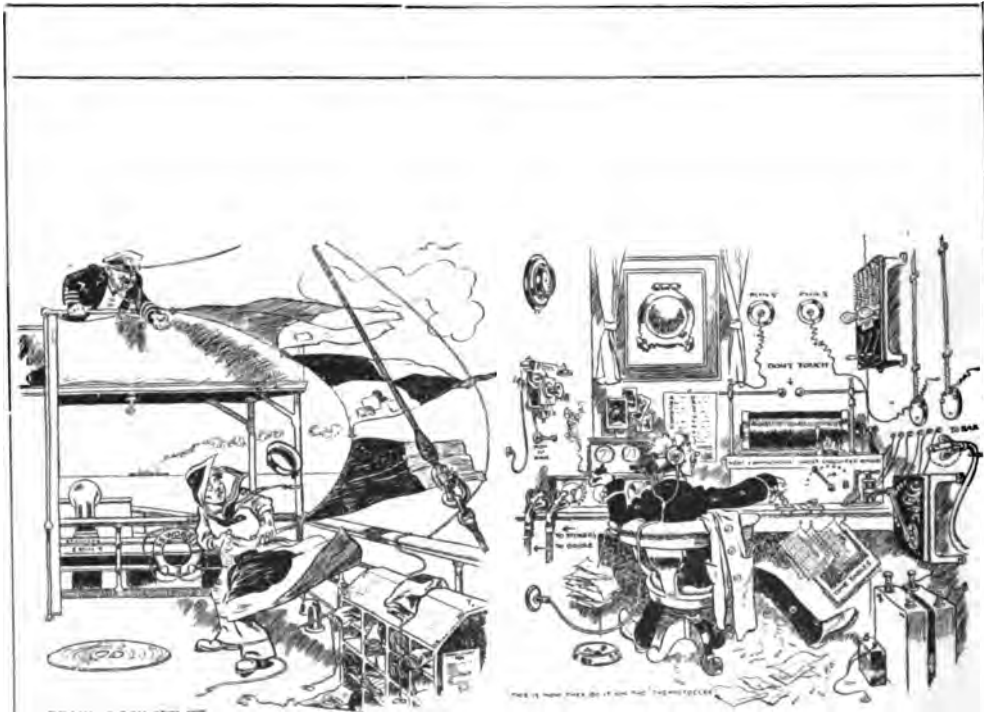
martial—the door of that room in which the secret operations were conducted was connected electrically with a bomb, so that any one opening the door while the house was left unguarded would automatically explode it and blow himself to atoms.

No details of the affair, or of the trial of the Dutchman, were allowed to leak out, as the authorities—with very good reason

—had no desire to alarm ocean-going travellers.

The fact that I had to be called as witness prolonged my leave for a further couple of months, greatly to Marjorie's joy, and in the end I had the satisfaction of being present at the Old Bailey, when, *in camera*, a sentence of penal servitude for life was passed upon the man with the grey plush hat.

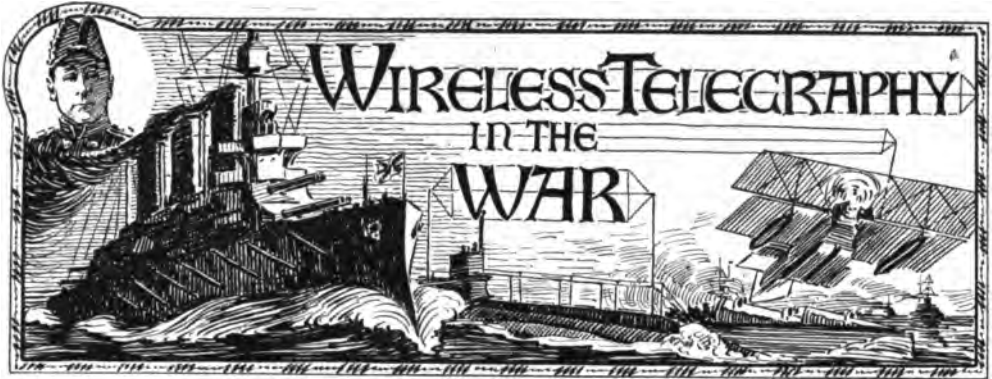
THE END.



"How they signal on every other ship."

"How it is they do it on the 'Themistocles.'"

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ONE of the earliest effects of the war was to introduce such changes in the working of wireless telegraphy as caused many of our usual features perforce to disappear. One feature, however, which has been appearing since our September, 1914, issue, under the above heading, owes its original inception to the same cause. We believe that this feature is one which has been appreciated by our readers, and we have endeavoured to carry out the promise of our sub-title and make these pages a real *résumé* of the work which is being accomplished by radio-telegraphy both on land and sea. Our **head-piece** on this page gives the place of pride to the Fleet and Admiral Jellicoe, who, as we have pointed out in previous numbers at some length, is able *with the aid of wireless* to exercise complete control over the most distant units of his Fleet in a way that has never been possible for any of his predecessors in our glorious naval service.

* * *

Amongst the very numerous items of duties performed at sea by radio-telegraphy which have been chronicled in these pages, we might remind our readers of our exclusive description (compiled from the report of the wireless operator on board the auxiliary cruiser *Otranto*) of the only naval disaster in actual fighting which has befallen us. In these pages also have appeared notes concerning the great victory of Admiral Sturdee, by which that previous reverse was so gloriously avenged, notes which led up to a special article dealing with the subject. We have chronicled from the point of view of WIRELESS readers the various adventures of

the *Emden* and her final destruction; we have described how radio-telegraphy contributed to the sealing up of the *Königsberg*, and ultimately directed the *coup de grâce* in the Refugi River; we have revealed the secret of how the German "Treasure Ship" was able through her wireless installation to escape the British cruisers scouring the Atlantic for her.

* * *

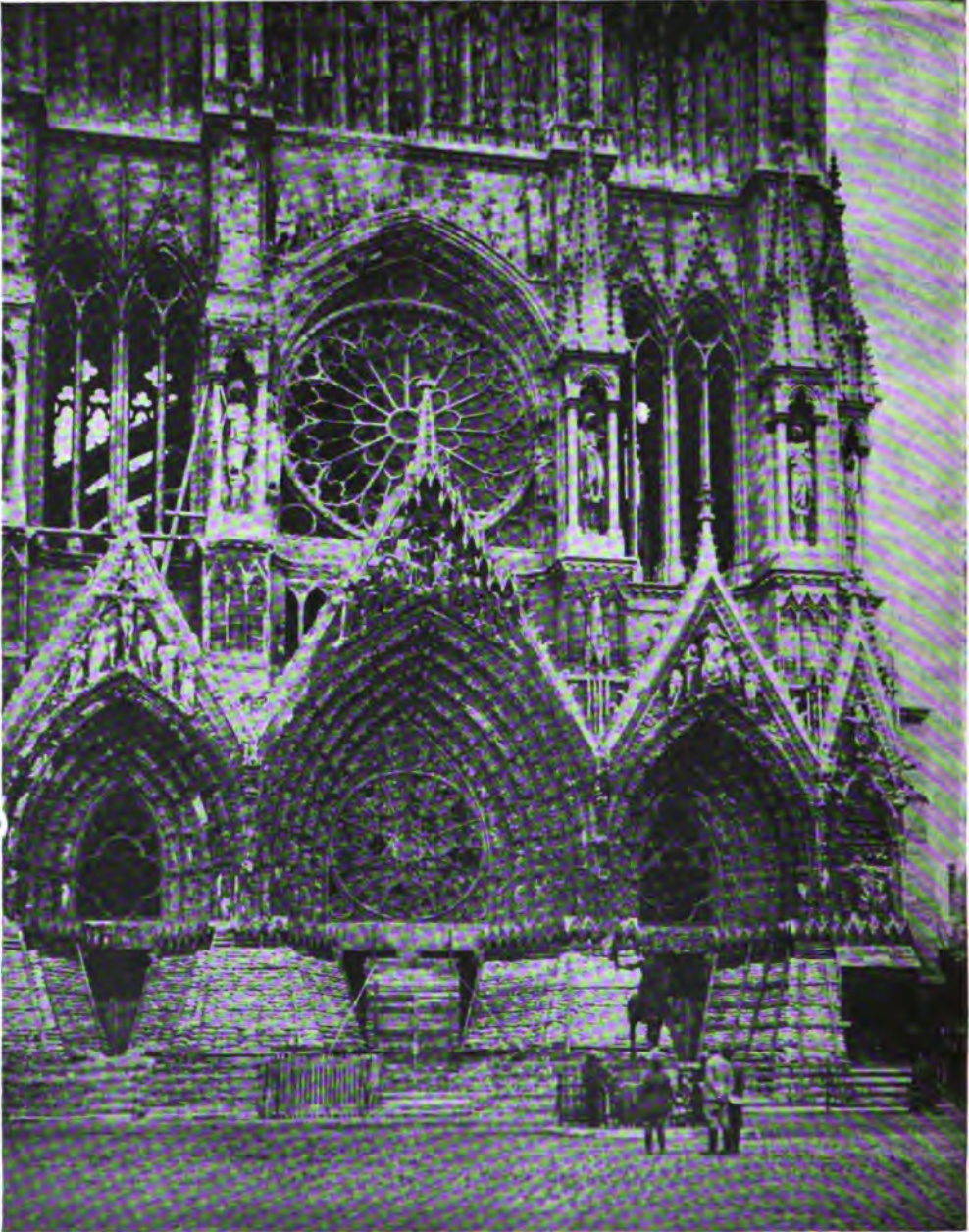
In our **tail-piece**, our artist has endeavoured to give an impressionist idea of the various accounts we have given describing the way in which wireless is playing its part on the field of battle, where it links up the various units in the fighting line, first to their divisional headquarters, and finally to the Commander-in-Chief himself.

* * *

Aviation has naturally received considerable attention in these columns, and we believe that our artist has not inaccurately indicated how these machines flying high above the enemy lines are able to communicate the intelligence gathered to the listening operators below.

* * *

The destruction of the German Wireless Chain has formed the subject of many an interesting paragraph in our successive issues as the news came in; whilst the series of happenings leading up to the closing of Sayville by the Americans have found a place in our series, and finally led up to a special article in which the subject was fully dealt with as a whole. It would be impossible to attempt an exhaustive enumeration; but we cannot close our mention of



Rheims Cathedral after Bombardment.

the general subject without referring to the interesting details of the wireless installations in Turkey and Greece, which formed some of the most recent and, at present, the most topical of our subjects.

* * *

One of the excuses put forward by the

Germans for their scandalous act of vandalism in the wanton and deliberate destruction of Rheims Cathedral was that the French put a Wireless Installation on the top of the tower. The falsity of this statement was immediately exposed by the French Government, as well as the alternative statement of

its having been used as an observation post by the French Military Authorities. It is sometimes said that hypocrisy is the tribute paid by evil-doers to virtue, and this is the best that can be said for this piece of unblushing mendacity. The remarkably fine photograph which we reproduce here possesses an added interest for WIRELESS WORLD readers, in that it is the work of the camera of Senatore Marconi, and that the exposure was personally made by him on the occasion of his recent visit to France. Nothing short of such incontrovertible evidence could make us realise the fiendish malignity with which the enemy has set to work to destroy a glorious achievement of pious antiquity, the heritage not only of France, the country in which it happens to be located, but of the whole civilised world.

* * *

All Englishmen have good reason for congratulating themselves that British men-of-war are so magnificently handled that, even under the severely trying ordeal of warfare at sea in every variety of weather conditions, they seldom stand in need of assistance from loss of life owing to wreckage. But when an unfortunate concatenation of circumstances lead to such mishaps as the loss of H.M.S. *Argyll*, the wireless installation which normally plays its less dramatic part in the daily routine of the ship proves itself here as elsewhere a sure help in need. The whole story, recently recounted in the daily press, emphasises not only the difficulties under which the units of our unseeing fleet are working, but also the magnificent spirit and discipline prevalent on board one and all of them, and the certainty with which wireless may be reckoned on even under such abnormal circumstances. The *Argyll* had been badly smashed on striking the ground, the night was extremely dark and stormy, and the sailors could plainly hear the crash of the riven metal as the heavy cruiser ground herself steadily to pieces on the rocks. Wireless messages speedily brought replies from one and another of her consorts, and at their hands the rescue was effected so skilfully that every man on board was saved. Here we have a case in which Wireless Telegraphy has to its credit the saving of not far off 1,000 skilled British sailors to go on performing their splendid

work in the defence of our shores and the confusion of the enemy.

* * *

The following description of a wireless operator on a torpedo boat recently appeared in *The Yorkshire Post* special report of the activities of the British Fleet. These smaller craft are more continuously on duty than the big battleships, and the strain upon officers and crew is often very severe. It is to torpedo boats and destroyers that we largely owe the fact that the "German Submarine Blockade" has proved a source of ridicule instead of danger. And a large measure of the success of our torpedo boats and destroyers is due to Radio-Telegraphy.

"Only the wireless operator, a fresh-faced young bluejacket, appears in uniform. He is taking a brief respite from the wireless cabin, where he sits all day and all night, the metal caps clamped over his ears listening for the little noises which are signals. They sound like the scratching of a nail upon metal—short-long, long-long-short, and so on. He transcribes them into longhand as he listens, and at the same time he can send a message with his left hand. There are occasions when he takes seventy hours duty on end, without suffering distress, and when they are done he cleans his instrument."

* * *

We presume that most of our readers will have read the various accounts of the different journalists, who recently visited the High Fleet, when they appeared in the daily papers, but there is one little item at the end of these impressionist sketches of British journalism which cannot fail to prove of interest to WIRELESS readers. As *The Yorkshire Post* correspondent left the rendezvous of the Fleet, and cast a backward glance in going, his eye naturally travelled to the flagship towering majestically against the curtain of lowering cloud. He watched the details of the picture fade gradually away, but the last feature of the admiral's headquarters at sea to disappear from his ken was what he describes as "the wireless kites making symmetrical cobwebs on the sky." This use of kite aerials is rather a reversion to earlier practice. Mr. Marconi used kites for his first trans-atlantic experiments, and they were frequently em-



An Outpost in Winter :—Wireless communication keeps the furthestmost units in touch with the Headquarters Staff.

ployed in the first days of wireless telegraphy. But during recent years they have rather fallen into disuse, and it is interesting to learn that under war conditions these wireless kites have re-asserted their utility. It will be remembered that in our issue of June last (page 184) we printed an account of wireless kites said to have been used by the *Eitel Friedrich*. Capt. W. J. King when a prisoner on board the German corsair, noted the use of them, and stated that by means thereof the range of the German's wireless was extended, from 900 to 2,500 miles. There are no means of checking such figures; but the utilisation of kites on the British admiral's flagship seems to point to the fact that the additional mileage covered by the use of kites is being found of assistance in the British Navy.

* * *

Wireless amateurs in England are, after the fashion of most Englishmen, inclined to think themselves very hardly used and tyrannised over by the authorities. That there may have been individual cases of hardship no one doubts (least of all the authorities themselves); but if they desire genuine, unadulterated, honest, straightforward tyranny, we would commend wireless amateurs to the expert pundits of the Turkish Empire. In the current number of *The Near East* Mr. W. Gordon Campbell gives some indication of what radio amateurs had to experience even in the Capital City, under the eyes of neutral diplomatists of every nationality. His statement is that:

“Everyone who possessed even the most harmless toy apparatus was assumed to be a spy in communication with the enemy outside the Dardanelles, and ran the risk of being hanged by the court-martial, which rarely paid any attention to the evidence. The mere fact that the police made such an accusation was usually regarded as sufficient. My own wireless installation was by no means a toy, but a fairly complete receiving station, with which I could hear all messages within a considerable area, and I suppose my doings were consequently regarded as all the more suspicious. In any case I had some exciting experiences with the Turkish police before escaping from Constantinople. . . .”

This Englishman's experience of pre-war days is well worth reading, and his wireless experiences with the “Concert of Europe” (his phrase for the radio messages passing between the various foreign Embassies and their vessels) make amusing reading, and indicate that the discords of wireless only too truly reflected the discords of politicians. Our wireless amateur was able to overhear the various preparations for the reception of the *Goeben* at Constantinople at a time when she was supposed to be far away. After her arrival, the Turkish station at Ok Meidan used to call her up every evening and exchange messages in French. The alteration of the *Goeben's* call letters appear to have proved ineffective in concealing the identity of what Mr. Campbell calls the “high penetrating note of her Telefunken apparatus.” Some of these messages included polite enquiries as to whether the Commander of the *Goeben* had any messages for the German Embassy, a clear demonstration of the complete Germanification of Turkey long before war was declared. This dominance of the Hun at Constantinople was made still clearer a little later on when the Ok Meidan Station started sending out messages in German, and increased its rate of speed, leading Mr. Campbell to the obvious deduction that a German expert had been located there. We must refer readers to our fellow countryman's own story of how he was denounced to the Turkish Police by the Germans as a wireless spy, and how he was visited and cross-examined on several occasions. The final consummation arrived when, though nothing incriminating had been discovered, he was informed that further enquiries would be instituted as the authorities had not yet been satisfied. Such an intimation brought home to him that the only safe course to take was flight, and we can easily imagine Mr. Campbell heaving a sigh of genuine relief, when, after passing over the Bulgarian frontier, he realised the fact that he was no longer within the power of Teuton-ridden Turkish officials.

* * *

The contrast between the “slick” methods pursued by the apostles of Kultur have not prevented them from claiming, with the most bland and guileless simplicity, the utmost licence under “International Law” from other nations. Despite

the *magnificent wireless installation* which they possessed at Dar-es-Salaam before it was smashed by H.M.S. *Pegasus* on August 8th, 1914, the British Government has actually been approached by the perfidious rapers of Belgium, who sent out wireless messages to the high seas announcing the declaration of war with England two days before it actually occurred, to credit the statement that no such message was sent to Dar-es-Salaam, and that poor innocent Teutons were "rushed" unexpectedly by the French at Bonga on August 6th and at Singha by the Belgians on August 7th. Moreover they claim that "Perfidious Albion" actually had the audacity to proceed to active measures on August 8th. On these grounds they have the impertinence to ask for a truce for Central Africa, and have appealed to the good offices of the United States and Netherland Governments. It seems incredible that the sinkers of the *Lusitania* should be received on such an errand with anything but a burst of sardonic laughter.

* * *

Strange as it may appear, the neutralisation of Central Africa receives support even from some who call themselves Englishmen. A pamphlet was actually received recently by the *African World* advocating this procedure. It was written by Mr. R. C. Hawkins, Barrister-at-Law, and called forth the following comment from our contemporary:—

"Britain did not see her way to comply with the suggestion so long as the German wireless stations in Togoland, West Africa, and East Africa were a menace to our Fleet and German African ports a possible refuge for enemy cruisers. Now that the high seas are cleared, and the German wireless stations all in our hands, Mr. Hawkins appears to think that the old treaty can be revived. But it is difficult to share Mr. Hawkins's hope. The *Conventional basin* of the Congo includes several territories, notably parts of the Cameroons and of East Africa, where operations are still in progress. Most of the mischief has been done, and in this world war it will hardly be found possible to mark out an area which shall be immune."

* * *

Small wireless telegraphy stations and

stores of benzine, etc., were not long ago detected on some of the tiny islets in the Baltic by the Russian naval authorities concerned in the defence of Riga. The method of their equipment seems to have been that swift motor launches should convey the material to these islets by night and store what they bring in caves. There are many such deserted spots off the Russian coast in this region of the Baltic which do not serve as any permanent habitation of men, but only for temporary occupation in the summer and autumn. The ingenuity shown by the Germans in this respect is worthy of admiration; but, now that the military authorities have had their eyes thoroughly opened to such possibilities, it is hoped that they will take effective measures to prevent the recurrence of such activities in the future.

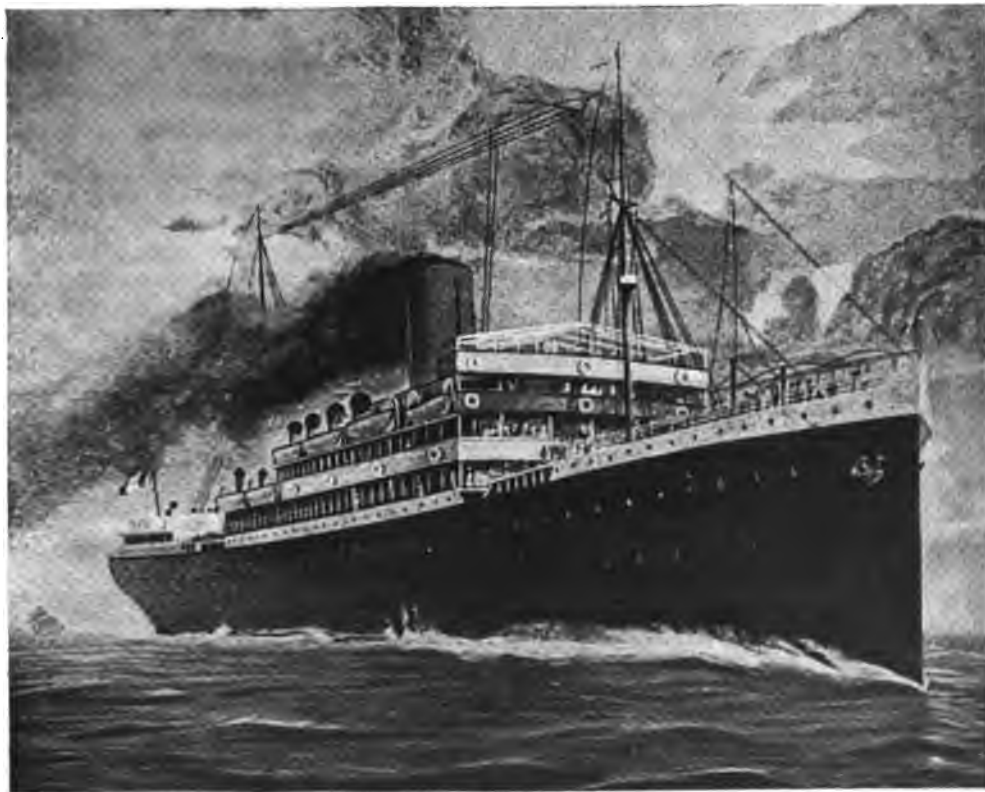
* * *

There is but little difficulty, as far as ships are concerned, in arranging for the despatch and reception of wireless messages between airships and shore stations. On this type of aircraft the difficulty arises, not so much from any trouble in arranging suitable facilities, as from the necessity of avoiding the dangers referred to by Professor Fleming in his recent address on "Science in the War and After the War," a full report of which appeared in our November issue. The lecturer on that occasion pointed out that there was considerable risk involved in the possible action upon the gases used to inflate the balloon by reduced sparks. He instanced a case of a Zeppelin which had been destroyed in this way, an explosion due to that cause having occurred after the airship had come into collision with a tree. In aeroplanes the difficulty has been one of a totally different nature, and arose from the fact that the noise of the engine was apt to drown the sound of the wireless signals as they were recorded by the telephone receiver, whilst, if the operator stopped the engine to listen, the aeroplane immediately started descending swiftly to earth. The most satisfactory method for overcoming this obstacle has proved to be the adoption of a sound-proof helmet to which the telephone is fastened, and this apparatus, combined with the reduction in engine noise characteristic of the latter types of machine, appears to have completely solved the problem.

Once again the savagery of nature has been outdone by the ruthless brutality of man. The circumstances attending the destruction of the large Italian liner, *Ancona*, of 8,210 register, torpedoed in cold blood off the Southern Coast of Sardinia, are even more revolting in their fiendish cruelty than the long list of German crimes, which up to the present had culminated in the destruction of the *Lusitania*. There would appear to be little doubt from the unanimous testimony of the survivors that the two submarines guilty of the outrage were German. It is true, at the time of actually launching their torpedoes, they flew the Austrian flag, but this had only a short while before been substituted for their true colours, and the first attempt at exculpation of the captains of the submarines came from Berlin, not Vienna. When between Cape Carbonara (south of Sardinia) and Bizerta on the morning of November 7th the submarines were sighted, and the vessel attempted to

escape by speed. The shots which at this period were fired may be justified, although we can hardly imagine this course being taken by a British man-of-war when dealing with a helpless merchant vessel. But after she had been brought to a standstill and torpedoed, the Austro-German brutes were actually guilty of firing upon boats crammed with panic-stricken emigrants, mainly women and children, as they attempted to leave the doomed vessel.

The "Marconi tradition" of gallantry at the post of duty was fully carried out, and a number of wireless messages had been despatched, despite the storm of shot and shell bursting around. These were immediately answered from the French stations at Bizerta and Ferryville. From the latter steam launches were promptly despatched, and 160 passengers, together with 10 of the crew, were rescued. The submarine was still on the scene when the rescuers arrived, and the latter were wit-



nesses of a successful enemy shot which destroyed a lifeboat in which a number of women and children had for the moment found themselves safe. The bodies of these poor victims were brought in to Bizerta.

* * *

In our November issue we published a plan showing "the wireless brain of the Army" and indicated pictorially the way in which the Chief Command receives and transmits information and orders to its sub-centres and through them to the farthest units at the front. The Special Correspondent of the *Daily Telegraph*, in a communication dated from the Headquarters of the Russian South-West Army, recently transmitted to his paper an excellent pen-picture, of which we give an extract below, and which will serve admirably as a description in words of what we have ourselves elsewhere indicated pictorially.

"There is little military movement in the streets; one sees neither guns nor brilliant cavalcades. But everything that is happening on the immense front is known here. At a certain spot a strong spark shines and crackles restlessly, and when this happens the silent waves of the wireless spread through space. Here come all the reports as to the movements of the enemy; here his intentions are divined and the necessary replies given in endless succession. This is the brain of militant Russia, which thinks in silence and co-ordinates the thousand movements of the scattered members, all with one object in view—to drive away the enemy and punish him for his invasion."

The following extract from the *Scottish Field* will speak for itself. We have often ourselves enunciated the points therein touched on, but confirmation from actual experience published in the pages of so well-known a contemporary appear worthy of record here:—

"I had a pleasant conversation the other day with an officer of the Royal Engineers.

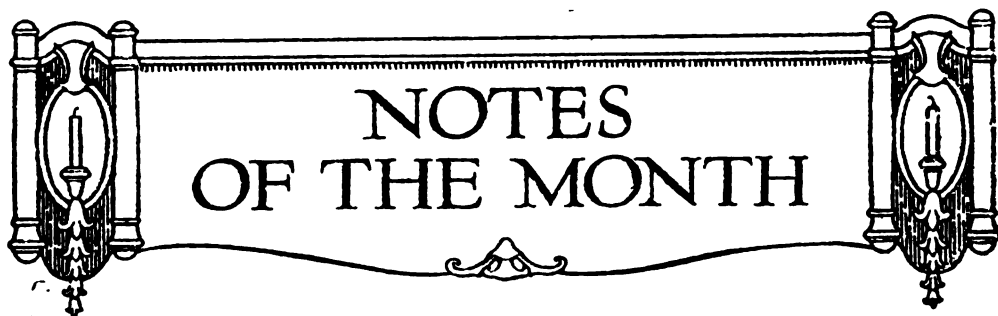
"He had much to tell of the part that electricity plays in the war, and I was specially interested in all he had to say about wireless telegraphy. As is well known, the wireless apparatus is used very freely by all the belligerents, and is found of the greatest utility and reliability. It is requisitioned by submarines when above the surface, and by its means aeroplanes and airships constantly transmit the result of their scouting efforts. In France and Belgium it forms part of each army's field equipment, and it is used by our warships for keeping in touch with each other and with their bases. Not very long ago it was generally believed that wireless would in war time prove more confusing than helpful, because the opposing nations would be able to interfere with each other's messages. My friend assured me that these misgivings had turned out to be quite unwarranted. It is found in practice that the possibility of jamming is very slight. Every endeavour in that direction proves so barren as to be now deemed unworthy of time and energy. Each side is so busy with its own messages that it leaves the others to attend to theirs."

* * *

We referred in a recent Editorial to the wireless newspaper published on the *Royal Edward*. In the series of interesting "Leaves from an Officer's Diary" recently published by *The Star* we find the officer-author enclosing "a copy of last Sunday's edition of the *Anzac Argus*. We get odd scraps of wireless news here, and as the *Peninsula Press* sometimes gets delayed in the stormy weather, or there is not much news in it when it does arrive, I started an opposition paper, just to amuse the boys, made up of scraps of wireless news suitably padded."

The "suitably padded" is delicious.





NOTES OF THE MONTH

IN the annual report of Lloyds' Register of Shipping for 1914-15 it is stated that the past year had witnessed a further increase in the use of wireless telegraphy and submarine signalling in the world's mercantile marine, there being now recorded in that society's register book 2,939 vessels fitted with wireless telegraphic installation and 947 fitted with submarine signalling apparatus.

The following incident (sent by a correspondent at the front) has a poignant interest now, as it refers to the Rev. C. E. Doudney, C.F., who was recently killed.

He was lecturing on wireless telegraphy to a group of gunners assembled in a room built of odd timber taken from ruined houses. In his review of the subject he arrived in due course at the subdivision of the impulses sent out into so many groups per second and the various tones resulting in the receiving 'phones. "In my own apparatus," he remarked, "which is worked by the current of the electric light, these groups are already prepared by the alternations of that current. The Bath light current, having a periodicity of 100, thus giving 200 impulses per second, the tone heard in the receiver by the operator at the other end is—"

A voice, apparently coming from the back row, at this moment gave the exact tone, anticipating the lecturer. "Ah," said the latter, "my friend down there understands these matters. He has the tone exactly." The men looked about, but no one confessed to this brilliant grasp of acoustics. There was silence, and then—then—there came from outside the rich, steady note of an old cow! It was some little time before

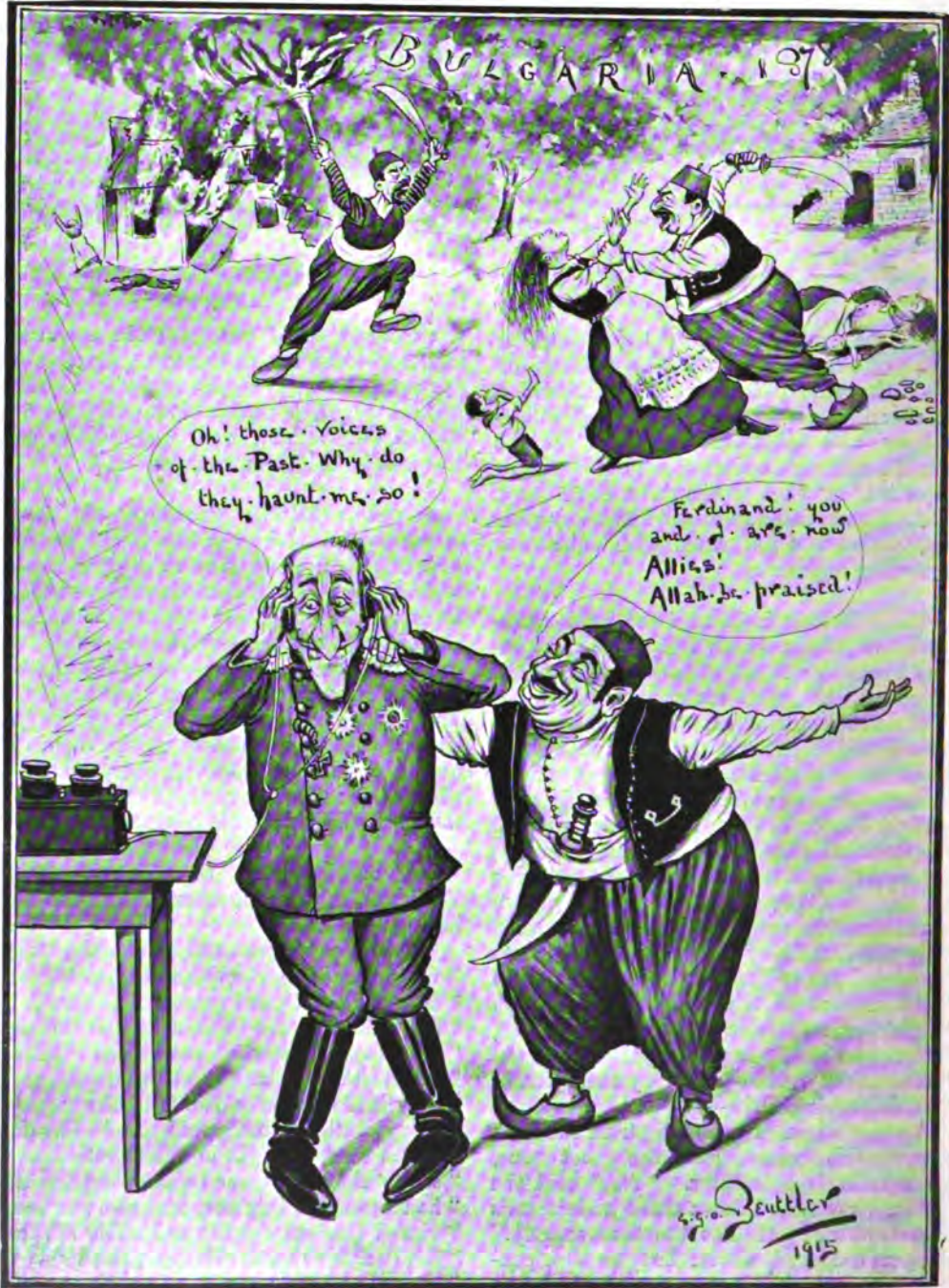
the lecturer could penetrate the storm of laughter which shook the hut. Mention of the late Rev. C. E. Doudney's amateur station, together with a photograph of his church (St. Luke's, Bath), appeared in our November, 1914, number, page 527.

According to *The Steamship*, the 7,000 wireless ship stations in the world require over 15,000 licensed men to operate them, while over 1,000 land stations, with a working force of 3,200 men, are required to handle the business which originates on board, or for these vessels. The records of the United States show that about 2,000 amateurs have been licensed in the past few years to operate their own stations. A fair estimate of the number of warships equipped with wireless is: Germany, 200; Austria, 60; whilst the United States possess over 300.

Our contemporary the *Sheffield Daily Telegraph*, in a recent issue printed the following:—

"One day a previously unknown lady visitor made her appearance at No. 10 Downing Street, and seemed so normal and ladylike that she was admitted to the entrance hall without hesitation. There she startled the attendants by inquiring if they had wireless at No. 10. She seemed disappointed at being told 'No.' She declared that, all night long, a wireless message, 'Deborah, come to Downing Street,' had been assailing her, and she was convinced that some great and noble mission awaited her there. However, said she, if the message was not from No. 10, it must have come from the House of Lords. So, to the great relief of the attendants, she left for the Gilded Chamber."

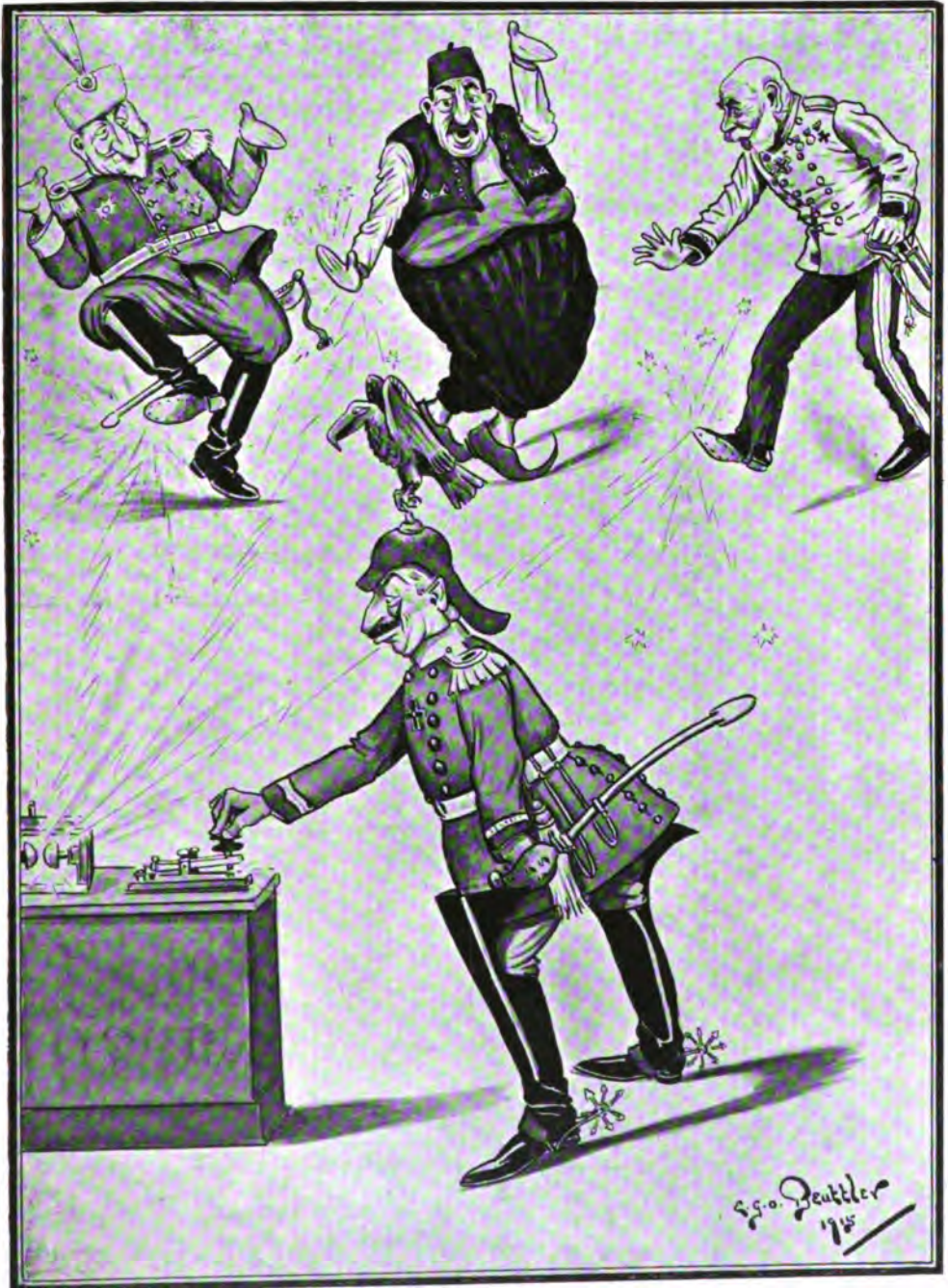
CARTOON OF THE MONTH (i)



MORSE AND REMORSE.

The Wireless Voices of the Unheeded Dead.

CARTOON OF THE MONTH (ii)



THE "WIRELESS" WIREPULLER.

Potsdam's Champion "Sparking" his Marionettes.

Transatlantic Radio-telephony

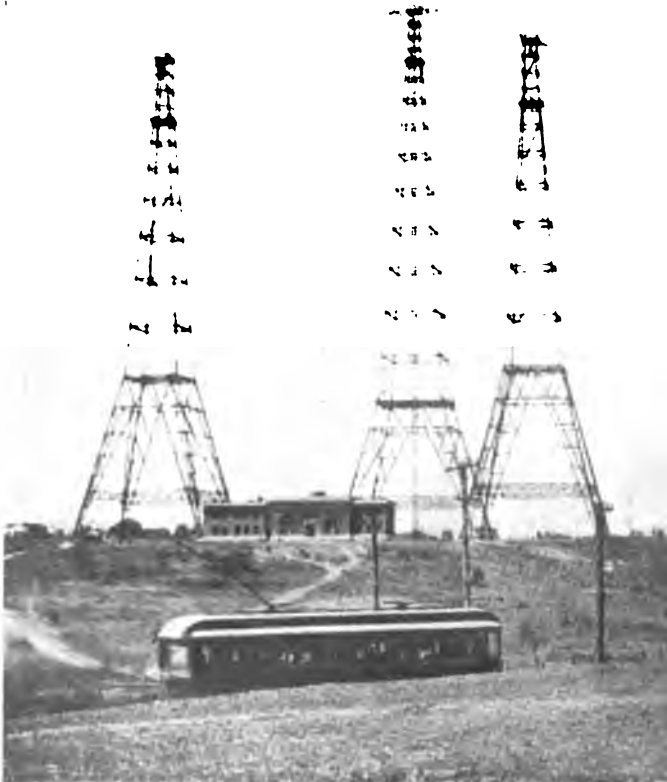
The Achievement of a Prophecy.

WHEN some time before the outbreak of war, Mr. Godfrey Isaacs predicted that wireless telephony across the Atlantic would be achieved ere long, a smile of amused scepticism flickered across the faces of many of his hearers. Mr. Isaacs spoke with an assurance which came from knowledge of the wonderful progress that has been made in the art of radio-communication, and cared little for the disbelief which his forecast might arouse. That he was justified in making such a statement is now amply proved by the announcement cabled from America that wireless telephone communication has been

effected between the giant station at Arlington, near Washington, and the huge "poste" of the Eiffel Tower at Paris. Had it not been for the overpowering influence of the war, which crowds from the newspapers almost everything save its own records, the brief accounts which were received from New York would have been expanded and written up, illustrated and embellished, until they formed the major portion of a day's issue. The importance of this new development of Senatore Marconi's invention cannot be overestimated, for not only is the new step a fresh link between the Old and the New Worlds, but it is an achievement in the

transmission of speech which has not even been attempted by the wired telephone. Not a single word, nor even a sound suggestive of a word, has ever been transmitted through an Atlantic cable, nor is there reason to think there will be while the present methods are in use, as every experienced electrician will agree. And yet the ether wave system, a mere child compared with the wire telegraph, has proved such a willing and capable servant that the spoken word has reached from the United States to Paris in a fraction of a second! It has been truly said that there are so many wonders now-a-days that the average newspaper reader accepts everything without question or surprise.

It is fourteen years since Senatore Marconi first received wireless signals



Arlington Radio Towers.

across the Atlantic, and since that time the complicated art of long-distance transocean wireless communication has daily grown in efficiency. It will, of course, be a matter of great regret that this new stride forward has not been made by Britain and her wireless experts, who have done so much for the new form of communication. For some time the Marconi Company has been working on wireless telephony, and long before the war they had attained results which were nothing short of marvellous. In the 1915 *Year Book of Wireless Telegraphy and Telephony* an article appeared from the pen of Mr. H. J. Round, a member of Senatore Marconi's staff of experts, in which were described the very interesting experiments in wireless telephony which had taken place up to the time of the publication of that volume. Mr. Round mentions that he had received very fair speech from Berlin at Marconi House so far back as at the end of 1913. In fact, such excellent progress was being made that, but for the intervention of the war, it is more than likely that the Marconi transatlantic stations would have been in wireless telephonic communication some months ago.

However, with all experimental work put by the board for the more serious requirements of war, the Marconi Company has perforce postponed its work in this connection. Our American cousins, working without restriction, have taken up the task and made the good progress above reported. Practically no technical particulars are yet available of the experiments, which were undertaken by the American Telephone and Telegraph Company, working in conjunction with the Western Electric Company, but from reports which are current it would appear that the apparatus used was a modification of the well-known Fleming valve, in its newer form as an amplifier and producer of oscillations. If this is so the methods adopted are very similar to those detailed



The Eiffel Tower.

by Mr. Round in the article above referred to. The method probably adopted was to use an ordinary microphone for speaking purposes, the current passing through this being amplified very many times and used to modify a high frequency current of great power, produced by the new oscillating Fleming valve. No special apparatus is required for reception, so that the Eiffel Tower, very kindly placed at the disposal of the Arlington station for a brief period on October 20th, had no need of a wireless telephone installation.

The transatlantic wireless telephone experiments were preceded by some fine results across America from New York to Arlington by wire telephone, and from

Arlington to Hawaii direct by wireless. The total distance thus traversed by the human voice was well over five thousand miles, for it is only a hundred miles less than that distance between Arlington and Hawaii. By means of the new amplifying devices it was possible to connect the wire telephone to the wireless, the speech so being uninterrupted.

And thus the ether wave becomes more and more the servant of the scientist. Who knows but that in years to come clear vision may be had by wireless, in such a way that to look down Broadway or across the sands of Egypt one has but to step to the apparatus and switch on ?

THE CUBE RESISTANCE PROBLEM.

THE letter from a correspondent which we published on page 492 of our November issue under the title "A Little Problem" has aroused considerable interest amongst our

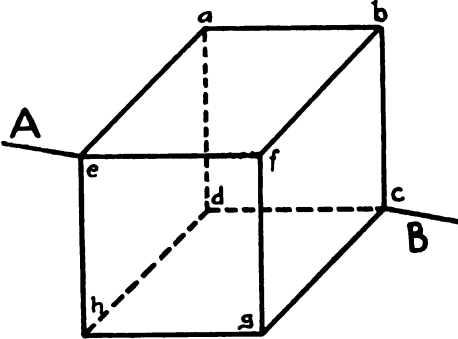


FIGURE 1 Problem Lettered.

readers. Another correspondent, Mr. W. B. Ferguson, has contributed the following explanations, which we think deal with the subject excellently:

First Method.—If the cube be imagined to be pulled apart from points e and c all confusion at once vanishes, as the cube assumes the shape shown in Fig. 3, from which it is obvious at a glance that we have three in parallel (W-X) in series with six in parallel (X-Y) in series with three in parallel (Y-Z), therefore the resistance from e to c is one-third plus one-sixth plus one-third.—

Answer: Five-sixths of an ohm.

Second Method.—The current entering at

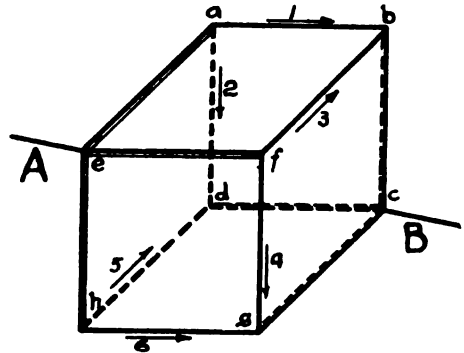


FIGURE 2: Proof of Figure 3.

e has obviously three 1-ohm paths to follow—viz. (Fig. 2), ea, ef, and eh (shown as double lines). The current also obviously leaves by three 1-ohm paths in parallel—viz., bc, dc, and gc (shown as thick lines); but so far there is a gap between the two sections. It will now be noticed that all the lines proceeding from a, f, and h connect on to the inside ends of the thickened lines—two from a, two from f, and two from h—six in all, obviously in parallel, filling up the gap referred to above. So there are three ohms in parallel (one-third ohm) in series with six ohms in parallel (one-sixth ohm) in series with three ohms in parallel (one-third ohm).—Total, five-sixths of an ohm.

Alternative Problem (Sides made of 1-ohm Sheets).—In Fig. 2 the current entering at e divides equally between top, front, and left side (abfe, efgh, eadh), each of 1-ohm resistance, therefore one-third of an ohm total. The current leaves by three sheets—bottom, back, and right side (cdhg, cdab, cbfg), each of an ohm resistance, therefore one-third of an ohm total. The first set of sheets joins direct with the second lot of sheets along the line a, b, f, g, h, d, a; therefore we have one-third of an ohm in series with one-third of an ohm.—Total, two-thirds of an ohm.

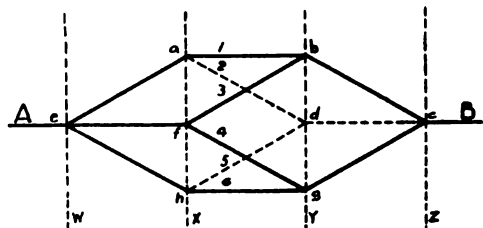


FIGURE 3: Method Employed



The Feast of Noel on Board Ship

By J. W. FARLEY

TO those who "go down to the sea in ships" the festivities ashore make a great appeal. We landlubbers do not appreciate how "cut off" Jack feels whilst at sea. The narrow compass and restricted environment of his ship constitute for many weeks, perhaps even months, his world. But even so, how very much worse was the plight of our ancestors in the days of the old sailing ships, when children bade their fathers good-bye, and wives said *au revoir* to their husbands—it was then a very different matter. In those days a voyage to New Zealand took anything from four to eight months. Now-a-days the same journey can be accomplished in just under six weeks. It is this very isolation which has caused the sailor to be known as the handy man. He had perforce not only to make himself acquainted with, but actually to engage in all sorts of work which ashore would be done by his wife or other members of her sex.

It is for these reasons that seafaring men form quite a distinct class of the community. They possess very different ideas from those of their friends ashore, and become, as their years of service afloat increase in number, more and more individualistic. This pen-picture, however, is not as true nowadays as it was years

ago. Within the last twenty years Senatore Marconi has produced his wonderful invention. Gradually and methodically he has set himself the task of improving and amplifying it so that now it has advanced almost to perfection, and has for some years been within the realms of practical politics. There is no further excuse for those at sea to be exiled from their friends and their country. The wonders of wireless telegraphy are brought into play by him who sits in his cabin unceasingly "listening in" to catch the strange sounds and convert them into messages of greeting and goodwill. Quite a small army of men is required in order that the majority of the ships equipped with the wonderful apparatus may sail with two such operators.



Welcoming Father Christmas.



Cutting up the Turkeys.

These men are highly trained and very skilled in the particular work in which they are engaged.

The position of wireless operator on board a ship is no sinecure. The work is responsible and at times very heavy, but since the advent of "two men" ships, each telegraphist is able to have an appreciable time off watch. On board the captain possesses supreme authority. He is a law unto himself, and everyone must yield to his dictates and superior knowledge on all occasions. The wireless operators, as members of the crew, must submit to his ruling in all things, but although theoretically the captain is an out-and-out autocrat, yet in actual practice it is found that his instructions are seldom such as to cause friction between his staff and himself. On the contrary, real British friendship generally characterises the relations between the "skipper" and his subordinates, whilst during "off" times, and at festive seasons like Christmas, the captain is not unmindful of the characteristic British chivalry which permeates all ranks.

Christmas in the Navy is kept with all its festivities in the good old British way. The first item of importance is the welcoming of Father Christmas by the commander of the ship, a photograph of which we are enabled to reproduce. In return the former invites the commander and officers down to the mess deck to sample the fare. It is amongst those whose business calls them to sea that

ancient customs still survive. On land we are getting so prosaic and so eaten up with our everyday affairs that we have not the time for indulgence in the old frivolities of Guy Fawkes Day, the May-Day celebrations, the Morris Dances, the Old English Fairs; all are gradually sinking into oblivion and are being lost in the whirlpool of modern life. But the old traditions of the sea fortunately remain. Although the officers and seamen are so differently placed in their respective



Father Neptune and His Hosts.



The Dining Table Bedecked with Photographs.

stations in life, yet a spirit of true British comradeship animates them all, and on this day of days they partake together of the good things provided at the board. Although "Jack" is a man in every sense of the word, yet at heart he is a child. He loves plenty of holly and mistletoe, turkey and plum pudding. On this occasion the inner man is not forgotten, as our illustration will show. On the contrary, extra fare is supplied to every possible ship. In the picture we see the head men of the messes cutting up the turkeys and fowls. After the feast of feasts, which takes place at midday, the whole ship, with the exception of the few officials requisite for the safe conduct of the vessel, gives itself over to hilarity and enjoyment. Now that most ships, including merchantmen, carry two wireless operators, one of these very necessary members of the crew is enabled to attend the jollifications below.

We are all familiar with the exploits of dear old Father Neptune. On this very important day he visits the ship in greater state than usual. The old gentleman's call is generally associated with

crossing the line, but he does not confine himself to this occasion only. Most of us are cognisant of the proceedings consequent upon a visit from Father Neptune when crossing the Line. Everybody on board (and the importance of the wireless operators' work does not excuse him from this) who has not before crossed the equator must submit to the ordeal with a good grace.

The writer well remembers his own experience in this connection when first he crossed the equator, and is thankful that such a procedure occurs only once. The unfortunate "victim" is led with much state to the shaving chair, there to await the visit of Father Neptune. On the arrival of the latter, who seats himself immediately in front of the shaving chair, the former is mercilessly lathered with soap and subsequently scraped with a huge wooden razor. The lathering is most uncomfortable, the soap being well rubbed in all over the face, into eyes, ears, nose and mouth, until the poor creature hardly knows where he is. After this performance he is cruelly tipped backwards out of the chair into a large improvised swimming bath, whence he is ignominiously pulled out

to the accompaniment of the cheers and plaudits of the onlookers. On Christmas Day Father Neptune changes his costume and appears habited as a diver, dispensing with his customary trident. In our picture we see him surrounded by several of his hosts. It will be noticed that that best-known symbol of Christmas, the Christmas tree, finds a place in the festivities.

The sign of the feast of Noel forms a link with the past. The old legends of Russia, Germany and Scandinavia contain many references to the pine tree. The latitude of the northern European countries is well adapted for the growth of this and other conifers. Perchance its abundance caused it to be chosen as the emblem of that festival of peace and goodwill. Its presence at this time is considered so necessary that jollification on board ship would be incomplete without it. All of us from our veriest youth have been accustomed to the enjoyment consequent upon the receipt of small tokens from the Christmas tree at the party. In like manner does "Jack" look forward to his Christmas tree. We repeat that although the sailor is a man yet at heart he is a child. He longs for the joyous season with all its adjuncts of festivity. To the Englishman the fête makes a more direct appeal than probably any other

holiday of the year. It is the time of year when all squabbles are settled and all petty differences put aside. Everybody forgets the troubles which once existed, and it forms, for most of us at any rate, the happiest time of the year. To such an extent is class-feeling sunk on board vessels that the whole ship's company from the Commander to the lowliest cabin boy fraternise together and forget temporarily that such a thing as rank exists.

In another illustration we see the manner in which the tables are laid. Whilst enjoying himself afloat the sailor likes to think of those whom he has left at home, and the dining table is consequently bedecked with photographs of his relatives and friends. Above may be seen decorations composed of the British national flag, the Union Jack, whose honour is at the present time being so effectively upheld. We do not realise the trials and difficulties which the brave defenders of our shores are undergoing at the present time; with the approach of cold weather their plight is anything but enviable. Steaming backwards and forwards over the storm-tossed seas, submitting to the icy blasts of the bitter winter winds without murmur and without complaint, such is the lot of those who are now engaged in preventing the despicable Hun from effecting a



A Fancy Dress Ball.

landing on our shores. After the war we shall learn, thrilled with pride, of the work our Navy has done, of which that accomplished by the wireless operator in particular will not form the least interesting or instructive reading. The legend over the table, "A Merry Xmas," characterises the spirit of the proceedings, whilst on the extreme right of the picture may be seen an iced Christmas cake.

On the great liners which plough the mighty ocean, and carrying those whose business or pleasure compels them to travel on Christmas Day, several forms of amusement are provided. Our picture shows a group of passengers garbed for a fancy dress ball. On the extreme right, with flowing white beard, may be seen the ubiquitous Father Christmas. At this time of the year he has a knack of always slipping in. He delights the children by coming in through the porthole (there are no chimneys to cabins), whilst his frolicsome fun makes amusing entertainment for the elders. Although most people welcome the exile at sea on account of the elimination of the morning letter-bag, yet on Christmas Day all are eager to hear from those at home. The ship's postman and the wireless operator are both exceedingly busy men at this time. In our photograph the former is seen handing a letter to the lucky recipient, whilst on the right the latter has just given a wireless message from home to one of the ship's officers, who is perusing it with evident interest. As the day progresses the mirth increases. The younger passengers and members of the crew indulge in romps or games like Blindman's Buff, whilst the more sedate



Christmas Messages.

settle down to bridge, whist, and other card games. During the evening toasts are freely exchanged, and the enjoyment is carried on until late in the night; whilst, sad as it is to relate, the blue twilight of dawn is often already stealthily creeping over the sea before the last merrymaker has turned in. However, "Christmas comes but once a year," and we would be the last to begrudge a few hours' pleasure to our compatriots who find themselves upon the high seas at this festive time.

SHARE MARKET REPORT.

LONDON, *November 18th, 1915.*

There has been very little business doing in the share market during the past month and prices remain practically unchanged. Marconi (English), Ordinary, £1 17s. 6d.;

Preference, £1 13s. 9d.; American, 17s.; Canadian, 5s.; International Marine, £1 5s.; Spanish and General Wireless Trust, 3s. 6d.



WE have to chronicle this month the employment of wireless telegraphy again to summon help to a vessel in distress. The Norwegian passenger steamer *Iris*, on a voyage from Bergen to the Tyne, lost her propeller early one morning off Peterhead, on the east coast of Scotland. She had twenty-four Norwegian passengers on board, and issued wireless messages for help. In response to these distress calls the steamer *Mira* left Shields in search of her. After experiencing great difficulty in consequence of the terribly foggy weather the *Iris* was located, but it was found that the *Iona*, another of the same company's vessels, had picked the *Iris* up and taken her passengers

aboard. The *Iris* herself eventually arrived safely at Shields.

* * *

The *Dacia* is probably the vessel which has been most discussed since the beginning of the war. It will be recollected that she was originally the property of the Hamburg-American Line and was sold to Mr. E. N. Breitung, a German-American, and sent to Germany with a cargo of cotton. During the voyage she was captured by a French warship, towed into Brest, being subsequently condemned by the French prize court. She and her cargo were confiscated, the boat was renamed the *Yser*, and she finally passed into the service of the French. She was recently in the Mediterranean and had responded to a



s/s "Yser" (ex "Dacia").

wireless call for help to the Italian vessel *Eliza Francesca*, which had been torpedoed, when she herself was struck, eventually sinking off Algiers. The passengers and crew reached the shore in safety.

The application of wireless telegraphy in summoning aid to vessels in distress is becoming so commonplace now that very often one hears nothing of such instances as the following: The steamer *A. W. Perry* left Boston, U.S.A., bound for Halifax. The weather during the first few days of the voyage was exceptionally foggy, when about five o'clock one morning there was a crash and a bump. The ship was on the rocks. In about five minutes' time the captain instructed the operators to send out the S.O.S. signal. The first station to answer was the Camperdown N.S. Naval Station, acknowledgments being also received from the Capital U.S.S. *Miami* and the Canadian Coast Guard Service ship *Premier*. The *Miami* was at such a distance that twenty-four hours would be required for her to steam to the wrecked vessel, but the others sent encouraging replies to the effect that assistance had been sent to her. Once more wireless demonstrated its utility. Tugs duly arrived, but were unable to move the ship. In the meantime, however, the forty-two passengers had been taken off. The vessel listed badly to port, and as the wireless room happened to be on that side the power was quickly cut off. She eventually slipped backwards off the rocks and sank in deep water.

The November number of the *Wireless Age* contains the following paragraph:

"A wireless call for a surgeon sent out by a Marconi operator on the steamship *John A. Hooper*, in the Caribbean Sea, brought medical aid to Miss Annie Christiansen, a passenger, who, during a severe storm, fell to the floor of her state room, sustaining a fractured leg. Aid was rendered by the surgeon on the steamship *Alliancia*, which, although thirty-five miles away, responded, and the sufferer was given attention.

"The doctor, however, recommended that the patient be sent to the nearest hospital, which was at Kingston, Jamaica, where Miss Christiansen was taken. She

"is a sister of one of the owners of the vessel."

* * *

In answer to distress signals the Flam-borough lifeboat *Matthew Wood* made a vain search for a vessel sending S.O.S. messages for assistance. The signals came from the direction of Smithwick Sands, and it was presumed that the vessel had grounded there and refloats with the rising tide. A heavy northern gale had fallen considerably and a high sea was still running. It is thought that the vessel was the Wilson liner *Eskimo* with passengers on board. This ship did in effect ground at about the spot whence the signals proceeded, but got off again.

* * *

A singular incident occurred during a voyage to Jamaica of a priest who recently returned from his furlough. This cleric had a recurrence of the complaint from which he suffered previous to his homecoming, but there was no doctor on board to call to his aid. Accordingly a wireless message was sent out over the ocean and succeeded in locating a medical man on another steamer. He was told the particulars of the ailment and a wireless prescription and instructions were sent back, with the result that the patient found relief and steadily improved to the end of the voyage.

* * *

The French liner *Rochambeau*, which left New York recently for Bordeaux, took fire at sea. The captain sent a wireless message to the New York office of the steamer, which carries 171 cabin passengers, 250 steerage passengers and 150 members of the crew. The ship's position was not given, but the officials of the line say that she should be near Halifax. The captain's message reads:—

"Fire in reserve bunkers; spontaneous combustion. Think there is no danger. If cannot control, will go into Halifax."

A subsequent wireless message received in New York from the Captain states that the fire was extinguished and that the ship is proceeding to Bordeaux.

* * *

The British steamer *Rio Lajes*, which left New York for Queenstown recently, sent a wireless message stating that she was on fire

and asked for help. The wireless message actually came from the SS. *Frederick*, saying that in the Western Atlantic in latitude 41.58 north longitude 59.30 west she passed a British steamer with fire in her hold, flying the signals "R.S.W.V.," which correspond with those of the *Rio Lages*. Although no word has been received from the *Rio Lages*, her agents in New York advance the theory that the fire on board was not serious, as apparently she did not ask the steamer *Frederick*, with which she communicated, to stand by, but only to report her to Halifax by wireless, with which the *Rio Lages* is not equipped. The latter vessel carried about 5,000 tons of sugar and is a tramp steamboat of 3,591 tons.

* * *

The crew of the American oil-tank steamer *Llama* were landed at Aberdeen quite recently by the Shetland steamer *St. Rognvold*. The *Llama*, a vessel of 6,000 tons, was wrecked off Noup Head, in the North Isles. She was bound from New York to Copenhagen with a cargo of oil. When the vessel struck assistance was summoned by an S.O.S. wireless call.

* * *

In our November number, under the heading "Doings of Operators," we gave an account of the loss of the Nelson liner *Highland Warrior*, which was wrecked recently off the coast of Spain. We are now enabled to publish a photograph of the big steamer as she looked after she had run ashore.

The steamship *Mariposa*, of the Alaska Steamship Co., bound from Seattle, Wash., to southern Alaskan ports, grounded at 4.36 a.m., October 6, on the rocky shore off Pointer Island, Llana Passage, about eight miles from the Indian village of Bella Bella, British Columbia. S.O.S. signals were transmitted at 4.40 a.m., and were answered by the steamship *Despatch*, of the Border Line Transportation Co., 30 miles distant, the steamship *Senator* of the Pacific Coast Co., 370 miles distant, and the Canadian land station at Triangle Island, British Columbia, approximately 150 miles distant. The *Despatch* immediately hastened to the scene of the disaster, and after taking off all persons on board the *Mariposa*, remained near by until she could be of no further assistance. The distress call was transmitted on the emergency radio equipment of the vessel, which was installed on the main deck, and which remained above water for six hours, when the vessel slid into deeper water and the apparatus was submerged by the rising tide.

* * *

A message is to hand in London from Malta to the effect that the Spanish steamer *C. Lopez Y. Lopez*, bound from Liverpool to Manila, in the Philippines, reported by wireless that she had fire aboard, and that she would arrive at Valetta the same day. Nothing further was heard of the fire, and it was therefore presumed that she was able to get it under.



s/s "Highland Warrior" on the Rocks.

Arlington Wireless Time Signals at Creighton University

By FRANK C. PERKINS.

THE accompanying illustration shows the location of the antennae of Creighton University at Omaha, Nebraska, where there has been erected a wireless station for the sole purpose of receiving the Arlington wireless time signals. The chief peculiarity of this station is the extreme simplicity of the antennae, or the outside wiring. This consists of four No. 12 bare copper wires, which unite at the tower over the main entrance on the east front. The north and south wires are each 120 feet long. They are the two seen on the photograph. The other two, not shown on the picture, come from the south-west and north-west, and are each 144 feet long.

It is pointed out that this inequality in

the length of the antennae wires may be noted as a second peculiarity of the Creighton station. The four antennae wires are fastened to porcelain knobs at their extremities. They rise about 34 feet to the tower, where they pass through bushings set into the galvanised iron cornice. The single wire, which here unites the four, drops 45 feet inside the tower, runs horizontally through the attic 95 feet, and finally drops 16 feet to the receiving outfit which is grounded to a water pipe close by. It is stated that the antenna wires are so inconspicuous that nobody notices them. They are completely invisible at a distance of 600 feet. The receiving set is an ordinary amateur's outfit. A galena detector is



Antennae at Creighton University, U.S.A.

used. The signals are surprisingly loud. While Arlington is heard almost every night, the whole United States may be said to be audible in the Creighton station, signals coming in from Sayville on Long Island, from the Gulf boats, and from Prince Rupert on the Canadian Pacific Coast. A single one of the four antenna wires sufficed to hear Key West, in Florida.

Arlington is sometimes heard at (Eastern) noon. The wireless station is connected to the astronomical observatory by over 300 feet of wire, 160 feet of which are underground in an iron conduit pipe, 200 being in a lead-covered cable with many extensions of the antenna, and the receiving station transferred to the observatory. Arlington was never heard, although signals came in from the Gulf and Prince Rupert. When the telephone receivers are connected directly, without any battery, to the wires running to the observatory clocks, the clock signals are heard distinctly in the College every even second exactly as if a battery was in series. It is of interest to note the solar clock breaks are dull and short, those of the sidereal clock are loud and sonorous. The break-circuit lever of the first is stiff, that of the other is a steel ribbon tipped with agate.

KLEIDER MACHEN LEUTE.

Anglice—Manners make the man,

THE systematic way in which every class of German is taught by his Government deliberately to disregard every regulation of any neutral country in which he may be located recently found itself exemplified in the case of the Hamburg-American liner *President Lincoln*, interned at Hoboken (U.S.A.). That steamer's wireless was supposed to be out of commission, yet the first intimation of the fact that cholera had broken out on board was picked up, by chance, from a wireless communication sent from the vessel. Considering that this German liner, like so many others, owes her immunity from capture to the protecting *ægis* of the United States, one would imagine that the regulations of the American Government would be respected by them. Nothing of the sort! Your modern German is deaf to everything—honour and conscience, as well as all the other laws of morality.

WIRELESS FAIRY STORIES IN THE FAR EAST.

Seasonable Comments by an Operator.

AT the time of Christmas our attention is turned in the direction of fairy stories, narratives of ghostly happenings, tales of marvellous adventure and the like. Such matters are amusing and interesting in their proper place, but the following account sent from India by a wireless operator located there will indicate that Christmas tales and fairy stories often produce an extremely annoying effect upon the white man in that sun-kissed land of dusky children of adult age.

After describing the Indian coolie, his characteristics, and the way in which his idiosyncrasies are played upon by agencies seeking to enlist him for emigration, Mr. F. T. Ebbetts goes on to speak of the matter which lies closest to his own heart:

"Wireless is a thing completely beyond the understanding of the ordinary coolie, the only name they have for the wireless room is the motor-car house, anything mechanical being to them a motor-car, whilst the operator is the Howa Taka Sahibque, the Sahib of the Wind-wire. In the cool of the evening they gather on the hatches and have a collection to pay some gifted member to tell long stories to them about fairies, princesses and wicked dragons, or else read to them from an Oriental Hans Anderson long tales and legends, such as are dear to the heart of Western childhood, all in a high-pitched, piercing sing-song. Very harmless no doubt, but scarcely adding to the comfort of an operator receiving weak signals, whose cabin happens to be close at hand, especially when the audience overcome by the enormities of the villain, hurl imprecations on his head at the top of their lung power. After a few days' peaceful voyaging through waters which are, according to Kipling, 'so soft, so deep, so blooming blue,' they arrive at the land of their sojourn, to return in a year or two's time with a little hoard of rupees, and much personal luggage consisting as far as one can see of pieces of teak wood, used petrol tins, and umbrellas, to take over once more the cultivation of their strip of land from that blessing of the East, a wife who works."

The Special Problems of Aircraft Wireless—I.

By H. M. DOWSETT.

It is the writer's impression that a short and not too advanced discussion of the Problems of Aircraft Wireless would prove welcome to many of the gallant men of the R.N.A.S. and R.F.C. engaged on wireless duty. Hence these articles.

AIRCRAFT were first associated with wireless telegraphy as part of their necessary equipment. They were used for supporting the aerials of temporary or portable installations. Thus Commendatore Marconi in 1896-97 used kites on Salisbury Plain, and the British Army in 1899-1900 used kites and captive balloons in South Africa for this purpose.

A kite (Fig. 1) can be flown in a wind; it sinks in a calm. A captive balloon lifts well in a calm, but in a wind it drags at an angle on its moorings, so that the aerial it supports loses much in height (Fig. 2).

As the kite and balloon are thus complementary in behaviour, the kite-balloon (Fig. 3) invented by Parseval in 1896, and now in military use by most of the Governments of Europe, provides a means of support of remarkable steadiness in both calm and strong wind.

When aircraft are used simply as an adjunct of wireless, they introduce no special problems other than those connected with (1) their lifting power, (2) the limitation of the aerial for obvious reasons to a single wire, and (3) the strong atmospheric effects which may follow when the full height made available by the aircraft is utilised.

A short discussion on "lifting power," accompanied by a few examples illustrating the working conditions met with, may prove of interest.

The tailless Baden-Powell kites used in South Africa rose with hardly any wind, but the weights such kites would carry, of course, was strictly dependent on the wind velocity. The wind velocity increases rapidly and becomes less fluctuating as the height above the ground increases, but it is strongly influenced by local conditions.

Thus the air in December and January, 1899-1900, over the plains of the Northern Karoo in Cape Colony, influenced possibly by the scattered, steep, flat-topped hills or kopjes, appeared from the behaviour of the kites to be full of air-pockets.

But reliable statistics as to atmospheric

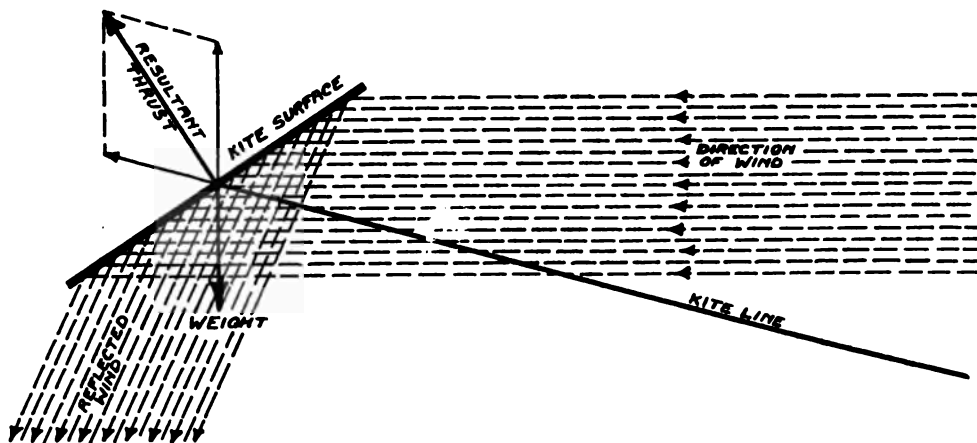


Fig. 1.—Equilibrium of Forces acting on a Kite.

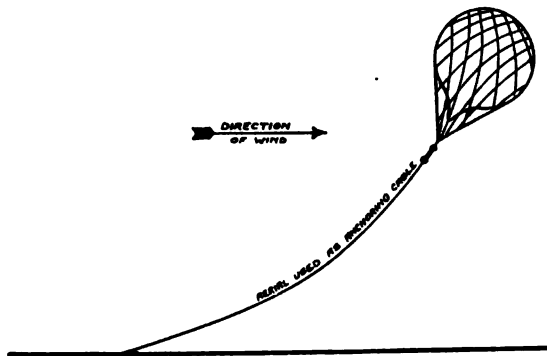


Fig. 2.—Action of Captive Balloon in a Wind.

conditions can only be obtained at present for some places in Europe. For many years the French military authorities have taken daily measurements of wind velocity at Chalais-Meudon, near Paris, and from the results obtained the probabilities of occurrence during the year of winds of various velocities have been calculated, and tabulated for aeronautical use. A few of these values are given below, the first column being in miles per hour instead of kilometres as in the original :—

Speed of wind in miles per hour.	Possibilities in parts of a thousand that the wind velocity will be less than that given in Column 1.	Number of days in year when there is possibility of wind velocity being less than that given in Column 1.
5	100	36
11	323	117
17	543	197
22	708	258
33	886	323
45	963	350
67	995	363
84	999	364
90	1000	365

In the neighbourhood of Paris, then, the average wind works out at about 15 miles per hour.

Suppose this is the wind velocity acting on the two Baden-Powell kites shewn in Fig. 4, which are flying on one kite line and supporting a short vertical aerial kept taut by a small balance weight. Now each of these kites has a 6-ft. backbone and a superficial area of 23.4 sq. feet. If a wind velocity of 15 miles per hour is applied normal to this surface, it is easy to calculate that each kite would offer a resistance to the air—which is the measure of its lifting power—of 27 lb.* But as the kite surface is inclined to the wind its resistance is less, and instead

* From formula—Resistance in kilogrammes = .125 × Surface in sq. metres × Square of Velocity in metres per sec.

of 27 lb. the actual working value is more likely to be about 12 lb.

Then the two kites, which together have a lifting power of 24 lb., have to support their own weight, the weight of the kite line, the small blocks and aerial counter weight, in addition to the aerial. As the counter-weight has roughly about the same weight as the aerial, the two kites would lift under the above conditions about 10 lb. of aerial wire, and if London Electric 7/20 class K cable were used, this would mean a length of about 150 ft. No allowance, however, is made in the above estimate for windage on kite line and aerial, which must also be added to obtain the total effective weight carried by the kites.

Suppose the wind should freshen, say, to 21 miles per hour, the lifting power of the two kites would increase from 24 lb. to about 48 lb., and one can understand that as the resistance offered by the kite increases as the square of the wind velocity, with still further increase the safe limit of working

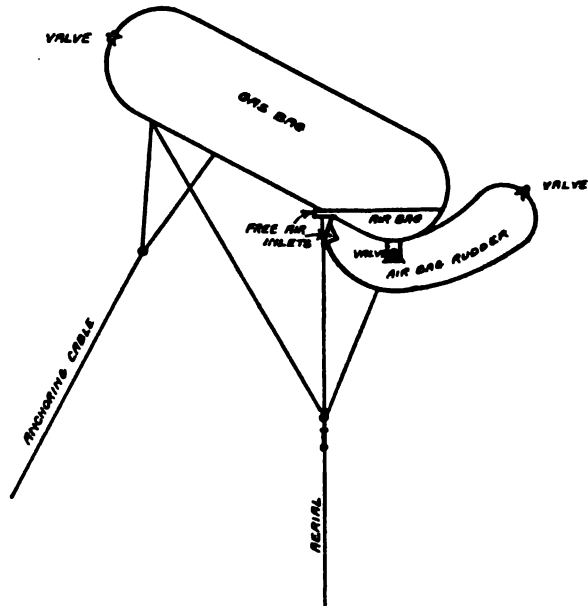


Fig. 3.—The Parseval Kite Balloon.

(In a strong wind the balloon turns its nose to windward, and air passes through the inlets into the air bag and rudder. The balloon rises, the gas in it expands and presses on the air bag forcing the air through the valve into the rudder, and thence through the rudder release valve out into the surrounding air. If the gas pressure becomes too great the gas-bag valve also acts.)

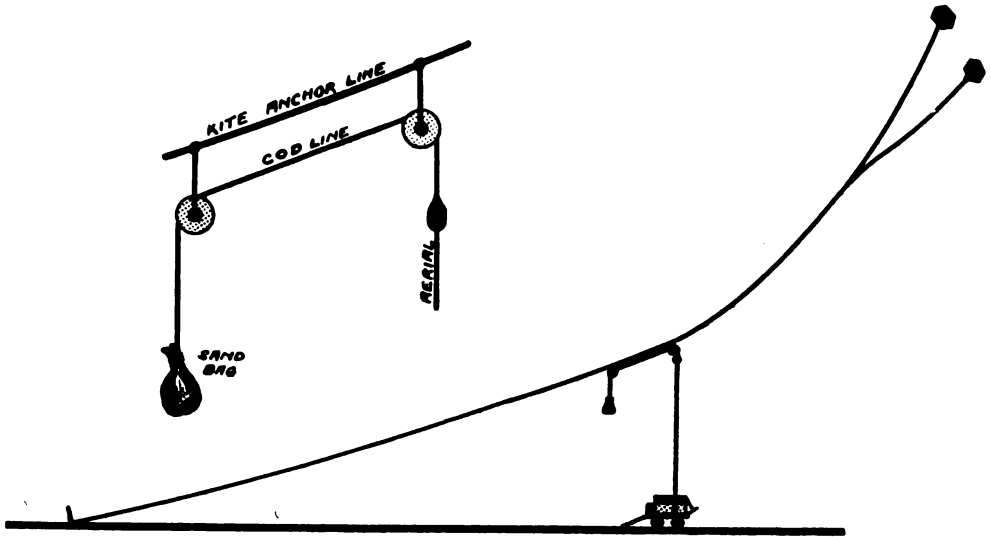


Fig. 4.—Tailless Baden-Powell Kites supporting Aerial as used in South Africa, 1899-1900.

strain for the kite fabric, frame, and cord is soon reached, and unless the kites are lowered something must give way.

The wind is always fluctuating. In South Africa atmospheric conditions are much less steady than in Europe. To correct for this, the kites were frequently flown in tandem (Fig. 5).

The falling of kite A as the wind drops creates a slight wind for kite B, which tends to check their common descent; also any side wobble of kite A is appreciably checked by the resistance of the air to the thrust which results from kite B. The multiple wind surfaces of the Hargrave kite (Fig. 6) act in very much the same way.

Because of wind fluctuations, the method of attaching the aerial shown in Fig. 4 is not often followed. Instead, the aerial is used as the kite line, so that the weight lifted is that due to the aerial and kite alone. Under such conditions the difficulty of insulating the bottom of the aerial makes it less suitable for transmitting purposes.

Consider now the case of an aerial supported by a balloon. A pilot balloon is quite large enough for the purpose. The type used in South Africa had an envelope of goldbeaters' skin, a diameter of 10 ft., and when completely filled with hydrogen a lifting power of about 39 lb. The weight lifted included the balloon, its net, and the

aerial, which was also used as the anchoring cable.

But the effect of the sun had to be allowed for, and on the South African veldt in mid-summer the sun's heat is intense. The balloon, therefore, was never filled to its full capacity, and its lifting power was probably not more than 20 lb.

On one occasion the career of the balloon at Enslin, 15 miles south of the Modder River, was abruptly ended by a dust spout, or "sand devil," which travelled across the veldt in an otherwise still atmosphere, made straight for the captive balloon and snapped its anchoring cable of steel-armoured telegraph wire which was used as an aerial with such small apparent effort, that the operator in the instrument cart first looked for a fault in his instruments before realising that his aerial support had carried away. The balloon rose quickly, expanding as it rose, and finally burst at a height of 2,000 ft. with the noise of a gun report, and fell two miles outside the camp.

A full-size captive balloon, say, of 20,000 cubic feet capacity, such as is used for observation work, lifting when filled with coal gas some 800 lb.—which includes its own weight—or with hydrogen some 1,600 lb., or a kite-balloon having a similar ascensional effort, offers of course no difficulty as regards aerial support.

A small steel wire cable would be used for anchoring, and a separate aerial—which would be carried well clear of the steel cable after being fixed by a suitable insulator to the car.

When the relationship of wireless telegraphy to aircraft is the reverse of that dealt with above, and instead of aircraft serving wireless, the wireless apparatus becomes the servant of aircraft on free balloon, airship, or aeroplane, it has to work under special conditions not met with on land or sea, and many new problems have to be faced.

There is first of all the consideration of weight and bulk of equipment.

Weight and Bulk of Apparatus.—A free balloon has very little space to spare in the car. Its equipment must, therefore, be of the simplest character. Frequently it has been limited to a receiver only, fixed to the outside edge of the car (Fig. 7), the arguments against the use of a transmitter being the weight of generator, and accumulator or dry cell battery—which accounts for the weight of the greater part of the transmitter—together with the space it would occupy inside the car, and the aeronaut's uncertainty as to the risks he might run from fire.

Weight and bulk are of less account on an airship, but a natural limit is set to the size of the transmitter by the capacity of the aerial system—which is controlled by

the size of the fixed balancing capacity—the safe voltage, and the spark frequency. This limit is about 5 k.w. aerial power for the largest Zeppelin known to have been built, the L1, 525 ft. in length and 50 ft. in diameter—which was destroyed by gale—or the large French "Speiss" airship, 460 ft. in length, 47 ft. in diameter, both types having a rigid metal frame inside the outer envelope, which is very suitable for a balancing capacity, provided the potential on it is kept very low.

Conditions as regards weight and space occupied by apparatus are not so difficult on an aeroplane. Certainly the set must be as simple and compact as possible, and it should be exceptionally robust; but the aeroplane engine can be used if necessary as a source of power in place of a battery, and the use of a transmitter carries with it no risk of fire.

Aircraft Transmitters.—The choice of a suitable aircraft generator is influenced by the following considerations:

The capacity of the aerial system of a free balloon and of an aeroplane is always small; of an airship it is larger, but it can never exceed that of an average ship aerial.

Then if the aerial system is to radiate appreciable power, it must either be raised to a high potential or its charge frequency must have a high value.

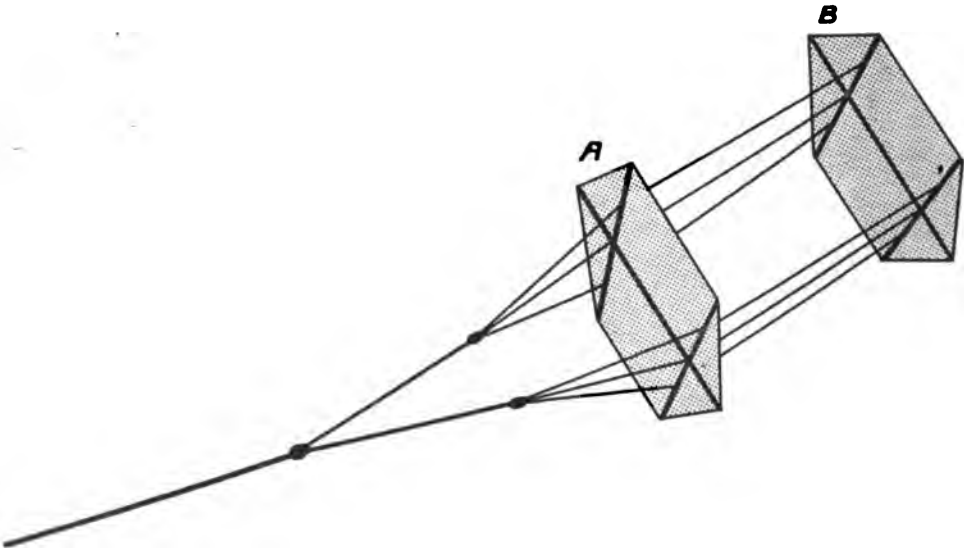


Fig. 5.—Kites flown in tandem for increased stability.

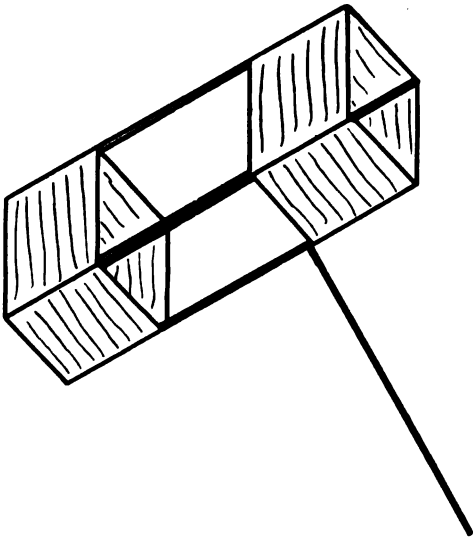


Fig. 6.—Hargrave Kite.

But in the case of balloons and airships there is a strict limit of potential which must not be exceeded if brushing on the balancing capacity—which might result in a gas explosion—is to be avoided.

Then, for the same amount of power delivered to the aerial, the different transmitting arrangements which could be used may be arranged as below in the order of the minimum voltage they would impress on the aerial—viz.:

1. Continuous wave excitation.
2. Close coupled, high note quenched spark.
3. Loose coupled, high note disc spark.
4. Loose coupled, high note plain spark.
5. High note, plain aerial spark.

In default of a robust, compact, continuous wave transmitter, a high note quenched spark, or high note disc spark transmitter comes next in order of suitability; but both types have a certain limitation in application owing to the weight of the generator. Below a certain critical weight energy is best supplied to the coupled transmitting circuits by means of a sparking coil with high speed interrupter.

The following examples illustrate the power-transmitting possibilities of aircraft. Suppose the envelope of a free balloon of 40,000 cubic feet contents were to be completely covered with metal foil, its electro-

static capacity in free space would be that of its radius in centimetres—namely, 647 cms. The practical limit of frequency for high note spark transmission is about 1,000 sparks per second, such as is obtainable from a 500 cycle generator.

Then, if the maximum potential on this metal-covered balloon above surrounding space were limited for reasons of safety to 5,000 volts, the P.D. between the balloon and its hanging aerial would be 10,000 volts, and the power it would deal with would be 114 watts. Again, suppose the Zeppelin L1 mentioned above, instead of having had a metal skeleton framework, were to have had its whole volume enclosed in sheet metal,

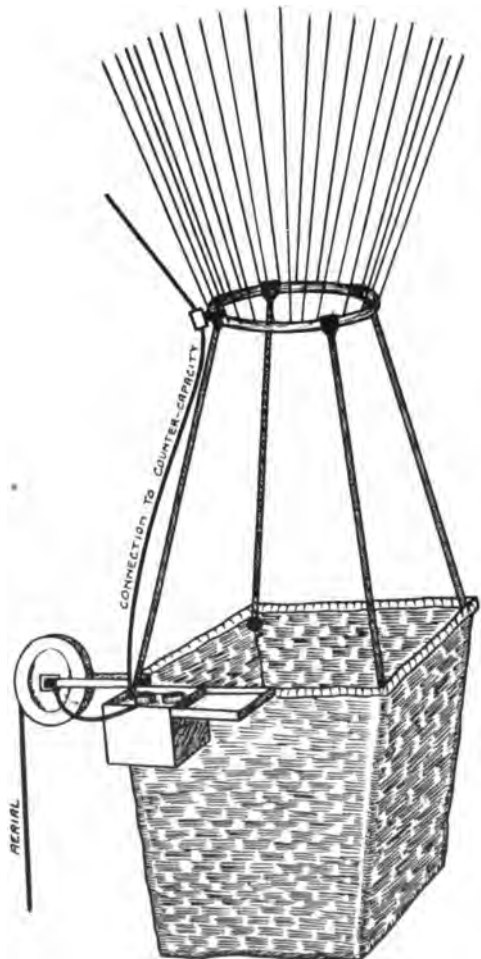
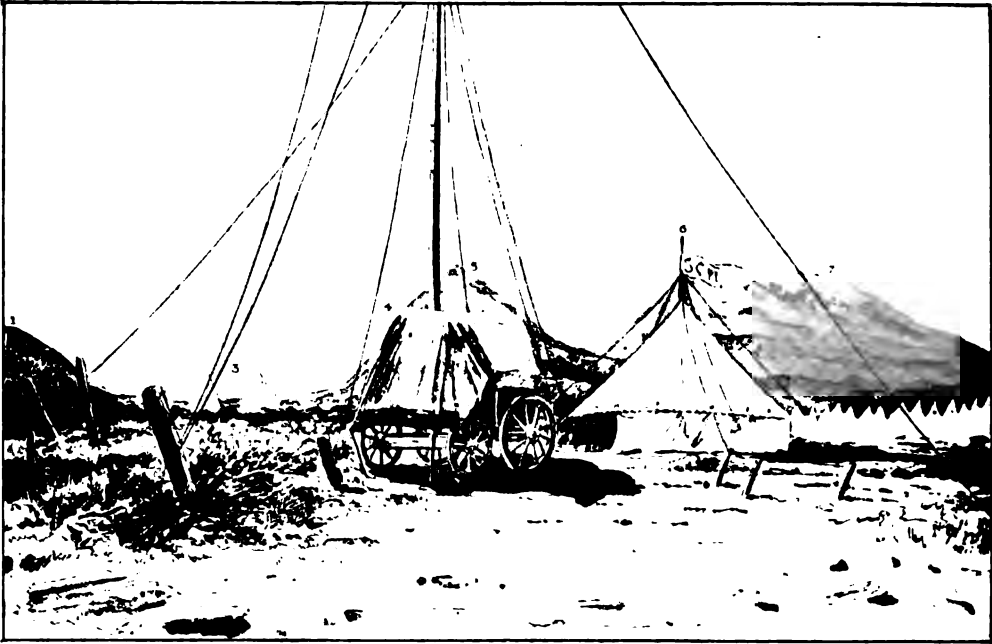


Fig. 7.—Wireless Receiver on Balloon Car.



1, Camp Kopje. 2, Pit for Wireless Balloon. 3, Wireless Camp. 4, Wireless Wagon and Mast. 5, Sharp Kopje. 6, Soldiers' and Christian Association Tent. 7, Big Kopje.

MILITARY CAMP AT ENSLIN, MODDER RIVER, CAPE COLONY (1899—1902).

then its capacity in free space calculated as that of an ellipsoid of revolution would have been 2,620 cms.

If this metal shell had been charged by a 500 cycle generator to the assumed safe maximum potential of 5,000 volts above surrounding space, 10,000 volts P.D. with its aerial, then its power consumption would have been 462 watts. The maximum power which could be utilised by an aeroplane

aerial system naturally falls between the two values given above.

These two values of 114 watts and 462 watts may well be on the high side, for in practice not only is there much less metallic surface available for use as balancing capacity than the surfaces dealt with, but the arbitrary value assumed of 5,000 volts maximum potential would under certain circumstances prove dangerously high.

(To be continued.)

CHRISTMAS, 1915.

“**P**EACE and good will, good will and peace.”
As if that message to deny

The shoutings of the hosts increase,
The thunders of the guns reply.

How shall we give that message breath ?

How speak the words—while man with man
Roll in the fiercest strife of death
That has been since the world began !

Is this the harvest we have sown ?

Is this the fruit that knowledge yields ?

The widow's tears, the orphan's moan,
The carnage of a hundred fields !

O faith, that moves the rugged hills,
Be with us, that we yet may dare
To battle with the doubt that kills,
To keep our hope against despair.

To see beyond the battle's cloud
The brightness of a coming dawn,
To hear above the tempest loud

The promise breathed on Christmas morn,

Doings of Operators

IN the September issue we wrote in this column of the loss of the s.s. *Jacona* and made reference to a poem by Mr. D. R. P. Coats, entitled "The Merchant Service Man," to which our thoughts turned when learning of the disaster. A correspondent has drawn our attention to the curious coincidence that Mr. Coats himself was at one time on this vessel. It will be remembered that an account of some of Mr. Coats's experiences was given in the July number.

* * *

It is with deep regret that we have to record the death from typhoid of Warrant Telegraphist J. C. Farmery, of the Wireless Station at Demerara. Mr. Farmery, whose home was at Upton Manor, joined the Marconi Company in December, 1912, serving on a number of ships, including the ss. *Remuera*, *Corinthic* and *Macedonia*. In March of this year Mr. Farmery was appointed for Admiralty duty, and as mentioned above, at the time of his death was attached to the Wireless Station at Demerara. The following account, reprinted from the *Daily Argosy* of Demerara for October 19th, will perhaps be



Operator J. C. Farmery.

of interest to the late gentleman's confrères in the Wireless Service:—

"We regret to announce the death at the hospital on Sunday morning of Warrant Officer J. C. Farmery, of the Wireless Station, at the early age of 21 years.

"Mr. Farmery, who was the son of Mr. and Mrs. Farmery, of London, entered the mercantile marine as a Marconi operator, and on the outbreak of war joined the Naval Service, being stationed on the auxiliary cruiser *Macedonia*, in the Southern Pacific, from which he was transferred to this colony, arriving in May. He became ill exactly four weeks ago, and on being taken to hospital his case was diagnosed as typhoid fever, to which he succumbed despite the best attention.

"Mr. Farmery was an enthusiastic member of the Georgetown Football Club, and became such immediately after his arrival in the colony. He was one of the club's most keen players, and at once secured a place in the senior eleven. He played in the Macdonald Charity and Eye-Witness competitions and received badges for both. A favourite with all the members who knew him, there was sincere regret on all sides when it was known he was so ill, and this was intensified when it was known that he had passed away. As a mark of respect the club's flags were flown at half-mast at the ground, and at 39, Main Street (the club's headquarters). Several wreaths were received, among them one from the members of the club.

"THE FUNERAL.

"The funeral, which took place from the hospital, was well attended, and there were full military honours, the Rev. R. L. Macnie, B.D., officiating. Among those present were Messrs. A. Russell, R. A. Hoban, J. Nisbet, H. S. Barnes, A. E. Chapple, W. Millar, F. H. George, W. H. Badley, A. Gilbert, J. Dennis, J. W. Gemmel, J. Slater, and J. Dennis, Lieut.

“Smith, Warrant Officers Smith and King,
“and first-class stokers Hems and Davis,
“from the station.

“Just after 4 o'clock two companies of
“militiamen, headed by the band under
“Sergt. Bennernagel, and commanded by
“Captains Walton and Cleare, Lieutenants
“Mullin and Matthey, and Lieut. Laing, the
“last-named representing the Artillery
“Militia, with Captain King, Staff Officer,
“in supreme command, arrived and formed
“up in the yard.

“The coffin was then brought out and
“placed on a 9-pounder gun-carriage,
“drawn by a couple of greys, with Corpl.
“McWatt handling the ribbons and Bdr.
“July beside him. It was then draped with
“a Union Jack, Mr. Farmery's helmet and
“sword being placed on top. A firing party
“with arms reversed then advanced at
“slow march, after which came the other
“men, unarmed, the band following, then
“the procession. On the way Chopin's
“‘Funeral March’ and the ‘Dead March in
“‘Saul’ were played, and to the cemetery at
“Le Repentir, where the interment was
“made. The service concluded, three
“volleys were fired over the grave, after
“which the ‘Last Post’ was sounded by a
“party of buglers.”

* * *

We are informed that Operator William
Neuville Freeman has been landed at Green-
wich Hospital from his ship, owing to illness.



Operator W. N. Freeman.



Petty Officer C. S. Gordon.

Mr. Freeman joined the Marconi Company in
January of this year. We trust that his
recovery will be speedy, and that he may
soon be at his duties again.

* * *

Among the telegraphists who went out to
the Gallipoli Peninsula with Petty Officer
L. T. N. Sanderson was Petty Officer Charles
Stanley Gordon. Mr. Gordon joined the
Marconi Company in August, 1911, having
previously occupied a post as telegraphist in
the Central Telegraph Office, London. After
a few trips on the *Oceanic* Mr. Gordon was
appointed Officer in Charge of the installa-
tion on board the ill-fated *Delhi*, which, as
some of our readers will remember, was
wrecked off Cape Spartel in December, 1911.
The date of the wreck, we may mention for
the benefit of the superstitious, was the 13th.
For two years after this Mr. Gordon served
on coast stations in Spain and the Canary
Islands, and on returning to England was
allotted duties in the Head Office. In
January of this year he took up special war
duty, and in due course was despatched to
Gallipoli, where he worked with Petty
Officer Sanderson, as mentioned in the
interesting account recently printed in this
magazine (p. 444 of the October issue).
Petty Officer Gordon is twenty-five years of
age, and was born in Cork. We trust that
he will come safely through all the adven-
tures which he is experiencing.

Among the victims of Germany's piracy must be counted the good ship *Den of Crombie*, recently sunk in the Mediterranean. Mr. Percival Denison, the Operator in Charge, was fortunately saved, and by the time this appears in print will have arrived back in England. Mr. Denison joined the Marconi Company two and a half years ago, having previously shown great interest in radiotelegraphy. A keen amateur, he erected his own wireless installation and those of several of his friends, and on occasions lectured locally on wireless telegraphy. Mr. Denison's first voyage as a professional wireless telegraphist was made on board the ss. *Trent*, and later he served on the ss. *Minnewaska*, *Menominee* and *Den of Crombie*.



Operator Percival Denison.

On this last ship, prior to the wreck, he had made a very lengthy voyage, visiting points as far apart as India, Italy and New York. We sincerely trust that he is none the worse for his latest adventure.

* * *

Our readers will have already seen notice in the newspapers of the sinking of the transport *Marquette*. The *Marquette* carried two wireless operators, Harry Whyte Taylor and Arthur Henry Dews. Mr. Taylor was saved, but unfortunately Mr. Dews is reported missing, and little hope is entertained of his being found. Our deepest sympathy is offered to Mr. Dews' parents in their terrible time of trial. Mr. Dews,



Operator H. W. Taylor.

who was born at Yarmouth, joined the Marconi Company as recently as July, 1915, and the *Marquette* was the first ship to which he was appointed.

Mr. Taylor joined the Marconi staff in June, 1913, having previously been employed as a telegraphist on the Great Western Railway. He has served on the ss. *Drina*, *San Lorenzo*, *Remuera*, *Moldavia* and *Marquette*, and is twenty-four years of age.

* * *

Mr. George Daniel Anderson, an operator on one of His Majesty's transports,



Operator A. H. Dews.



Operator G. D. Anderson.

has been presented with the following letter :

“ Before leaving for Basra to rejoin
“ Headquarters I should like to place on
“ record my appreciation of the excellent
“ work done by Mr. G. Anderson, of the
“ Marconi International Marine Communi-
“ cation Company, on the hired transport
“ which conveyed troops from Bombay to
“ the Shatt-el-Arab during the operations

“ in Mesopotamia, which commenced in
“ November, 1914. The ship was also used
“ to convey the disembarkation staff, and all
“ messages for this staff were sent to her.
“ Mr. Anderson was kept busy day and
“ night, and worked without a murmur or a
“ grumble. We of the embarkation staff
“ are deeply grateful to him for the impor-
“ tant part played by him during the disem-
“ barkation, and we realise that but for
“ him the work could not have been got
“ through. I have had much pleasure in
“ bringing his good work to the notice of
“ the General Officer.

“ (Sd.) A. R. B. SHUTTLEWORTH,

“ Major, D.A.Q.M.G., 6th Division.

“ Shatt-el-Arab.

“ Dec. 1st, 1914.”

We are sure all Mr. Anderson's fellow-operators will be proud of their confrère, and on their behalf we offer him hearty congratulations. Mr. Anderson joined the operating staff of the Marconi Company in 1913, and has since served on a number of vessels, mostly on the Indian coast. In August of this year, and after carrying out the work to which reference is made in the above letter, Mr. Anderson was taken ill and entered the hospital at Bombay. We are very pleased to learn that he has now been discharged, and is again fit for duty.

OUR PRESENTATION PORTRAIT-PLATE.

A fine Picture of Senatore Marconi.

In response to numerous requests from readers in all parts of the world, we have pleasure in presenting to the purchasers of the Christmas Double Number a specially prepared and beautifully reproduced photogravure plate of Senatore Marconi in the uniform of a lieutenant in the Aviation Corps of the Italian Army. The devotees to the particular branch of science invented by Senatore Marconi have long desired a really good portrait with which to decorate the walls of their sanctum ; many for want of a better have cut out from the illustrated newspapers more or less faithful reproductions of the famous scientist. Based as they often have been on casual snapshots taken in the streets, these

pictures have rarely had any artistic value, and more rarely still have they adequately represented the clever inventor. Our photogravure, on the other hand, is on delicate sepia-toned paper, mounted artistically by the corners on a backing of brown art paper, the portrait being the most recent of the famous Italian. This plate has been produced at great expense, and after the Christmas Number has been sold out, which will be early in the month, further copies will be obtainable from the publishers at the price of sixpence each, post free. The supply of these will be limited, so we suggest that readers who require further copies for presentation should order them early.



By P. W. HARRIS.

THE penny 'bus which set me down outside Professor Gapp's mansion was not a vehicle for comfortable travelling on a cold and snowy evening, and as my folding opera-hat suddenly collapsed with the weight of snow which had accumulated on its crown, I thanked my stars that I had at last arrived. From the windows of the house, or, rather, through the cracks of the Zeppelin blinds, there came a warm glow of light which spoke of comfort within, of pleasant company and Christmas fare. The door swung open and I entered.

Now everything would have gone quite satisfactorily if it had not been for my opera-hat and the mechanism within it, and even at the present moment I fail to understand what caused the annoyance on the part of the footman. It was no fault of mine that as I handed him the confounded headgear the spring should revive and shoot a handful of dirty snow in his face. It was nothing to what our men have to go through in the trenches, and I told him so. The sounds of altercation brought the Professor to my side. "Ah!" said the great scientist, shaking me warmly by the hand, "Mr. Botkins, of THE WIRELESS WORLD! Welcome to our little party!"

The blaze of light and glitter of the great room to which I was conducted at first took my breath away. Then I began to observe the individuals in the historic gathering to which I had been invited. Famous scientists with foreheads so high that they seemed to

need scaffolding to support the immense weight of experience contained therein, world-renowned authoresses whose mental attainments were as dazzling as the Parisian creations they wore, representatives of the Church endeavouring to maintain an expression of pious detachment from such worldly temptations—in fact, a gathering of intellectuals so appalling in its impressiveness that my own importance in the world of science seemed, for the moment, to be overshadowed.

Pausing before a tall, ascetic individual, attired in the robes of a foreign priest and bearing in his face indications of birth in a southern clime, the Professor presented me to him.

"Monsignor Nonsonulla, allow me to introduce to you Mr. Botkins, of THE WIRELESS WORLD. Mr. Botkins—Monsignor Nonsonulla. Monsignor Nonsonulla," explained the Professor, turning to me, "is the famous bi-weekly inventor of pocket wireless, of which you have probably read frequent notices in the lay press." The famous man graciously condescended to acknowledge my homage, which I expressed with the deepest reverence. Of his fame I was well aware, for who has not read the paragraphs in the daily press after this style:—

"From our Correspondent in Madrid." (Or Barcelona, or Seville, as the case may be.) "Considerable interest has been aroused in the invention by an Spanish priest of a "pocket wireless apparatus. Although only



"No fault of mine . . . the confounded headgear should shoot a handful of dirty snow."

"one-eighth of an inch long by three-sixteenths of an inch wide, the instrument is marvelously sensitive, the inventor having already received messages from Honolulu, Glace Bay, and Cleethorpes, to say nothing of all the Italian stations."

The reverend gentleman explained to me that he had contracts with most of the news agencies to invent the apparatus at intervals of not more than three weeks, and with the proceeds of the press notices (at a penny a line) he had been able to found a hospital in his native village. On my asking him whether the invention had yet reached a practical stage, he replied that unfortunately he was severely handicapped in this respect, as almost as soon as he had invented it properly he was due to invent it again. "The public, you know," remarked the priest, "are really so impatient!"

A little later I had the good fortune to be introduced to Miss Letta Doerwurst, the first lady wireless operator. Miss Doerwurst, who, by the way, is most prepossessing, allowed me five minutes' conversation to speak of the travels which she had perforce to make in order to be discovered in different parts of the world. As Fräulein Schneidersnitsch she was due to appear in Hamburg at the outbreak of hostilities, but luckily missed the boat and remained in America for some months, where, under the name of Masie Popcorn, she had posed (with one hand on the spark-gap and the other on the aerial) for many interesting photographs.

Passing hither and thither among the very highest of the high in the intellectual world, I was enabled to converse briefly with many whom, but for the Professor, I should never have had the opportunity of meeting. Monsieur Tonnerre, the Academician who had discovered that wireless waves, colliding in mid-Atlantic, had caused the explosion on board the ill-fated *Voltfaco*; M. Ilaff Samashu, the famous Polish explorer, who, whilst travelling in China, had obtained irrefutable evidence that Confucius invented the coherer; Madame Iva Kold, the great singer, whose top note has only been equalled by a quenched gap on overload; and many another whose interest in wireless is as practical as it is intellectual.

Suddenly all conversation was hushed owing to the booming note from a loud buzzer concealed in an electrolier. Slowly, and after some preliminary "V's" the announcement of Dinner rolled forth in Morse signals of perfect formation; and then, with but a brief pause, each gentleman received the name of the lady whom he was to lead to the table. By good fortune I had to take the arm of Miss Molly Denite, a first cousin, by the way, of the Official Receiver.

The dining hall of Professor Gapp's mansion had been constructed in perfect imitation of a baronial hall of the Cromwellian period. The Gapp family is a very old one, extending back to the time of the Conqueror, when the first Baron Arress de Gapp gained his title and much land as a reward for repairing the aerial on the Royal transport which brought the Norman Conqueror to our shores. Around the dark oak walls of the hall were ranged many trophies and flags, whilst directly above the Professor's seat were displayed the Gapp arms (argent, three X's gules, in a field magnetic, a strop insulator sinister).

Of the dinner itself I could write much if space permitted. (Space *does* permit. It's no good trying to get out of it that way.—ED.) The long table with its dazzling white cloth was covered with the daintiest wireless decorations that could be imagined. As a centre-piece was placed a silver discharger, rotating at full speed and illuminating the table from the brilliance of its spark. To deaden the sound the whole instrument was enclosed in a crystal case, which enabled everything to be seen and yet muffled the roar down to a pleasant hum.

As soon as we were all seated the Professor

rose and addressed the gathering in these words :—

“ My dear friends, although speech-making is usually a feature of the latter end of a meal rather than the commencement, I think it necessary to explain before we begin that the whole of the dinner will be served—as it has been cooked—by wireless. In years to come you will perhaps remember our little festivity as the first occasion on which a dinner was organised and completely managed by the aid of radiotelegraphy. First, then, my new invention, the radio-culinerimeter, has been installed in the kitchens of the famous Splitz Hotel, whose chef, as you may know, is by repute a true past-master of his art. This invention enables any dish or dishes placed in it to be immediately transported here by electric waves and received in the radiogrubbdispersulator which is arranged beneath the table. From this instrument the food will be brought to each guest through a small trap-door in the table. I myself have before me the controlling-keys by which the timing of the courses can be arranged. We will now commence. Potage ! ”

As he announced the first course the venerable scientist pressed a key and immediately there arose a roaring sound accompanied by a slight smell of ozone. Then before each guest appeared a plate of steaming soup accompanied by a hot roll. Everyone was delighted, save a somewhat ill-mannered foreign guest, who, having his elbow on the table where his soup was due to appear, received a full charge of mulligatawny in the arm. For the next few minutes the clanking of spoons and the gurgling of soup echoed through the hall and jangled the armour.

“ Poisson ! ” commanded the Professor.

Again the roaring noise commenced. With an air of experienced expectancy the rows of guests watched the table before them. Then just as suddenly as before the plates appeared with— But what was this ? Everybody regards the plates with consternation and three ladies faint ! Horror ! Every fish has two legs and a beak ! !

“ A thousand apologies ! ” cried the Professor. “ Be calm, I beseech you ! I accidentally pressed both the fish and game buttons together. The matter can soon



“ Scientists with foreheads so high as to need scaffolding.”

rectified. REVERSE!!" Immediately the plates disappeared and were replaced by others bearing delicate fillets of sole.

In a few moments the slight disturbance had subsided and the unconscious ladies were restored by squirting soda-water down their backs, placing vanilla ices on their bare shoulders, and other homely remedies. Thenceforward course after course appeared with admirable precision, all served in perfect style and each a masterpiece of culinary art. I shall never forget the wondrous scene and the impression made upon me by hearing the champ, champ of the jaws of so many leading lights in the literary and scientific world as they devoured the courses before them.

After the ladies had withdrawn and coffee and liqueurs had appeared, Professor Gapp explained in detail to a fascinated gathering the intricacies of the apparatus which had served us so well. I am afraid the technical details are too complicated to be described here. (Another excuse.—ED.) I must not, however, fail to mention the ingenuity of the great scientist in devising an instrument which caused soup and other liquids to be conveyed in the *trough* of the waves, so as to avoid spilling.

In the drawing-room, where we joined the

ladies, arrangements had been made for a delightful musical evening. Seated at the wireless piano Miss Doerwurst was charming the assembled company with a delicious little southern air entitled "I'd send you heaps of love, dear, but the Captain's cut the juice off!" in which, with touching melancholy, she described the pangs of a darkie operator who wished to violate the Berne Convention by sending "Notes" to his dusky queen. As soon as the applause had subsided Monsieur Ilaff Samashu, who possessed an excellent baritone voice, began to sing that charming old-world melody, "I'll Sing Thee Songs of Ebonite!" rendering in a sad yet forceful manner his distrust of Bakelite, Condensite, Shellaced paper and other insulating materials. So great was the impression created by this song that one old gentleman, in an ecstasy of emotion, tore off his celluloid collar and threw it into the fire.

And thus, with songs and music, we passed as enjoyable an evening as could be wished. Amongst so many brilliant people a large number were able to contribute by song to the entertainment, and others drew forth sweet melodies from violin and pianoforte. Others, again, recited with great feeling. I particularly remember Mr. Blodiff Ino, the famous Anglo-Siberian, reciting Shelley's



"An ill-mannered foreign guest . . . received a full charge of mulligatawny."

well-known poem, "Ode to an Atmospheric." As most of my readers will remember, it commences :—

Hail to thee, blithe atmospheric !
 Word thou never wert,
 That from heaven or near it,
 Pourest thy full heart,
 Higher still and higher,
 From the air thou springest,
 Like the Eiffel Tower,
 The blue deep thou wingest,
 And singing still doth jamb, and jamb-
 ing ever singest.

There was scarcely a dry eye to be seen when the great man came to the lines :—

Such harmonious madness,
 From my lips would flow

and, as Miss Molly Denite remarked to me over an ice, "No one but a madman could have written such stuff."

As a final item in the already full programme M. Ilaff Samashu stepped to the piano and, accompanying himself, trilled forth another old favourite :—

Of all the crystals bright and smart,
 There's none like carborundum,
 It is the darling of my heart,
 In spite of German Hun-dom,
 There is no crystal in the land,
 So sensitive as Carby,
 And if it shouldn't rectify,
 It's dead I'd sooner far be !"

And then, to close the evening, the great Professor rose to address us, but immediately fell back, overcome with emotion. A large



"Horror ! Every fish has two legs and a beak !"

bottle of emotion and a syphon being near at hand, he attempted to revive himself, with little success. Several other gentlemen, in somewhat negligé attitudes, were assisted to an erect position, and we all said farewell to one another and to our host. By a strange coincidence, I have no very clear recollection of just how the evening ended, probably owing to the philosophic arguments we had had. But that, I suppose, I must regard as the martyrdom of science, and who would not be martyred for Professor Sparkington Gapp ?



Among the Wireless Societies

Notes on Meetings and Future Arrangements.

Institute of Radio Engineers.—A meeting of the Institute was held on Wednesday, September 1st, in the Fayerweather Hall, Columbia University, New York, and a paper presented by Professor J. Zenneck on "The Operating Theory of Frequency Changers." The fundamental equations of the theory of the frequency changer were derived (with certain assumptions), and the application of the solution to unloaded and loaded frequency changers was discussed. The Institute availed itself of the presence of Professor Zenneck in New York to have this paper presented in person.

At the meeting held on October 6th at Columbia University, New York, Mr. M. E. Packman read a paper on "The Training of the Radio Operator." Mr. Packman has had much experience in training operators for commercial service, and his views on the proper methods of training operators in the technical, traffic, and actual operating sides of their profession, and description of equipment actually used for this purpose, were given in detail. The paper was of unquestionable interest to all engineers and operators, and discussion thereon was invited.

On Wednesday evening, November 3rd, Professor A. E. Kennelly read a paper on "The Impedances, Angular Velocities, and Frequencies of Oscillating Current Circuits." As Professor Kennelly has developed a new method of finding the true periods and dampings of any system of oscillating circuits, the paper was of great interest. In the event of time permitting, a second paper by Mr. William C. Woodland was to be presented on "The use of Multiphase Radio Transmitters." The advantages obtained by using multiphase currents and a number of rotary gaps, insofar as high frequency and low high-tension condenser capacities are concerned, were to be discussed.

* * *

Croydon Wireless Society.—Mr. J. E. Taylor, M.I.C.E., of the Post Office Engineering Department, gave a lecture

to a meeting of members of the Croydon Wireless Society at the Polytechnic, Scarbrook Road, recently, his subject being "Lightning and other Electrical Properties." Mr. Taylor dealt with the conditions of the atmosphere at various elevations, pointing out the changes which take place up to a certain elevation, and above this the temperature remains almost the same. The conductivity of gases and the effect of the ionising agent were also dealt with, together with the diurnal and seasonal variations of atmosphere, diagrams and records being thrown on the sheets by the lantern illustrating the lecturer's remarks and being of material assistance to members. The electrical conductivity of gases in the normal state is very small, and Mr. Taylor explained how gases may be put into a state in which they conduct electricity, the greater conductivity generally being in mid-winter.

* * *

Timaru Association, New Zealand.—Although amateur activity is very quiet throughout the whole British Empire, a number of societies still carry on their work, if only in a restricted form. We have much pleasure in publishing the following letter from a keen wireless enthusiast in New Zealand, knowing well that British amateurs will reciprocate the kind wishes expressed therein:

"The Timaru Association (N.Z.) A.W.A. is a branch of the parent society, the New Zealand Amateur Wireless Association, with its headquarters at Wellington (the seat of Government), and came into existence in 1914. It was formed by wireless enthusiasts in the Dominion, so that as an influential body they can establish and maintain their rights and assist the Government by regulating the conditions under which they may experiment, and by means of its branches carry out suitable research work in wireless telegraphy and its kindred subjects. Its Hon. Secretary is Mr. R. Joyce, 'Stonar,' Kilburne Parade, Wellington.

"As the oldest member I may state that I began my experiments in 1900, and was granted a licence to erect an installation in 1901, and had to make all my own apparatus, etc. Afterwards I had the co-operation and association of Messrs. A. D. Hathaway, L. J. Hitch, W. A. Cooper, J. Young, G. A. Warwick, and H. B. Curtis.

"Mr. A. D. Hathaway has since entered the Marconi service and is still with them. The other four gentlemen in the order mentioned are at present in the N.Z. Telegraph and Engineer Department of the N.Z. Government, Mr. Warwick being stationed at Samoa; Mr. Curtis and myself being the only 'unattached' ones in our society. Several young men at different times evinced a passing interest, but the society is a small one, and since the suspension of our licence, and the dismantling of aërials and apparatus, we have confined ourselves to Morse sounder and buzzer practice, and the study of the theoretical side of the subject. We get all the current literature published so as to keep in touch with what is being done in the wireless world.

"If any enthusiasts should happen along we would be pleased to make their acquaintance and do our best to entertain them, and we wish you all the Greetings of the Season, and trust it may not be long before we can again 'Listen in.'

"W. J. HUGGINS,

"Hon. Sec. T. (N.Z.) A.W.A.

"September 10th, 1915."

* * *

Wireless Society of London.—The Committee, at a meeting held on October 7th, decided that the monthly meetings and lectures shall be discontinued for the present.

This decision was arrived at in view of (1) the restrictions imposed upon all private radio-telegraphy in war time, and (2) the absence of so many of our members on active service. The Statutory Annual General Meeting will be held in December, of which due notice will be given. The financial position of the Society is such as to justify the Committee in remitting the subscriptions for the financial year 1915-16, but last year's subscription should be forwarded to the Hon. Treasurer forthwith, if not already sent.

A NEW ROUTE TO SIBERIA.

Further Use for Radiotelegraphy.

THE terrible European crisis through which we are now passing and the consequent closing of continental routes from one side of Europe to the other have created the necessity for another route to Russia and Siberia. One for passengers, and to a certain extent freight, has been opened across Norway, Sweden, and Finland, but the difficulties of transporting large quantities of produce and other goods have proved almost insurmountable. But enterprising shipping companies have made use of yet another route—viz., that round the north coast of Norway, through the Kara Sea to the Siberian coast. The Russian Government has recently seriously undertaken the exploiting and prospecting of this country. It has erected three wireless stations near the shores of the Kara Sea, which communicate with a station at Archangel. Ships arriving by this newest route are warned by these wireless stations of the presence or absence of ice as the case may be, thus accelerating their passage through the danger zone. In 1913 ships took 23 days from Tromsø in Norway to the Yenesei. This year the voyage *there and back* was accomplished in 19 days. Thus the ice difficulty has been overcome by the use of wireless telegraphy. Before its invention it was impossible for ships to get adequate information as to the conditions which lay before them. The wireless stations are situated at Yugorski, on the mainland, at the entrance to the Kara Sea; at Vaigatch, also at the entrance to the Kara Sea, on the north side of the island of the same name, between Nova Zembla and the mainland; at the Mara Sale, on the eastern side of the Kara Sea. The first two stations command the two straits which give entrance to the Kara Sea, and approaching vessels can be informed by wireless which strait is freest from ice, and what are the conditions beyond. It is proposed to equip the wireless stations with seaplanes to help in investigating the state of the seas, and to find out in greater detail which way the ice is moving and where open water lies. The utility of "air watercraft" is becoming increasingly felt, and the possibilities which lie in this direction would appear to be boundless.

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.

C. C. (Dublin).—The new edition of Hawkhead's Handbook just published contains many new diagrams which will perhaps assist you. From the information therein contained you will be able to draw for yourself a complete diagram of $1\frac{1}{2}$ k.w. set; and remember that the drawing of such a diagram will be of great value in teaching you the connections. As separate diagrams are given of the various circuits, it is an easy matter to make a drawing which combines them all.

H. P. R. (Fetter Lane, E.C.) writes.—Under what circumstances and why is a telephone transformer with low resistance telephones preferable to high-resistance telephones for wireless receiving? Given 'phones of a certain low resistance, on what principles are the windings of a suitable transformer calculated?

Answer.—As far as efficiency is concerned, there is little to choose between the two arrangements, but it is much easier to construct a telephone transformer and low-resistance telephones than to make high-resistance telephones. To get a sufficiently large number of turns within the limited space available in a telephone, extremely fine wire must be used, and this is very delicate to handle. The resulting telephone, however carefully it may be constructed, is at the best a frail instrument, and the windings may be totally destroyed by a fairly strong current, such as that given by strong signals. On the other hand, a telephone transformer can have its primary winding of sufficiently high resistance without using an extremely fine wire, as there is much more space available. In the early experiments with the Fleming valve the windings of a ten-inch induction coil were often used to make the telephone transformer, the high-resistance secondary being connected to the detector and the low-resistance primary to the telephones. Telephone transformers are constructed on the same principles as ordinary transformers.

A. W. (Fulham Road, London.)—To answer your queries satisfactorily would require more space than we can spare here, but we may point out that all the information you require—and a great deal more—is to be found in the instructional articles recently published in THE WIRELESS WORLD and in Bangay's *Elementary Principles of Wireless Telegraphy*, published by the Wireless Press, Ltd., and advertised in our pages. We think in any case you would derive more benefit from studying this book than from having your queries answered in this column. If you still find difficulty after reading the book in question, write to us again.

I. M. (South Town, Gt. Yarmouth).—THE WIRELESS WORLD examination scheme is not being pursued during the war, but we hope to take up the matter again when peace is declared. Applicants for entry into the Marconi Company's ship operating staff must be physically fit in every respect, and have to undergo a medical examination before acceptance. They must also possess a good general education. We think our article in the August number on "How to Become a Wireless Operator" will give you a great deal of assistance.

G. S. (Kingston-on-Thames).—On page 317 of the August issue of THE WIRELESS WORLD you will find an article which will give you all the information you require.

J. E. L. (Nagpur, India).—There are reasons why you do not get signals with the arrangements shown in your diagram. First, the crystal is connected in the very worst place, namely, in series with the aerial; secondly, the telephone transformer is connected in series with the crystal and the aerial; thirdly, the potentiometer is so connected that no current can possibly pass through the crystal. We would strongly advise you to study the *Elementary Principles of Wireless Telegraphy*, by R. D. Bangay, as it is evident you do not understand the principles on which a crystal detector is designed. Try short-circuiting the A.T.C. and then connecting the leads which you show in your diagram as connected to DD, to A and E. This will shunt the detector circuit across the A.T.I. and may give you some results. The detector terminals must be short-circuited by a piece of wire and the change-over switch placed on "Std. bi." Write and let us know what kind of results you obtain. You must not expect much, as the tuner in question is not designed for working with potentially operated detectors.

F. G. B. (Yarmouth).—Whilst the Morse Code is easily learnt without a teacher, to acquire a good style of sending without expert assistance is most difficult. If you and your friend could arrange for a few lessons from an expert telegraphist your progress would afterwards be rapid. If you make a few enquiries locally you will perhaps find a telegraphist who would be pleased to give you an hour or so in the evening once or twice a week for a small consideration. Try an advertisement in the local paper. If any Yarmouth reader can help our correspondent, we shall be pleased to forward any correspondence.

W. T. R. (Bolton, Lancs).—An Angstrom unit is the unit wave-length of light with which other light wave-lengths are compared. It takes its name from the physicist who first introduced it. The X-rays are a form of other vibrations whose wave-length is of the order of one Angstrom unit. In answer to your question on the effect of a rotating glass disc on a beam of light, the reply is that the effect would be exactly the same as if the disc were stationary. With regard to the other, very little is known on the subject, and we do not know of any book which is able to give much real information on the subject. Dr. Fleming's definition of the ether in *The Wireless Telegraphist's Pocket Book* is as follows:—"The imponderable medium which is assumed to pervade all space, certain forms of vibration in which constitute electromagnetic waves, and therefore waves of light or radiant heat. The ether must be supposed to possess a certain absolute dielectric coefficient, and also a certain absolute magnetic permeability. The velocity of propagation of a wave through the ether is 3×10^{10} centimetres per second, and is inversely proportional to the square root of the product of the absolute dielectric coefficient and magnetic permeability of the ether." In *The Principles of Electric Wave Telegraphy and Telephony* Dr. Fleming devotes a considerable portion of the chapter on Electromagnetic Waves to the subject of the ether. With regard to your other question on the inductant calculation, we are not quite sure what you wish to know. Are you certain that you have read correctly?

Instructional Article

NEW SERIES (No. 4)

The following series, of which the article below forms the fourth 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.

21. A quadratic equation is one which contains no higher power of the unknown quantity than the second. For example:— $2x^2+x-6=0$ and $x^2-9=0$ are quadratic equations in which x is the unknown.

There are several ways of solving these equations, and we will first of all consider the

22. *Method of Factorisation.*—Taking the first of the two equations above, we can (see Article III.) resolve it into the factors $(2x-3)(x+2)=0$. What we have now to do is to find numerical values for x which, when substituted for x in these two factors, will make the product of the factors equal to 0.

It is obvious that if either one of the factors was equal to 0, then the product of the two would also equal 0, and this gives the clue to the method of finding the required values of x . What we do is this—we take one of the factors, say $(2x-3)$, and make it equal to 0, subsequently by very simple algebra finding the correct value of x to make this true.

$$\begin{aligned} \text{Thus—} \quad 2x-3 &= 0 \\ 2x &= 3 \text{ or } x = \frac{3}{2}. \end{aligned}$$

We now know that $\frac{3}{2}$ is a value for x which will make one of the factors, and therefore the product (which is also the original equation) equal to 0. Similarly with the other factor—

$$\begin{aligned} x+2 &= 0 \\ \therefore x &= -2. \end{aligned}$$

It can be shown that there are only two such values of x , or *roots*, for any one quadratic equation, and so the *solution* of the equation $2x^2+x-6=0$ is

$$x = \frac{3}{2} \text{ or } -2.$$

23. Just as a check on our working, we will substitute these two values in the original equation, and find whether they are correct

$$2x^2+x-6=0.$$

$$\begin{aligned} \text{Putting } x &= \frac{3}{2}, \\ \text{we get} \\ 2\left(\frac{3}{2}\right)^2 + \left(\frac{3}{2}\right) - 6 \\ &= 2 \cdot \frac{9}{4} + \frac{3}{2} - 6 \\ &= \frac{9}{2} + \frac{3}{2} - \frac{12}{2} \\ &= \frac{12-12}{2} = 0 \end{aligned}$$

$$\begin{aligned} \text{Putting } x &= -2, \\ \text{we get—} \\ 2(-2)^2 + (-2) - 6 \\ &= 2 \times 4 - 2 - 6 \\ &= 8 - 8 \\ &= 0 \end{aligned}$$

Thus $x = \frac{3}{2}$ or -2 is the correct solution.

It need hardly be pointed out that this method is applicable, not only to quadratics, but to any equation which can be equated to 0, and then factorised. For example—

$$2x^2-6+x^3=5x$$

Arranging— $x^3+2x^2-5x-6=0$
 $(x+1)(x-2)(x+3)=0$ (factorised by trial)
 Putting $(x+1)=0$ we get $x=-1$

$$\begin{aligned} \text{,, } (x-2) &= 0 & \text{,, } x &= 2 \\ \text{,, } (x+3) &= 0 & \text{,, } x &= -3. \end{aligned}$$

Therefore $x = -1$ or $+2$ or -3 .

Another method for solving quadratics is that of

24. *Completing the Squares.*—Let us take the quadratic $5x^2-4x-1=0$.

First reduce the coefficient of x to unity by dividing all through by 5... $x^2-\frac{4}{5}x-\frac{1}{5}=0$. Next transpose the term not containing x to the right-hand side of the equation... $x^2-\frac{4}{5}x=\frac{1}{5}$.

We must now find a quantity which, added to the left-hand side of the equation, will make that side a perfect square. This quantity, when found, must be added to both sides of the equation so as to preserve the balance.

Considering the expression $x^2-2ax+a^2$ which we know to be a perfect square, being equal to $(x-a)^2$, we see that the last term a^2 equals (half the coefficient of x)². For the coefficient of x is $-2a$; half that is $-a$; and $(-a)^2=a^2$ (the last term).

Now in our case we have an expression

$x^2 - \frac{4}{5}x$, which we require to make into a perfect square by adding a third term.

We have seen above that the expression $x^2 - 2ax$ can be made into a perfect square by adding a^2 , this term a^2 being (half of $-2a$)². Similarly in our case we can make $x^2 - \frac{4}{5}x$ into a perfect square by adding (half of $-\frac{4}{5}$)²

$$= (-\frac{2}{5})^2 = (\frac{2}{5})^2 = +\frac{4}{25}$$

Adding this to $x^2 - \frac{4}{5}x = \frac{1}{5}$
 we get $x^2 - \frac{4}{5}x + \frac{4}{25} = \frac{1}{5} + \frac{4}{25} = \frac{5+4}{25} = \frac{9}{25}$

We can write this as—
 $x^2 - 2(\frac{2}{5})x + (\frac{2}{5})^2 = (\frac{3}{5})^2$
 or $(x - \frac{2}{5})^2 = (\frac{3}{5})^2$

Taking the square root of both sides—
 $\pm(x - \frac{2}{5}) = \pm(\frac{3}{5})$.

The \pm signs are required because the square root of $(x - \frac{2}{5})^2$ can be either $+(x - \frac{2}{5})$ or $-(x - \frac{2}{5})$. Similarly the square root of $(\frac{3}{5})^2$ can be either $+(\frac{3}{5})$ or $-(\frac{3}{5})$. Thus we can have four possible arrangements of our simplified equation—

- (i) $+(x - \frac{2}{5}) = +(\frac{3}{5})$, $x = \frac{3}{5} + \frac{2}{5} = +1$.
- (ii) $-(x - \frac{2}{5}) = -(\frac{3}{5})$, $-x + \frac{2}{5} = -\frac{3}{5}$,
 $-x = -\frac{3}{5} - \frac{2}{5} = -\frac{5}{5}$ or $x = +1$.
- (iii) $+(x - \frac{2}{5}) = -(\frac{3}{5})$, $x = -\frac{3}{5} + \frac{2}{5} = -\frac{1}{5}$.
- (iv) $-(x - \frac{2}{5}) = +(\frac{3}{5})$, $-x + \frac{2}{5} = \frac{3}{5}$,
 $-x = \frac{3}{5} - \frac{2}{5} = \frac{1}{5}$ or $x = -\frac{1}{5}$.

Thus the four arrangements boil down to two results, one of which is obtained when the signs on the two sides of the equation are the same, and the other when they are different. Thus if we had put $(x - \frac{2}{5}) = \pm(\frac{3}{5})$, this would have met both cases, and this is what we do in practice.

The roots are, of course, $x=1$ or $-\frac{1}{5}$.

This method, put shortly, is as follows :—

First, remove the term not containing x to one side of the equation, leaving the x^2 and x terms on the other side.

Secondly, to both sides add the square of half the coefficient of x , thus making the x^2 side of the equation a perfect square.

Thirdly, take the square root of each side. You will now be left with a simple equation containing x , but not x^2 . This can be easily solved for x . The last method we shall make use of is that of a

25. *Derived Formula*.—If we take a quadratic $ax^2 + bx + c = 0$, we can use it as a general equation to cover all cases, as we can always put in the proper values for a , b , and c to fit in with any particular quadratic we have to deal with.

By means of the method used in the preceding paragraph, we can obtain a solution for this equation, as follows :—

$$ax^2 + bx + c = 0$$

$$ax^2 + bx = -c$$

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

We must now add $(\frac{1}{2} \times \frac{b}{a})^2$ or $\frac{b^2}{4a^2}$ to both sides

$$x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = -\frac{c}{a} + \frac{b^2}{4a^2}$$

$$= \frac{-4ac + b^2}{4a^2}$$

We can write this

$$x^2 + 2\left(\frac{b}{2a}\right)x + \left(\frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

or $\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$

Taking square roots

$$\left(x + \frac{b}{2a}\right) = \pm \sqrt{\frac{b^2 - 4ac}{4a^2}} = \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

This formula will enable us to find the two roots of any quadratic equation, one root being

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \text{ or } x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Taking again the equation $5x^2 - 4x - 1 = 0$, in this case $a=5$ $b=-4$ and $c=-1$.

Then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(5)(-1)}}{2 \times 5}$$

$$= \frac{4 \pm \sqrt{16 + 20}}{10}$$

$$= \frac{4 \pm \sqrt{36}}{10} = \frac{4 \pm 6}{10}$$

$$= \frac{10}{10} \text{ or } \frac{-2}{10} = 1 \text{ or } -\frac{1}{5} \text{ Ans.}$$

[When working these out, don't forget the signs. That is, remember that

$$b = -4 \text{ not } +4.$$

$$\text{and } c = -1 \text{ not } +1.]$$

EXAMPLE.

Six times a certain number subtracted from three times its square leaves a remainder 105. Find the number.

Let x be the number.

Then we are told that $6x$ subtracted from $3x^2$ leaves 105, or $3x^2 - 6x = 105$, or $3x^2 - 6x - 105 = 0$.

In this case $a = 3$, $b = -6$ and $c = -105$.

Thus

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{6 \pm \sqrt{36 - 4 \times 3 \times (-105)}}{2 \times 3}$$

$$= \frac{6 \pm \sqrt{36 + 1260}}{6}$$

$$= \frac{6 \pm \sqrt{1296}}{6}$$

$$= \frac{6 \pm 36}{6}$$

$$= \frac{42}{6} \text{ or } \frac{-30}{6} = 7 \text{ or } -5. \text{ Ans.}$$

To check this result we proceed as follows :

Taking $x = 7$, we get $x^2 = 49$, and $3x^2 = 147$
 $6x = 42$

Subtracting, the difference is 105
 which is correct.

Similarly, when

$x = -5$, we get $x^2 = 25$ and $3x^2 = 75$
 $6x = -30$

Subtracting, we get -105
 again the correct result.

It is very important when solving any equation to remember to *check the results* by substitution of the values obtained in the original equation.

26. *Logarithmic Solution of Equations.*—

We shall sometimes come across equations such as $3x^{7.3} = 17x^{3.5}$. The best way to solve such equations is by means of logarithms (see Articles I. and II.)

As usual, we begin by reducing the equation to its simplest form. This we do by dividing both sides by $x^{3.5}$, when we get

$$\frac{3x^{7.3}}{x^{3.5}} = 3x^{7.3-3.5} = 3x^{3.8} = 17$$

Taking logarithms of both sides—

$$\log 3 + 3.8 \log x = \log 17$$

$$0.4771 + (3.8 \times \log x) = 1.2304.$$

Therefore $3.8 \log x = 1.2304 - 0.4771$
 $= 0.7533.$

Thus $\log x = \frac{0.7533}{3.8}$.

To work out the value of $\frac{0.7533}{3.8}$ we will use logs again. $\log 0.7533 = \bar{1}.8770$
 Subtracting $\log 3.8 = 0.5798$
 we get 1.2972

Antilog $\bar{1}.2972 = 0.1983 = \log x$.
 Therefore $x = \text{antilog } 0.1983$
 $= 1.579 \text{ Ans.}$

EXAMPLE.

The insulation resistance of a condenser can be measured by charging it to a known voltage, and allowing it to discharge by leakage through its own dielectric. The voltage left in the condenser is measured at different times after the discharge begins. The formula from which the resistance is

obtained is $V = Ae^{-\frac{t}{KR}}$ where

V = voltage across condenser (volts).

t = time from start of discharge (seconds).

K = capacity of condenser (farads).

R = insulation resistance (ohms).

$e = 2.718$

A = a constant.

Given that $V = 100$ when $t = 0$

$V = 55$ when $t = 1800$

and $K = \frac{1}{3}$ mfd. $= \frac{1}{3} \times 10^{-6}$ farads,

find R .

$$V = Ae^{-\frac{t}{KR}}$$

$$\log V = \log A - \frac{t}{KR} \log e.$$

Putting $V = 100$ when $t = 0$

$$\log 100 = \log A - \frac{0}{KR} \log e$$

$$= \log A - 0$$

$$= \log A$$

Therefore $A = 100$.

Again, putting $V = 55$ when $t = 1800$ we

$$\text{get } \log 55 = \log 100 - \frac{1800}{\frac{1}{3} \times 10^{-6} R} \log e$$

$$= \log 100 - \frac{1800 \times 3 \times 10^6 \times \log e}{R}$$

$$1.7404 = 2 - \frac{5400 \times 10^6 \times 0.4343}{R}$$

$$0.2596 = \frac{5400 \times 10^6 \times 0.4343}{R}$$

Thus $0.2596 R = 5400 \times 10^6 \times 0.4343$

$$\text{or } R = \frac{5400 \times 10^6 \times 0.4343}{0.2596}$$

$$\log 5400 = 3.7324$$

$$\log 10^6 = 6.0000$$

$$\log 0.4343 = \bar{1}.6378$$

$$\text{Adding} = 8 + 1.3702$$

$$\text{Subtracting log } 0.2596 = \bar{1} + 0.4143$$

$$\text{we have left } 9 + .9559 = 9.9559$$

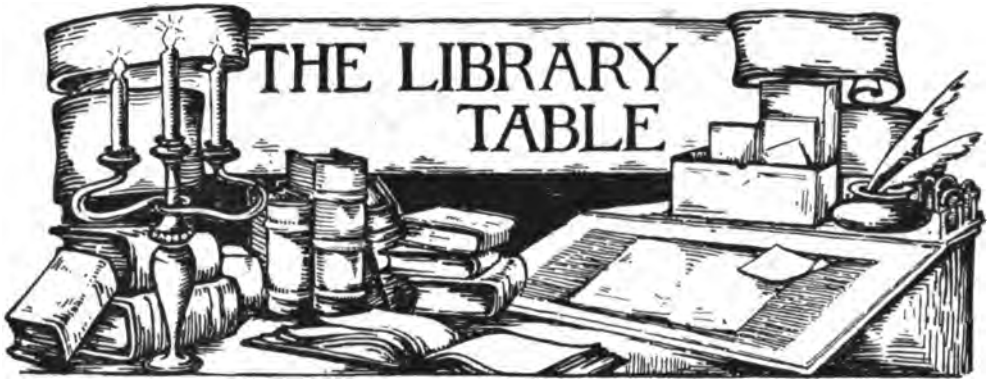
$$R = \text{Antilog } 9.9559 = (9.035 \times 10^9) \text{ ohms.}$$

$$\text{or } 9035 \text{ megohms.}$$

AN ULTRA-PORTABLE WIRELESS INSTALLATION.



THE accompanying photographs show a new American invention by which it is claimed to send and receive wireless messages without any additional apparatus over a distance of several miles. Such portable installations are frequently invented, and as particulars of this little set are not at present available, we are unable to say whether it presents any novel or remarkable features.



“THE GOOD SHIP ‘BROMPTON CASTLE.’”
By Lady Bell. London: Messrs.
Mills & Boon. 6s.

In *The Good Ship “Brompton Castle”* we have a favourable specimen of a novel of the modern school placed in a thoroughly up-to-date environment. The title is, just for once in a way, a true indication of the *locale* of the book. Almost all the action takes place on board an “Union Castle” liner, the “preliminary skirmish” occurring on an homeward voyage and the *dénouement* on an outward. We cannot say that we are much “smitten” with the character of the hero. The very idea of the book is against it, and although the gifted authoress, Lady Bell, tells us that he is a straightforward and manly fellow, his conduct hardly appears to be in keeping with that characterisation. He is represented as afflicted with the unmanly attribute of “not knowing his own mind.” This we suppose is necessary in order that a suitable field may be left open for the struggle of the two heroines to win his affections. These ladies, contrary to the ordinary run of such persons, are both of them charming in their own way. Antonia and Hildred represent two different types, the one softly brought up and thoroughly feministic, the other up-to-date and independent, knowing her own mind as the man does not, and thoroughly determined to “go in and win.” The victory falls inevitably to the latter; but the story of their struggles and the pictures of life on board are “drawn from life.”

It is characteristic of the modern novel

that the crucial engagement between the two contending parties is decided in the *Marconi cabin of the s.s. “Brompton Castle.”* The hero, who has been in the British Navy, and retired for personal reasons, takes the ladies up there, apparently in order to display his own knowledge of wireless telegraphy. He kindly explains the various technical details in popular language, and the conversation between himself and the senior wireless operator is amusing and not uninforming. Lady Bell is, not unnaturally, guilty of a few minor slips in technical details. We may instance the description of a piece of apparatus described as being the “receiving box,” the contents of which must be somewhat weird because they are denominated “receiving informers”! On the whole, however, we beg to offer Lady Bell our congratulations upon the fact that her technicalities are in the main correct, and form in this respect a refreshing contrast to the greater number of such descriptions in works of fiction.

We would specially commend the incident of the junior operator left alone on watch for the first time in the middle of the night. The authoress’s description of the thoughts and feelings that arise within him, culminating in an ingenious and happy solution of his mental crisis, constitute in our opinion a well-conceived and well-executed piece of literary workmanship.

The book is one well worthy of more than casual perusal, and we can recommend it to our readers for inclusion among their Christmas purchases.

"THE DYNAMICS OF SURFACES." By L. Michaelis. London: E. & F. N. Spon, Ltd. 4s. net.

This volume, ably translated by Mr. W. H. Perkins, M.Sc., is intended to summarise the essential points in the theoretical treatment of surface phenomena, always keeping in view the object of applying the knowledge obtained to biological purposes. Although, as the author says, it is not a biological work, it is intended for biologists and is written from their point of view.

The book is, of course, of an advanced scientific nature and as such will appeal to but a limited class of readers, but we believe it will be welcomed by many who are interested in pure research and modern scientific problems.

* * *

"RUSSIAN SELF TAUGHT." (5th edition revised.) By Major C. A. Thimm, and J. Marshall, M.A. London, 1915: E. Marlborough & Co. Cloth, 2s. 6d.; Paper, 2s.

The admirable "Self-Taught" series of foreign languages placed on the market by Messrs. Marlborough fill an ever-increasing need. In that particularly under review the usual clear and concise style has been followed. The study of the language of our gallant Ally will be much more prevalent upon the cessation of the present hostilities. In fact it is not too much to say that in view of the increasing commercial expansion of the vast Russian empire it will, to a large extent, take the place of German. The book contains naval and military vocabulary and phrases and should prove of immense service to soldiers and sailors and others in touch with Russia at the present time. We heartily commend the book to the attention of our readers.

* * *

"THE HOLIDAY ADVENTURES OF MR. P. J. DAVENANT." By Lord Frederic Hamilton. Eveleigh Nash. 2s. 6d. net.

In other parts of our journal we have often insisted upon the fact that wireless telegraphy is one of those secular inventions the advent of which is important not merely on account of its effect in influencing a particular branch of industry, but because it signalises its arrival by permeating the whole fabric of Social Existence. Fresh evidence

in support of our view is afforded by the book before us and by similar volumes, of which that under review may be taken as typical.

The idea is one familiar enough in the annals of what (for want of a better term) may be denominated *detective fiction*. The hero (yclept J. P. Davenant) is one of those superhumanly clever pieces of precocity whose premature development is looked upon by the author as adding piquancy to his narrative. Actually there is no reason why "J. P. Davenant" should not have been depicted as a highly developed *savant* of the type familiarised to English readers by Sir Arthur Conan Doyle in his well-known "Sherlock Holmes." He possesses the same eagle eye which goes straight to the weak points of the enemy's defence and the same fertility of resources in bringing to nought the machinations of the evil-doer.

But the novelty in this, as in most others of the same type of fiction, lies in the fact that the enemy against whom he has to contend baffles the ordinary routine investigator by the use of wireless. Many other writers of fiction of this type have utilised radiotelegraphic "machinery" without rendering themselves sufficiently acquainted with its technique to avoid ridiculous blunders. Lord Frederic Hamilton has avoided this pitfall, and, so far as we can judge from his descriptions, it would have been perfectly possible for the iniquitous German governess-spy to erect and work her aerials, and for the pseudo-Belgian refugees, working in the cause of Germany, to run up and manipulate their collapsible mast from the specially devised sockets of their large travelling motor-car.

We will not do the author the disservice of detailing his plots, because in this class of story the interest centres round the plot, the characters being mainly puppets introduced to "work" the action. The main idea is that P. J. Davenant, a schoolboy of between 17 and 18, with a (we hope rare) taste for smoking, finds himself on holiday with time hanging heavily on his hands, and devotes himself to the tracking down of the terrible "K.U.W."! This is the short for *Kaiserliche Ueberseeische Wacht*, which—being interpreted—means "German Imperial Oversea Guard," an institution specially devised to work against and *strafe*

the British. Our detective schoolboy penetrates the secret of their code, and his process of discovery is accompanied by many interesting and picturesque details duly set forth in the novel. Thanks to this excellent start, he exposes the whole series of ingenious machinations of German spies, and even succeeds (at the risk of his life) in bringing about the arrest of the "Master Spy" himself. For our own part we are not extremely struck with the brain power of the aforesaid Master Spy—but let that pass! There is a great deal of ingenuity shown in his detection. Probably the most ingenious incident narrated in the volume is that which includes "wireless and the language of flowers," where a certain amount of "love-interest" is introduced, which centres round a fascinating adventuress who is posing as a Belgian refugee, but all the time working treacherously against England, in combination with the usual feminine companion, and a Prussian criminal disguised as a Belgian abbé.

We may, in all sincerity, congratulate Lord Frederic Hamilton on his work, and recommend it to the attention of those who desire to give a suitable Christmas volume to schoolboys, boy scouts, *et hoc genus omne*.

The author's profits are destined for Lady Lansdowne's "Officers' Families' Fund." Both for the encouragement of the author and for the sake of the fund we hope that the circulation of these "Holiday Adventures" will be large.

* * *

"ELECTRIC BELLS, ALARMS, AND SIGNALLING SYSTEMS." By Herbert G. White. London: S. Rentell and Co., Ltd., 1s. 6d. net. Postage 2d.

Although the average "handyman" is sufficiently acquainted with electricity to fit up a simple electric bell or alarm, and often a six or eight line indicator, yet there are many cases where problems of wiring arise and where great simplifications could be made had the fitter greater knowledge. It is in circumstances of this nature that the above book will prove of considerable benefit, containing as it does particulars of the best and simplest methods of wiring all kinds of bell circuits, indicator systems, burglar alarms and the like. The book is clearly illustrated with numerous diagrams of connections and apparatus which should

make it very useful in the hands of all who have either regularly or occasionally to fit up such systems as are therein described. The chapters on fault localisation and mine signalling systems add considerably to the interest and value of the little volume.

* * *

"VILLAGE AND TOWN LIFE IN CHINA." By T. K. Leong, LL.B., B.Sc., and L. K. Tao, B.Sc. London: George Allan & Unwin, Ltd. 5s. net.

Wireless telegraphy has played, and is playing, an exceedingly important part in the opening up of the remote and hitherto little-known regions of the vast Chinese Republic. Its development there is making very rapid strides, and it is not too much to hope that before long it will be possible to communicate with any part of the "Celestial Republic" by its means. The attention of those interested in radio-telegraphy has, for some time past, been centred on this part of the globe, and the book under review, therefore, has been produced at a particularly opportune time. The work is divided into two parts, one descriptive of a Chinese village, and the other of a Chinese town. The authors, Chinese gentlemen, who have lived for many years in a Chinese village and a Chinese town respectively, give true pictures of life in China. They describe the organisation of the village and town, the family, clan, ancestral worship, marriage, education, and many other topics interesting to the student and general reader. The work is of immense interest, and we trust that it will receive the attention of readers interested in the commercial development of that part of the world.

* * *

"AIRCRAFT IN THE GREAT WAR." By Claude Grahame-White and Harry Harper. London: T. Fisher Unwin. 1915. 7s. 6d. net.

"The object of this work is to explain in a popular, dramatic, and perfectly non-technical way just what aerial warfare means, as revealed in the happenings of the great war." These words give, in a nutshell, the *raison d'être* of the book under notice. The authors dwell upon the perils an airman has to run from artillery fire, how he seeks to avoid destruction (by

various methods of flight), a matter on which Mr. Grahame White can speak with authority, and how the guns are handled which are meant to destroy his craft. They also deal with the destructive powers of aircraft with bomb-dropping, both by airship and aeroplane, and with aerial fighting. The authors devote a chapter to weather and scouting, with a reference to wireless. The application of wireless to aeroplanes has been studied very carefully in the British Flying Corps, and a number of the machines sent to the front have been equipped with radio-telegraphic plant. In the authors' own words, "in the official history of the war, when there is time and space for detail, wireless will be shown to have played its good and useful part."

* * *

"ELECTRIC MINE SIGNALLING INSTALLATIONS." By G. W. Lummis Paterson. London: Constable & Co., Ltd., 4s. 6d.

Mining is at the best risky work, and the occasional disasters which send a thrill of horror through the country only serve to emphasize the need for devices which will in any way lessen the risks of those who toil beneath the ground. Of primary importance in every mine is an efficient system of signalling, for without it little rescue work could be done in case of disaster, and its absence would hamper the winding and haulage arrangements very considerably.

The author of this book sets out to illustrate and describe the mine signalling apparatus which in his experience has been found to give the best results in practical mining work, and to indicate, by plans and diagrams, the most approved methods of installing and maintaining the apparatus. The conditions prevailing in most mines, particularly in those where inflammable gases are likely to accumulate, call for very special precautions to prevent explosions, for even the tiny spark from a bell-push may be sufficient to ignite a mixture of coal dust and air, or the dread "fire-damp," which has caused so many disasters. Moisture and dust also have to be guarded against far more than in the case above ground. All these points are carefully dealt with, and numerous diagrams and illustrations of apparatus elucidate the text. In an appendix an abstract of the rules and regulations issued by the British Home Office

relating to electric mine signals, together with the corresponding rules of the American Bureau of Standards, helps the reader to grasp just what is required by the authorities and what are the most important points to be considered. The book is well produced and should supply a distinct want.

* * *

"BROWN'S SIGNALLING." Glasgow: James Brown and Son. 2s. 6d. net.

That the volume before us should announce the seventeenth edition of this well-known volume is sufficient indication of the popularity it has acquired, and few will dispute its claim to be the most complete book on signalling yet published. All methods of signalling are fully dealt with, and wireless telegraphy is treated in a very interesting and lucid manner. Of the twenty-eight pages devoted to this method of signalling, the greater part is devoted to wireless theory and descriptions of apparatus and the remainder to lists of stations, particulars of how to send messages, regulations and other useful information. Some interesting particulars of the Marconi Wireless Direction Finder are also given. The German Telefunken system which certain shipowners introduced on some British ships prior to the war, is described in some detail, its alleged superiority to other "wireless" being ingeniously if somewhat inaccurately set forth. Readers who are acquainted with the real facts will be amused to read the statement "Approximately a wireless installation in which the spark discharged in the exciting circuit is quenched will be twice as efficient as one in which the spark is not quenched, so that, with the use of any given primary energy, the range of the station will be approximately doubled when the excitation circuit is quenched." Even assuming the superiority of the quenched gap to be what is stated here, we would draw special attention to the latter part of the sentence, which states in effect that if the transmitting power is doubled the range is doubled. Anyone with the least practical acquaintance with wireless telegraphy knows that other things being equal to double the range it is necessary at least to quadruple the power. If any proof were required of the absurdity of the statement

regarding doubled power and doubled range, we would point to the known facts regarding long-distance transmission. As two kilowatts with an average aerial is ample power for communicating over 200 miles in practically all conditions, then if the statement in question were true twenty kilowatts in the same conditions would be ample for two thousand miles! Other arguments in favour of the quenched spark are put forth in a similar fashion, that regarding the use of a musical note suggesting to the reader that the quenched spark system is the only one using a musical note. This, for example: ". . . in which case it would be totally impossible to distinguish a non-musical note and communication would so be interrupted. *For this reason the adoption of the quenched spark system in tropical countries, where such atmospheric are always present and very intense, has been very extensive.*" (The italics are ours.) We do not know whether the article on this system was supplied by the Telefunken Company from Berlin—we hope not—but in any case the arguments strongly suggest the official wireless bulletins from that capital.

The remainder of the book is throughout excellent, both in arrangement and lucidity, and we congratulate the publishers in producing such a thoroughly useful manual.

* * *

"ELECTRICAL ENGINEERING." By. T. C. Baillie, M.A., D.Sc. Vol. I.: Introductory. Cambridge: The University Press. 1915. 5s. net.

The purpose of this book is well set out in the author's preface, in which he states that the volume is designed to serve as a text-book for elementary courses in electrical engineering in technical institutions. "Naturally," says the writer, "one of the main purposes of such a book is to teach first principles, and, while matters of practical utility have been included, an endeavour has been made to avoid overloading it with descriptive details which are more appropriate to oral than to written exposition."

That the author has well achieved his object few will doubt on perusing this excellently written text-book. In the historical introduction, with which the book commences, sufficient consideration is given

to the main theories of electrical action which have been put forward since Dr. Gilbert, of Colchester, performed his famous experiments, and we are glad to see that the chapter has not been overloaded, as is so often the case in similar books, with matters which are relatively unimportant. Chapter II. deals in a very practical and thorough way with the Conduction of Electricity. The note on "laws" at the bottom of page 9 will, we venture to think, invest a subject usually regarded as "dry" with an additional interest for those who peruse the book. Magnetism, Current Measurement, Electromotive Force Resistance Measurements, and other subjects, have each a well filled chapter, and the Potentiometer, nowadays so largely used in practical instruction, is treated very thoroughly. The chapter devoted to Batteries is particularly valuable and up to date, the Edison Cell not being overlooked. A final chapter on Electric Light brings us to the end of the volume.

A word must be spoken for the excellent way in which the book is illustrated and produced. These points add much to its value and attractiveness.

TOTALISING AND TALLY COUNTERS.

"TIME is money," is the oft-quoted motto of the business man. With the existence of such a dictum it is only natural that somebody should have racked his brain to produce time and labour-saving devices. In this category fall the instruments sold by Messrs. Markt & Co. (London), Ltd., 98 Clerkenwell Road, London, E.C., comprising the combined Set-back and Totalising Counter, the Zero Ratchet Reset Counter, and the new Veeder Set-back Hand Tally Counter. These instruments fill a long-felt want, and enjoy a very high reputation for the very fine quality of their workmanship. They are particularly adapted to, and successfully used on, all kinds of machinery where a correct record of the amount of work done by the machine or the operator is required. We have pleasure in commending them to the attention of our readers.



Foreign and Colonial Notes

Antarctic.

One of the objects of Sir Ernest Shackleton's present South Polar expedition is to establish a wireless station in the Antarctic, the staff to be relieved once a year. The main object of the station would be to keep the civilised world acquainted with the meteorological conditions around the Pole. Theoretically the power of such a station need not be very great for long-distance transmission, but during Captain Scott's investigations it was discovered that the Aurora Australis (the South Pole equivalent to the Aurora Borealis in high northern latitudes), somewhat counterbalanced the lessened interference of sunshine.

* * *

Guatemala.

There is good business to be done in the States of Central America. Each country is emerging from its lethargy, and is awakening to the fact that it holds vast resources of wealth. In connection with this commercial development, it is interesting to notice that wireless messages have been exchanged between the Naval wireless telegraph stations at Arlington, Va., and the new Government radio station erected at Guatemala City, via the naval station at Key West, Florida.

* * *

Spain.

During the present time when so many European nations are engaged in warfare, it is refreshing to record the experiments of those remaining neutral. The trial of a Spanish airship will shortly take place in Barcelona. It is the invention of an engineer, Don Francisco Salas, of Seville, who has devoted many years of study to bring it to perfection. The application of radio-telegraphy to aircraft has often been touched on in the pages of this journal. It is gratifying to learn, therefore, that the new airship is fitted with a wireless installation. The airship contains 15

motors, and it is worthy of note that this is the first time that aeroplane motors have been applied to a dirigible. Another important improvement is that no ballast of any kind is necessary, and also that it has no water compartments of any kind. No loss of hydrogen takes place in descending, which forms a very distinct advantage. On a calm day the airship is able to develop a speed of about 80 miles an hour, the average speed being about 55 miles an hour. Stability is procured by an ingenious combination of counter-weights which maintain the equilibrium, thus allowing passengers to move about without causing the airship to pitch.

* * *

United States.

It is interesting to learn that the American Marconi Company has sent a number of specially trained wireless telegraphists from New York to its Pacific stations. These men will work the trans-Pacific wireless service to be inaugurated in the near future with the Japanese Government telegraph system.

* * *

All commercial and amateur wireless stations in the United States will soon be organised by the Navy Department for immediate use in the case of emergency by the Intelligence Bureau of the Navy. In the event of war thousands of operators along the coast lines would be instructed to "listen in" on any radio conversation that might be in progress within range of their instruments, each station using a different wave-length. The result would be to establish a line of radio "eavesdroppers" around the country which would be certain to intercept any message transmitted by ships at sea, or shore stations beyond the borders south and north. Intercepted messages would be promptly reported to the Navy Department, which would be able eventually to communicate with all Atlantic coast wireless stations at least directly from the office of the Chief of Navy operations at Washing-

ton. Five wireless antennæ are now being erected on the roof of the Navy building at Washington, and in a sound-proof room will be established a radio exchange station with five operators and five sets of instruments. From that room conversations can be conducted directly with the big central Navy radio plant at Arlington, Virginia, and with Navy stations along the Gulf and Atlantic coasts.

* * *

During the fiscal year 1915, the radio inspectors of the United States Bureau of Navigation reported twenty-six cases of vessels leaving United States ports which met with accident or disaster, requiring the use of wireless to summon assistance. Four of these were from fire; twelve were from running ashore, stranding, or getting into an ice jam; three were from the breakage of machinery; four resulted from collisions; one from shifting of cargo; one vessel was storm-battered and water-logged; and one was torpedoed. Excepting in the case of the *Lusitania*, which was torpedoed, the assistance thus rendered resulted in but two lives being lost.

* * *

The advantages of wireless telegraphy have lately been realised by the United States Government. We understand they have issued orders to the officers of their Navy in the following terms:

"Due to the ease with which the Navy Department can be communicated with from all parts of the world, no commander in-chief, divisional commander, or commanding officer, shall issue an ultimatum to the representative of any foreign government or demand the performance of any service from any such representative that must be executed within a limited time without first communicating with the Navy Department, except in case where such action is necessary to save life."

* * *

The Marconi Company has placed a phonograph and a large supply of records in the Cape Hatteras station for the use of the operators there.

* * *

According to a San Francisco newspaper a government wireless station will be erected at Coos Bay, Oregon.

The United States Bureau of Navigation annually compiles an edition of the "List of Radio stations of the United States." This year's shows the total number of land, ship and amateur stations in that country to be 5,073, an increase of 1,131 from the 1914 figures. The list shows that the number of government and commercial land stations in 1915 is 224, as compared with 198 in 1914. The number of general and restricted amateur stations is 3,836, an increase of 1,040 on last year's figures.

* * *

The *Electrical World* of October 23rd last prints the following paragraph:—

"The Electrical Commission of the city of Baltimore, Md., has in service a motor truck which is equipped with a 'wireless' receiving outfit, enabling headquarters to keep in communication with the crew of the truck at all times, so that emergency calls can be handled in the field with the greatest dispatch. The truck serves as a receiving station only, and for its antennæ is equipped with 425 ft. of No. 14 rubber-covered copper wire suspended just beneath its roof. During the preliminary tests the truck never failed to intercept messages sent to it within a radius of ten miles of the sending station. Even under the most unfavourable conditions, with the truck running at full speed and blanketed by tall buildings of steel construction, no difficulty was experienced in reading the messages. A simple code of signals has been adopted to avoid the necessity of engaging trained telegraph operators."

* * *

Mr. Daniels, the Secretary of the Navy, recently successfully transmitted the first wireless telephonic Naval order to Rear-Admiral Usher at Brooklyn Naval Yard.

* * *

Among the many interesting exhibits at the New York Electrical Exhibition, which was held in October at the Grand Central Palace, New York, was a five-kilowatt wireless sending and receiving station and the central generating station of an American Dreadnought. These were exhibited by direction of the Naval Department and attracted considerable attention.

PERSONAL PARAGRAPHS.

With reference to our note last month in this column that Mr. S. B. Balcombe had been promoted to the rank of Temporary 2nd Lieutenant, we now have pleasure in publishing a few particulars regarding the new officer.

Lieutenant Balcombe went out to the Front within a fortnight of the outbreak of hostilities, and fought through the famous retreat from Mons, and in the advance on the Aisne. Three months afterwards—in November, 1914—Mr. Balcombe was appointed Corporal, and in a further eight months received his promotion to Sergeant. By this time Mr. Balcombe appears to have been well on the move upwards, for only two months afterwards he was gazetted Temporary 2nd Lieutenant. At the time of going to press Lieutenant Balcombe had not received any further promotion.

* * *

Sergeant A. H. Brown, to whom we referred recently in these columns, informs us that he has now been transferred from the Seaforth Highlanders to the Royal Engineers Wireless Training Centre, and is now employed on wireless work.

* * *

Our heartiest congratulations are also due to Captain Benjamin Newton on his promotion from Lieutenant. Captain Newton, who joined the Marconi Company some five or six years ago, has had many varied experiences, for after serving for some time on board ship he took up the position of Superintendent of Telegraphs in Somaliland. This position, however, he had to relinquish owing to ill health, and, after returning to England, carried out various duties in the Marconi Company's Head Office.



Cap. B. Newton.

Soon after the outbreak of war Captain Newton received his commission, and has since been on special duty for the War Office. We are sure his many friends in the world of wireless will be glad to hear of his promotion, and on their behalf we offer him our heartiest congratulations.

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