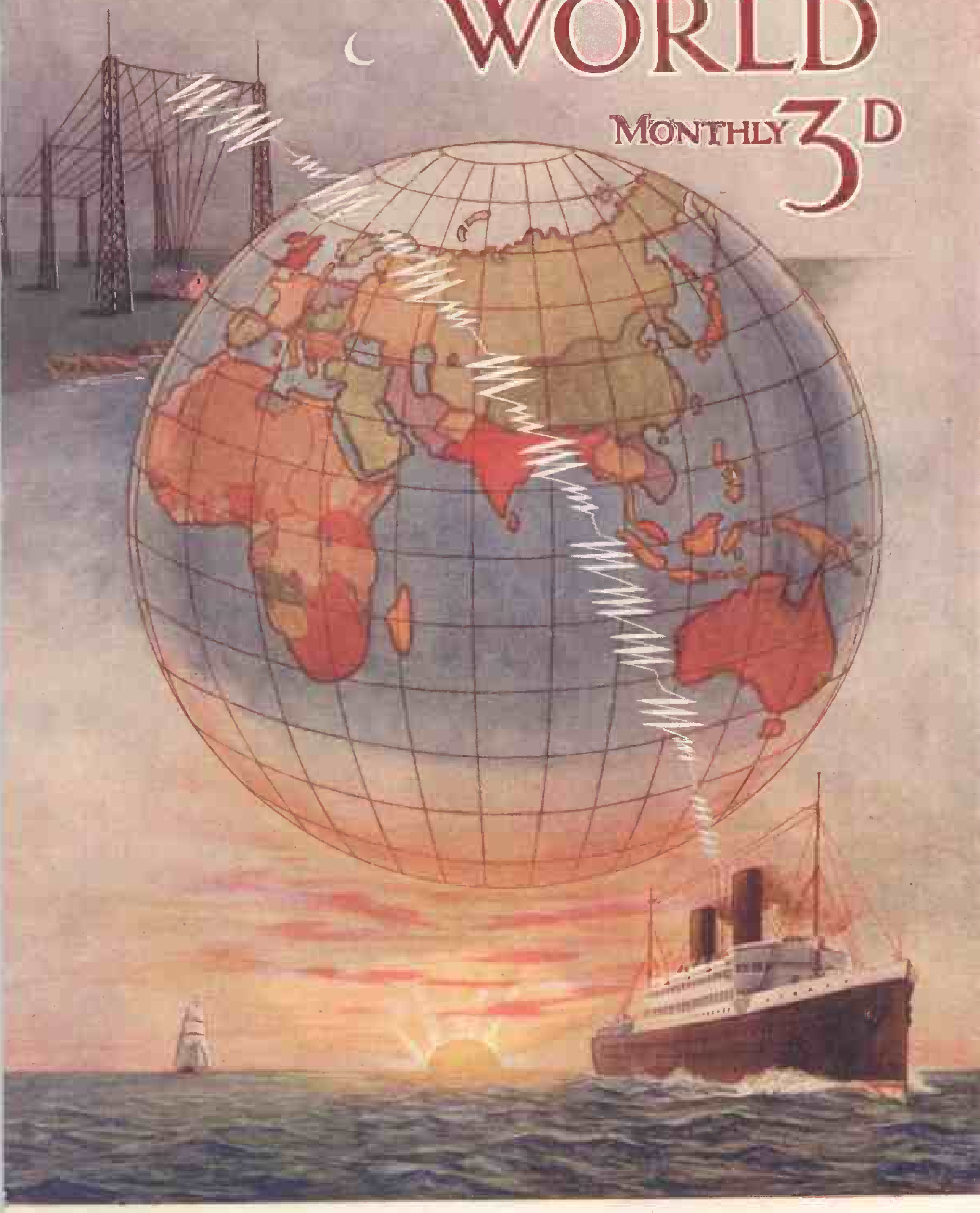
Vol. III. No. 28. (NEW SERIES.) Registered at the G.P.O for transmission to Canada by Canadian Magazine Post. JULY, 1915

WIRELESS WORLD

MONTHLY 3D



SULLIVAN INSTRUMENTS

Sullivan "Universal" Galvanometers and Shunts for Land and Sea Use.

SULLIVAN TELEPHONE RECEIVERS.

Fast Speed Wheatstone Automatic Transmitters and Receivers, guaranteed at 400 words per minute, and Wheatstone Apparatus generally.

Precision and Standard Measuring Equipments for D.C. and A.C. (high frequency) determinations, Condensers of Low Power Factor, etc.

H. W. SULLIVAN WINCHESTER HOUSE, LONDON, E.C., ENGLAND.
Works: LIVERPOOL HOUSE, MIDDLESEX ST., LONDON, E.C.

Telegrams: "Deadbeat, London."

Telephone { Office: 3518 London Wall.
Works: 3518a ,, ,,

Silk and Cotton Covered H.C. Copper Wire, Resistance Wires, Fuse Wire, Binding Wires, Charcoal Iron Core Wire, Asbestos Covered Wire

P. ORMISTON & SONS, 79 CLERKENWELL ROAD
LONDON, E.C.

"Ormiston, London" Established 1793. 13259 Central.

Braided and Twisted Wires, Bare Copper Strand & Flexibles of any Construction, Wire Ropes & Cords, down to the finest sizes, in Galvanized Steel, Phosphor Bronze, etc.

NORMAN, SMEE & DODWELL

MANUFACTURERS OF HIGH-CLASS VARNISHES for Coach Builders and Decorators, Railway Carriage and Locomotive Builders, and Ship Builders. Special Insulating Varnishes for Electrical Purposes

Offices and Factory: MILES LANE, MITCHAM, SURREY.

Willcox's Undertake Supply of all Requisites

for Engine Rooms, Power Plant, Machine Shops, etc.

SEND US YOUR INQUIRIES

We shall be pleased to supply Electrical and other Engineers with copy of our enlarged

736 pp. CATALOGUE

on receipt of application on business form.

Our Specially Refined Lubricants are in use on every class of Machinery.

W. H. WILLCOX & CO., LTD.

32/8 SOUTHWARK STREET, LONDON, S.E.

The Wireless World.

With which is incorporated "The Marconigraph."

An Illustrated Magazine for all interested in WIRELESS TELEGRAPHY, published monthly by THE WIRELESS PRESS LTD., Marconi House, Strand, London, W.C.

Registered for transmission by Magazine Post to Canada.

Telegraphic Address: "Expanse, London." Telephone No.: City 8710 (Ten Lines).

Codes used: Marconi, A.B.C. (4th edition), Western Union.

Advertisement Agents for Belgium, Holland and Colonies: Adr. Koller & Van Os, Rotterdam and Amsterdam.

Subscription Rate... ... ... 5s. per annum, post free.
Single Copies ... ... 3d. each, by post 5d.
Subscription Rate in the United States ... ... $1.25 per annum, post free.
Do. in Canada and Newfoundland ... $1 per annum, post free.
Europe ... ... fr. 6 per annum, post free.

All Editorial communications to be addressed to "The Editor, 'The Wireless World,' Marconi House, Strand, London, W.C."

All communications relating to Subscriptions, Advertisements, and other business matters, to be addressed to "The Publisher, 'The Wireless World,' Marconi House, Strand, London, W.C."

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

CONTENTS.

THE WIRELESS WORLD

Vol. 3.—No. 28. (New Series) July, 1915. Subscription 5/0 per annum post free. Price 3d. Post Free 5d.

LINKED BY WIRELESS

THE REVIVIFICATION OF TRADITIONAL BONDS BETWEEN ENGLAND AND ITALY.

MEN have long recognised that it was an unnatural alliance which placed Italy in a camp adverse to Great Britain. The national sympathy which has so long existed between the two liberty-loving countries is at length free to act once more in the world of politics and war.

Luigi Galvani, the pioneer discoverer of animal electricity, was a native of Bologna, an old University city at the foot of the Apennines, and the early name by which British scientists denominated that branch of electrical study is derived from the patronymic of this distinguished eighteenth-century Italian. Alessandro Volta, another son of Italy, born at Como in the middle of the eighteenth century, has in like manner bequeathed the epithet *Voltaic* to the development of current electricity along purely physical lines. The initiating genius was Italian, but much of the practical development of the Italian discoveries is due to the activity of British scientists.

Both of the foregoing electrical pioneers flourished during the period before Italy attained her freedom. England not unjustly boasts that the Italian path to liberty was smoothed by British hands, and the periods which have elapsed since the days of bondage have been no less prolific than their predecessors in their production of Italian scientific discoverers.

Not only did the City of Bologna give to the world Galvani in the eighteenth century, but also Marconi in the nineteenth. Just as the name of the former has become so closely linked with his special branch of electrical science that we have to recall it every time we wish to speak of that particular phrase, so the name of Marconi has become practically inseparable from wireless telegraphy. Cases must constantly have occurred to our readers where writers on the subject, with all the will in the world to avoid reference to the great Italian of modern days, have found themselves totally unable to do so. Englishmen in general, however, are as proud of the fact that their country has been chosen for the principal sphere of Marconi's practical activities as are Italians of the genius of their distinguished compatriot.

We may passingly allude to the many other examples of the closeness of the sympathetic link between Italy and England. Englishmen are proud to remember that Cavour and Mazzini found a congenial home in our island in the dark days of Italian liberty, whilst our greatest mid-Victorian poet, Robert Browning, lived a large part of his life in Italy, and died under Venetian skies.

It is no matter for wonder, then, that England rejoices to grasp in full comradeship the hands of a nation linked in such traditional harmony with herself. The electric waves which pass between our countries telling Englishmen and Italians of the progress made against the modern foes of liberty are only symbolic of links in many another field. The wish for a formal alliance has long been present with us all ; but Italian hands have until recent days been held back by Teutonic bonds. Every strand has been parted now, and England linked with Italy is pressing forward towards a common goal.

ADMIRAL SIR HENRY JACKSON,
K.C.B., K.C.V.O., F.R.S.

Personalities in the Wireless World

ADMIRAL SIR HENRY JACKSON, K.C.B., K.C.V.O., F.R.S.

THE appointment of Admiral Sir Henry Jackson to be First Sea Lord, in the place of Admiral of the Fleet Lord Fisher of Kilverstone, will be noted with great interest by all concerned with wireless telegraphy. Sir Henry Bradwardine Jackson is a Yorkshireman, and was born at Barnsley on January 21st, 1855. At the age of thirteen he entered the Navy, and when the Zulu War broke out in 1878 he was a lieutenant on H.M.S. *Active*, and served on that vessel during the war. Originally Lieutenant Jackson specialised in navigation, but in September, 1881, he entered the *Vernon* to qualify as a torpedo lieutenant, and for three and a half years was a staff officer of this ship.

While on the *Vernon* Lieutenant Jackson was associated with many officers holding high appointments to-day, amongst others, Sir Frederick Sturdee, Sir Frederick T. Hamilton (Second Sea Lord), and Admiral Sir George Egerton. After completing his course, he was appointed torpedo-lieutenant on the battleship *Alexandra*, flagship of Admiral Lord John Hay in the Mediterranean. In 1886 Lieutenant Jackson was appointed to command the special torpedo vessel *Vesuvius*, attached to the *Vernon* as an experimental ship, and here he remained until January, 1900, when he was sent to Fiume, the home of the Whitehead torpedo, "for torpedo service." On leaving the *Vesuvius* Lieutenant Jackson was promoted to the rank of Commander, and at the end of his service at Fiume he took duty for a short time on the battleship *Edinburgh* in the Mediterranean.

It has been stated that Sir Henry Jackson preceded Mr. Marconi in the invention of Hertzian wave wireless telegraphy, and that prior to 1896 he had telegraphed in this manner from one ship to another. Some confusion still seems to exist in the minds of many people regarding the difference between *ether-wave* wireless telegraphy and the various inductive and conductive wireless systems which operate by means of electric currents through the earth or water. Sir Henry Jackson, whilst commander of the *Edinburgh*, and later when commander of the Devonport torpedo school ship *Defiance*, carried out a number of experiments with this older form of wireless telegraphy, and it is these experiments which have given rise to the statement above referred to. In the year 1896 Sir Henry made the acquaintance of Mr. Marconi, and thereupon turned his attention to the new invention which was destined to play such a leading part in naval warfare. From that time forward his name has been closely associated with naval wireless telegraphy, and great credit is due to him for many improvements and the extensive application of this priceless asset to Britain's sea power.

He remained responsible for the progress of wireless telegraphy in the Navy until 1906, on October 18th of which year he became a Rear-Admiral. During these years his appointments had been such as to facilitate the experiments and research work which he pursued. In 1902 he became Assistant-Director of Torpedoes at the Admiralty. Early in 1905 Lord Fisher, under whom he had served in the Mediterranean, selected him for the office of Third Sea Lord and Controller of the Navy. In 1906 the distinction of K.C.V.O. was conferred on him. On leaving the Admiralty in 1908 Sir Henry was given command of the Sixth Cruiser Squadron in the Mediterranean, where he remained for two years. In February, 1913, Sir Henry was transferred to the position of Chief of the War Staff at the Admiralty, and after eighteen months there he was nominated to be Commander-in-Chief in the Mediterranean in succession to Sir Berkeley Milne, but the war intervened, and Sir Henry was kept at the Admiralty in a special capacity. Admiral Jackson, besides being a Fellow of the Royal Society, is a member of the Institute of Electrical Engineers, and also an associate of the Institution of Naval Architects. He was created a K.C.B. in 1910, and on the list of admirals stands next above Sir John Jellicoe in seniority. Lady Jackson is a daughter of Mr. S. H. Burbury, F.R.S.

Dr. Fleming on Photo-Electric Phenomena.

THE SECOND TYNDALL LECTURE AT THE ROYAL INSTITUTION ON MAY 8th.

A full report of the first lecture appeared on Page 171 of our June issue.

RESUMING his subject on May 8th, Dr. Fleming said :

The action of ultra-violet light on metals was discussed in the last lecture. We have now to consider its action on gases.

The energy expended to pull an electron out of an atom is one-billionth of an erg. A figure like this is awkward to handle, but its electrical equivalent can be easily understood. Thus it requires from 2 to 10 or 11 volts to displace an electron. Electro-positive atoms give electrons up very readily, but electro-negative atoms hold on to them much more strongly.

The ionising volts for sodium potassium alloy are 2·1 volts.

There is a minimum ionising light frequency for all substances. No electrons are liberated from sodium by red light, the frequency must be increased to that of yellow or green light for ionisation to occur.

It is found that the product of the ionising potential in volts into the minimum light frequency in Ångström units gives a constant of 11,000 or 12,000 for all substances, as shown in the following expressions :

$$V_0 e = hn. \quad V_0\lambda = \frac{hc}{e} = 12{,}000.$$

when V_0 is in volts and λ in Ångström units.

Or, again, if

V = maximum photo-potential in volts.
n = light frequency.
V_0 = ionising potential in volts.
n_0 = minimum frequency for photo effect.
h = Planck's constant $= 6{\cdot}55 \times 10^{-27}$.
e = electron charge $= \frac{16}{10^{20}}$ coulombs.
v = maximum velocity of photo-electrons.

$$V = kn - V_0 = k(n - n_0).$$
$$Ve = ken - V_0 e = hn - W_0.$$
$$\tfrac{1}{2}mv^2 = hn - W_0.$$

$$\text{Therefore } v^2 = \frac{2h}{m}(n - n_0).$$

$$\frac{2h}{m} = 14{\cdot}6.$$

$$\text{Therefore } v = 3{\cdot}82\sqrt{n - n_0}.$$

For sodium illuminated by green-blue light v is of the order 400 kilometres per second, or say 250 miles per second. Sodium potassium alloy which requires about 2 volts to start photo-electric action works at a minimum frequency of 5,500 Ångström units. This gives a product of 11,000, which agrees with the constant. The minimum light frequencies for the alkali metals are in the visible spectrum, but electro-negative oxygen which requires the large ionising voltage of 9 volts works at 1,350 Ångström units. This wave-length is in the ultra-violet spectrum two octaves below the visible spectrum.

The following data were given relating to the electron :—

Charge $e = \frac{4{\cdot}772}{10^{10}}$ coulombs.

Mass $m = \frac{9}{10^{28}}$ grammes.

Charge/Mass $= \frac{e}{m} = 1{\cdot}772 \times 10^7$ e.m.u.

Diameter $= \frac{3}{10^{13}}$ centimetres.

Density $\frac{7}{11} \times 10^{11}$.

The experimental proof of the ionisation of a gas by ultra-violet light is difficult, as the ionisation may proceed from the walls of the chamber holding the gas or from dust particles suspended in it. The gas may not be bubbled through a liquid as it may carry up electrons with it obtained from the liquid. Also the number of substances transparent to ultra-violet light are very few, and one such substance must be used for containing the gas to be influenced by the rays. Quartz is partly transparent to ultra-violet light. Fluorite is much more so.

Prof. Fleming then made an experiment to show the ionisation of the gas by ultra-violet light. For this purpose he used two quartz tubes through which dry and dust-free air passing through a plug of cotton-wool could be sucked, the air finally passing between the walls of a charged tubular condenser connected to an electroscope.

Both positive ions and negative ions were sent off by the flame of a candle, as air passed through the flame and thence to the tubular condenser, discharged it when it was positively charged, and also when negatively charged.

Next tubes of fluorite were used and sparks were made to pass along their length and outside them, with the result that the air inside became ionised and discharged the condenser.

Now the question arises, Does sunlight contain wave-lengths which can ionise the atmosphere?

The shortest wave-length of light to reach this earth from the stars and sun is about 2,950 Ångström units, but the sun is probably sending us shorter waves which do not reach us, due to the wave absorption of the oxygen element in the air.

The sun is a mass of gas. The photosphere—the part we see—is probably glowing carbon at a temperature of 5,000 to 6,000 degrees C., or twice that of the electric arc, radiating not only ether waves, but like other hot bodies, it is sending out streams of electrons as demonstrated by Arrhenius. To illustrate this a Fleming valve was shown having a glowing carbon filament in an exhausted glass bulb, the filament being surrounded by a metal shield. When an electroscope charged negatively was connected to the shield it was discharged very slowly. When charged positively, however, as soon as the valve shield was connected to it the charge disappeared instantly. The sun's photosphere can be regarded as a great carbon filament radiating heat, light, and electrons. Outside this photosphere and for a great depth—some 500 miles thick—is what is known as an absorbing or reversing layer of metal vapour containing iron, sodium, and other metals in large quantities. Outside this is the chromosphere, composed mainly of hydrogen, helium, and calcium vapour.

The corona, which is only seen at times of eclipse, assumes different forms corresponding with the occurrence of sun spots. Near the poles it appears to radiate as do iron filings at the poles of a magnet. This appearance may be due to the electrons ejected from the photosphere, which pass through the condensing layer and act as nuclei for atoms, and are then forced out and onwards, if small enough, by the pressure of light. Maxwell showed theoretically that light exerts a pressure. This light pressure, however, must not be confused with the working of a Crookes' Radiometer, which works from the bombardment due to heat of the few gas molecules left in the partly exhausted tube.

Nicholls and Hull experimentally proved that light pressure exists. The instrument used for measuring light energy is called a pyroheliometer, and consists of a copper box filled with water having a thermometer attached to it to measure the temperature. The energy received from the sun per one square centimetre of surface is 2·1 gramme calories per minute, which is known as the solar constant, and thus the amount of energy contained in one cubic mile of sunlight at the earth's surface is 14,720 foot-lbs. The intensity of the light at the sun's surface is 46,000 times greater than on the earth at the tropics, which gives a figure for one cubic mile of sunlight at the sun of 302,300 foot-tons. Light pressure at the tropics is 2 lb. 13 oz. per square mile. At the sun it is 58 tons per square mile.

Gravitation near the sun is 27 times more than at the earth's surface, and its pull on a body decreases as the cube of the body's diameter, whereas light pressure decreases as the square of the diameter. At a certain critical diameter a particle will neither be attracted nor repelled. Below this diameter it will be repelled. Thus a particle having a diameter of 13,000 Ångström units will be in a state of balance, and it would appear that light pressure exerts a maximum repelling effect for bodies having a diameter of 1,600 Ångström units.

Now it is not impossible to obtain free particles with diameters as small as this. Prof. Fleming exhibited a slide covered with gold leaf beaten to the thickness of one-hundred thousandth of an inch, which is equal to half the wave-length of green light. The following table has been calculated by Prof. Fleming for three particles of very small diameter having the density of water :

Diameter Ångström units.	Hours to reach earth.	Velocity kilometers per sec.	Energy brought to earth by one kilogramme. H.P. hours.
1,600	25	1,700	540,000
5,000	55	800	120,000
10,000	112	350	45,000

But some ions may start with a velocity given to them by sun spot upheavals of 200 or 300 kilometres per second. Some prominences have been observed to grow to a height of 70,000 miles in a few minutes. Then energy is conveyed to the earth by this impinging dust, which has a predominant negative charge.

The upper atmosphere of the earth contains hydrogen and helium, and these invading electrons and dust particles appear to wind themselves round the lines of magnetic force of the earth, and render the gases of the upper atmosphere luminous in the form of auroræ.

It has been noticed that the disturbances of the magnetic needle correspond with auroral disturbances, also that at places so far apart as Singapore, Toronto and Hobartstown the same magnetic variations occur. The number of auroræ, the daily range of magnetic declination, and relative extent of large sun spots, are co-related. Magnetic storms follow the meridianal disturbance of sun spots. It has been pointed out by Arrhenius that there is an interval in some cases of twenty-one hours, in others of forty-two hours or more, between the passage of a sunspot across central solar meridian and the maximum magnetic disturbance. This agrees with the time taken for very small solar dust to travel from the sun to the earth. There is therefore good reason for the view that the upper layers of the earth's atmosphere are invaded by ions which naturally give it some degree of conductivity.

We must also conclude that, due to ultra-violet light, ionisation takes place in the atmosphere on that side of the earth which faces the sun. As soon as sunlight is withdrawn the ions recombine.

There is first a permanent conducting layer at the outside of the atmospheric belt, and then another region below it which becomes ionised by day and unionised at night—a diurnal layer—and at lower levels what conductivity there is is not due to ionisation from the sun but to photo-electric action in dust or ice particles at high altitudes. Suspended water in the form of clouds, however, is not photo-electric. Our knowledge of the condition of the upper atmosphere is purely inductive. The greatest height a recording balloon can ascend, carrying meteorgraphs but no operator, is some nineteen or twenty miles only. Above this height our knowledge must be obtained indirectly.

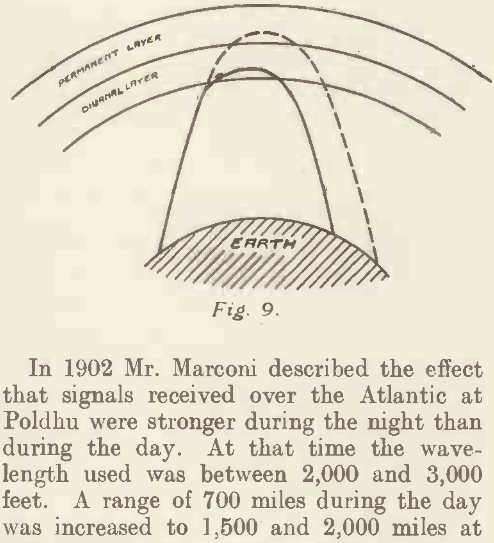


Fig. 9.

In 1902 Mr. Marconi described the effect that signals received over the Atlantic at Poldhu were stronger during the night than during the day. At that time the wave-length used was between 2,000 and 3,000 feet. A range of 700 miles during the day was increased to 1,500 and 2,000 miles at night. Mr. Marconi suggested that daylight had some effect on the radiating antenna ; but this cause could not be held adequate, as the effect only became apparent when signalling over considerable distances. However, his suggestion is worth attention. The experiments of Hertz with ultra-violet light showed that there was no difference in the effect whether the spark balls were of one metal or of another. In fact, all substances are photo-electric if raised to a potential sufficiently high to give off sparks, such as is the case with an antenna.

How is transmission over the Atlantic to be explained ? As long as the distance between two stations does not exceed 200 miles, the current in the receiving antenna is found to be inversely proportional to the distance, and this can be proved theoretically from Hertz's equations. Messrs. Duddell and Taylor were the first to prove this fact experimentally.

The experiments conducted by Dr. Austin between Brantrock station and the United States warships the *Birmingham* and *Salem*, carried out in July, 1910, show that the intensity of the received current for big distances fall off much more quickly than the distance increases; also that the night observations are more irregular than those taken in the day.

What explanation can be offered of these facts ? Lord Rayleigh was the first to point out that the curvature of the earth must be taken into account when signalling over long distance. The earth has a diameter of some 42,000,000 feet. Light, we know, bends round small objects, and this phenomenon is called diffraction; but this diffraction depends on the ratio of wave-length to the size of the object. At first it was considered that diffraction by itself was not sufficient to explain long-distance radio transmissions; but now Professors MacDonald and Love, on re-examining the subject from the mathematical side, think that diffraction will account for the day effect. Dr. Austin has represented the results of his tests as if they were carried out on a flat plain and the falling off in strength as an absorption. This method does not meet the case.

The night effect, the abnormal effects during the day and night, the effect noticed by Mr. Marconi in 1911 that the strength of signals east and west is often very different to the strength north and south, all require some explanation. Prof. Fleming showed Mr. Marconi's curve, exhibited at his 1911 lecture, showing the variation of Transatlantic signal strength during twenty-four hours. The strength was steady during the day; then a fall after sunset; and two hours after sunset signals were at their weakest. As four hours is the difference in time between London and New York, at two hours after sunset in England the base of the earth's shadow cone would be half way between the two stations. After the minimum position the curve rises to a maximum corresponding with sunset at Glace Bay, when both stations would be in darkness. Then follows a return to the normal, a strengthening before sunrise, and finally a fall to the normal after sunrise. A curve showing the variation of day and night signals between Paris and Liverpool obtained by Prof. Marchant shows a steady rise in signal strength from light to darkness.

In order to completely explain the facts observed we must fall back on some form of theory of ionic refraction as given by Dr. Eccles, by which the wave velocity in the ionised atmosphere is greater than in the unionised air, so that the wave front bends forward. The effect is that of an inverted mirage.

Prof. Fleming then showed a working slide (Fig. 9) to illustrate the action of ionic refraction on radio-telegraphic rays.

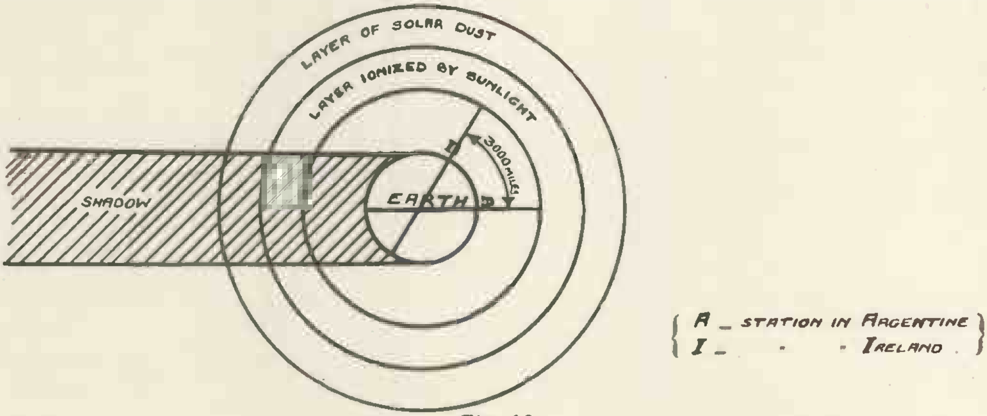


Fig. 10.

B

The sharp divisions between the layers as shown in the diagram, of course, do not exist. One layer merges into the other. When the stations are not in the shadow the result of the effect of ionisation which increases the speed of the wave is shown in Fig. 10.

A ray starting from earth in the direction shown by the heavy line, when it reaches the temporarily ionised belt caused by ultra-violet light, has its path bent downwards, and thus describes a trajectory which reaches the earth much sooner than if the ray had to proceed higher right into the permanently ionised layer before undergoing the refracting process as it would have to do when travelling in the earth's shadow.

When the diurnal layer is disappearing under the influence of night it will leave behind patches of ionised air here and there, roughening the under surface of the permanent layer. Now it is well known that a perfectly transparent solid when powdered up becomes opaque. Thus powdered glass is opaque; so is snow, which is simply powdered ice. Light is dissipated by reflection from the small particles; so it is with a liquid. Shake up paraffin and water, two transparent substances: the oil will emulsify—be broken up into small particles—and the mixture will become opaque. In this state the material will reflect light far more than before.

And so also we may expect the under surface of the permanently ionised layer to act as a much better reflector where these irregular patches of ionised air occur, thus accounting for the irregularities of signal strengths observed at night time.

Not only is there a diurnal but there is also an annual variation in signal strength which follows the path of the sunset line. The whole question of wireless transmission over great distance is very complex. Diffraction of the space wave, wave energy also travelling through the crust of the earth, refraction and interference, all play a part. No theory can be complete which does not admit the photo-electric effect of solar light and the effect of solar dust.

Finally, Prof. Fleming referred to the two Committees established for wireless telegraph research—one suggested by Dr. Fleming, under the auspices of the British Association, with Dr. Eccles as secretary; the other established mainly through the instrumentality of Mr. Goldsmidt, of Brussels, having Mr. Duddell as first chairman. The labours of these Committees were brought to a sudden and untimely end, but it is to be hoped they will resume their useful functions in the near future.

Maritime Wireless Telegraphy

ONCE again wireless telegraphy has come to the aid of lives imperilled on the high seas.

In the very early hours of May 27th the steamer *Ryndam*, of the Holland-America Line, collided with the Norwegian vessel *Joseph J. Cuneo*. The accident took place in foggy weather in the vicinity of the Nantucket Lightship, and as a result the *Ryndam* was badly damaged. The latter vessel had left New York the previous day with about 90 passengers, 25 of whom were in the first saloon, 40 in the second, and the rest steerage. She had on board a cargo valued at over £200,000.

When the collision occurred both vessels sent out wireless calls for help. Fortunately the American Atlantic Fleet was manœuvring in the neighbourhood, and the battleship *Louisiana* answered the call from a distance of about 20 miles and was the first to appear on the scene. When she arrived the *Joseph J. Cuneo*, which was the less damaged, was already engaged in taking off the passengers from the *Ryndam*. Later on in the day the passengers were transferred to the battleship *South Carolina*, as the *Cuneo* was considered to be unsafe. For some time there was considerable doubt as to the chance of the *Ryndam* reaching port in her damaged condition, as wireless messages reported she was able to steam but very slowly and had a heavy list owing to two of her holds being filled with water. However, eventually her commander was able to bring his vessel safely back to New York.

The *Cuneo* also reached that port, and the two vessels are effecting repairs. The *Ryndam* is a favourite passenger ship of over 12,000 tons register, and was making the voyage from New York to Rotterdam when the disaster overtook her.

Digest of Wireless Literature

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

CALL SIGNAL DEVICES.

At a recent meeting of the Institution of Post Office Engineers Mr. L. B. Turner read a paper entitled "Wireless Call Devices," in which many points of interest were considered. At the commencement Mr. Turner said that, in the main, the problem was to provide an apparatus which was sufficiently sensitive to respond noisily to such a stimulus as may be got from an antenna supplied with about one hundredth of a milliwatt, but would not respond to unwanted signals such as those given by foreign wireless stations discharging their ordinary traffic, or atmospherics. The author next described the attempts which had been made in various directions to actuate a call signal device by means of the received messages. It was comparatively easy to actuate a bell with the old style of coherer, but such a receiver was not nearly sensitive enough for present day work. The power received by the ordinary telephone was not of the order required to actuate the Post Office relay, but such instruments as the Orling jet relay, the Brown telephone relay, the Heurtley amplifier (depending on the change of resistance produced in a hot thin platinum wire when slightly displaced across the edge of a blast of cold air), or the Lieben-Reiss cathode ray amplifier, might be employed. A certain amount of selectivity was necessary, and the simplest arrangement was to use a long "dash" as the call signal, and to arrange the receiving apparatus so that it did not respond to a short signal. Another method depended on musical note syntony, and an analogous device was that responding only to dashes at regular intervals.

Mr. Turner also referred to the Marconi Company's device for the remote control of fog-signalling apparatus. In this a coherer, in a specially reliable and therefore insensitive condition, controls a relay of conventional pattern, the local circuit of which energises magnets acting on a pendulum of balance-wheel form. Dashes sent out automatically from the calling station at equal intervals give a series of impulses to the balance wheel, which is mechanically tuned to their frequency, so that its amplitude is increased until a fork wherewith it is furnished dips into mercury cups and the fog gun is switched on or off.

The Post Office has ten wireless stations in use for communicating between the mainland and outlying islands, or between the islands of a group, and Mr. Turner showed a call device which had been specially designed for use with such installations. At frequent prearranged intervals, say four times an hour, a clock switches in a crystal receiver, which is of ordinary character except that a sensitive d'Arsonval galvanometer takes the place of the telephone. The receiver remains in circuit for only seven and a half seconds; and, if during this period the key of the calling station is kept depressed, the needle of the galvanometer is deflected into position between the jaws of a hit-or-miss device actuated by a local circuit. If the needle is not deflected, the closing of the jaws is without effect, for the jaws are slightly staggered, but if it is in place between them, it is gripped by them, a local circuit is closed, and continuous ringing bell relay actuated, and the bell rung. Neither atmospherics nor signals of any kind have any effect unless they occur during the activity of the receiver, and therefore the probability of damage to the crystals and of false calls is reduced by the clock switch in the ratio of 15 minutes to one-eighth minute, or 120 times, whereas the delay to a telegram under this system cannot exceed quarter of an hour. To guard against the contingency of the crystal being "knocked-off" by atmospherics, two crystals are provided and are switched in alternately by an ingenious mercury switch.

Another apparatus was also described, in which the swing of a galvanometer is gradually built up from the sending station by keeping the key depressed every alternate five seconds. With a signal of ·063 microampère, a call could be made in this way in 2½ minutes. In this case a Fleming valve is used in place of the crystal.

* * *

WIRELESS TELEGRAPHY AND THE WEATHER.

Dr. H. R. Mill, Director of the British Rainfall Organisation, at a recent meeting of the Royal Meteorological Society, discredited the theory that the heavy rainfalls of last winter was due to the firing at the seat of war. In the same way, he said, the heavy winter of 1903 had been explained by the general adoption of wireless telegraphy. The fact that 1873 was equally as wet, if not wetter, without the aid of Hertzian waves, and that no year since 1903 had been nearly so wet, in spite of the enormous increase of radio-telegraphy, showed the fallacy of the inference.

It had been argued that it was the concussion caused by high explosives which determined the precipitation of rain from supersaturated vapour. The difficulty arose that if concussion was the cause, precipitation must occur immediately and presumably over the area within sound of the explosions. That, at least, was the principle which people who tried to induce public bodies to cannonade for rain had always adopted. The dryness of September, October, March and April, however, were difficult to explain on this hypothesis.

* * *

THE "ELECTRIC DOG" AND CONTROL BY LIGHT.

With reference to our note in the May issue and the wide publicity given to the invention of an "Electric Dog" in the United States, some particulars of its construction may be of interest. A detailed account of the ingenious apparatus appears in a recent issue of the *Electrical World*, and a suggestion is made regarding the possibility of equipping torpedoes with such directive mechanism. This mechanism could perhaps automatically cause the torpedoes to be steered towards—and to follow and sink—battleships or other hostile vessels from which search-lamps were being operated. The apparatus has been constructed by Mr. B. F. Meissner, a student of electrical engineering at Purdue University, Indiana, and was recently demonstrated before several meetings of electrical men in the United States.

By means of a small hand flash-lamp, of the "electric torch" variety, the speaker was able to control the movements of the "dog," which is really a peculiar box on wheels. The box has two "eyes," consisting of lenses, mounted on the front, and behind these are placed the selenium cells which control the interior mechanism. Directly the beam of light is thrown upon the "eyes" the box commences to move towards the source of light in a most uncanny manner. At the demonstrations the speaker caused the box to follow him about the stage, turning corners and avoiding chairs with no other control than that of the beam of light. By reversing a switch on the "dog," it can be made to back away from the light. The apparatus in each case started into motion quickly when the light was thrown upon it, and stopped just as promptly when the lamp was extinguished or turned away.

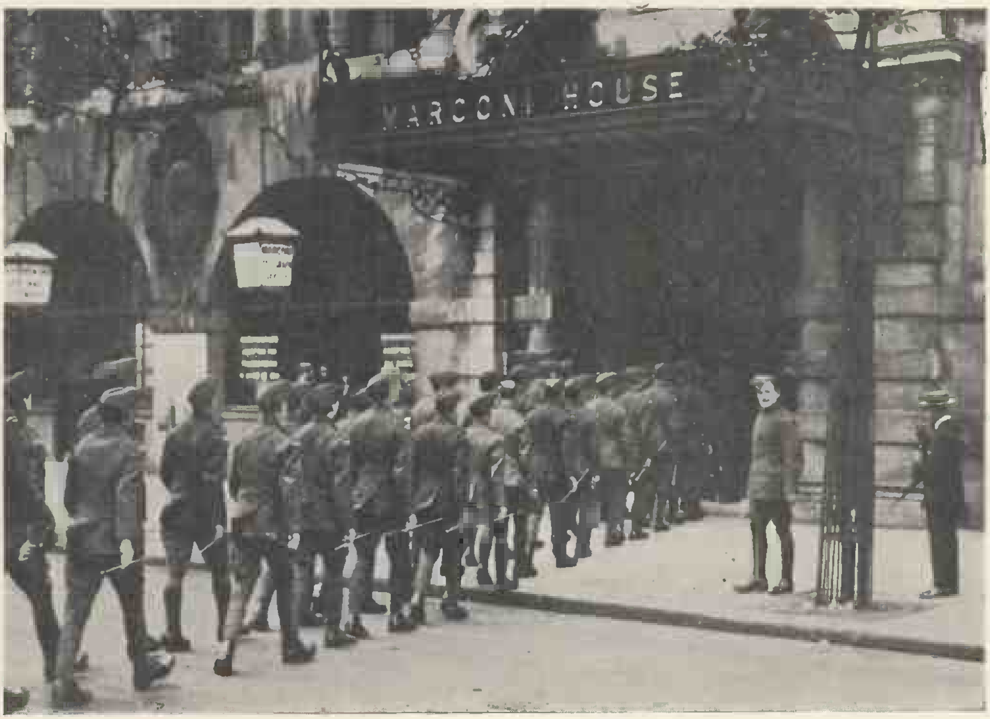
The motive power is provided by storage cells contained in the body of the box, and propulsion is effected by means of an electric motor. Each of the selenium cells behind the eye lenses controls a relay which actuates the motor and one of the two steering magnets at the rear of the device. Illuminating a cell on one side starts the motor and turns the rear wheel to that side; illuminating both cells equally causes the mechanism to run straight forward. Thus the action of the control mechanism is to keep the two lenses always equally illuminated and pointed at the source of light, in whatever direction that source moves. The idea of the light-controlled "dog" was suggested by Mr. John Hays Hammond, jun., and the mechanism was worked out by Mr. Meissner. A number of proposals, more or less practicable, have been made with regard to the control of mechanism by means of light beams, amongst them being that of the control of torpedoes mentioned above.

During the demonstrations Mr. Meissner performed a number of other experiments, such as firing a revolver, ringing a bell, extinguishing lamps, etc., all by means of a light-controlled selenium-cell mechanism. At the close the speaker showed the electric "thief catcher," which is actuated by the light of the supposed thief's hand lantern. At the slightest illumination of the sensitive cell by the rays from the marauder's flash-lamp an alarm was sent in and a bell set ringing, a revolver began firing, and a flash-light powder was ignited, taking the burglar's photograph. Mr. Meissner has suggested that the directive mechanism employed in the "dog" might be applied to the aiming of a revolver, thus leaving the robber no chance to escape.

Wireless and Aircraft

THE magnificent achievements of the Allied airmen during the present war in learning the disposition of the enemy's troops and artillery have largely depended for their success upon the facilities offered by wireless telegraphy for communication between the observer in the aeroplane and the staff officers below. Of such vital importance is a knowledge of wireless to the members of the Flying Corps that the Government has made arrangements for them to receive instruction in radio-telegraphy at Marconi House. Our picture shows the corps marching into the well-known Strand building at nine o'clock in the morning.

A certain famous animated picture firm has taken a short cinematograph film of the Flying Corps men training at the Hendon aerodrome, and also a picture similar to that reproduced here depicting their entry into Marconi House. These films have been incorporated with their weekly review of current events.



Entrance to Suez Canal—Port Said.

Wireless in the Near East

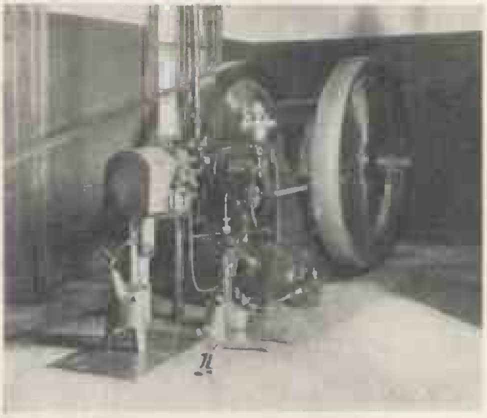
The Port Said Station

THE annexation of Egypt by the British, the abortive "invasion" of that country by Turkey, and the movements of our over-seas forces who spent the winter in training by the Nile prior to the commencement of the Dardanelles campaign have drawn the world's attention to this corner of the Mediterranean and have emphasised the importance to England of the Suez Canal as a means of communication with our Eastern Empire. It is hardly possible to realise that less than fifty years ago travellers to and from India and the Far East were obliged to take either the lengthy sea route *via* the Cape or else make a laborious journey on camel back between Alexandria and Suez. Although as far back as the reign of Rameses II. a canal for small boats is said to have been excavated between the Nile delta and the Red Sea, it was not until the time of Napoleon that serious consideration was given to a project for linking these two seas by means of an artificial waterway sufficiently large to take ocean-going ships. The engineer Lepère, who was commissioned by the Emperor, in 1798, to examine and report upon the practicability of such a scheme, at the conclusion of his investigations stated that the surface of the Red Sea was 30 feet higher than the Mediterranean, and therefore the scheme was for the time being abandoned. Forty-three years later some English officers proved Lepère to be wrong, and once again a Frenchman, this time the diplomat de Lesseps, set to work to make a study of the isthmus. The interest of the Khedive Said Pasha having been enlisted in the new project, certain concessions were obtained, and on April 25th, 1859, the first spadeful of earth was turned at Port Said. In ten years the Canal was completed, and on November 16th, 1869, after some twenty million pounds had been expended, the first ship passed through.

The tremendous utility of wireless telegraphy for notifying the Canal authorities of the times of arrival, delays, and the many other matters connected with the passage of vessels was early realised, and two small wireless stations, one at Port Said and the other at Suez, were erected by the Committee of Lloyd's.

The two installations were of a very simple nature, each comprising merely a 10 inch induction coil connected directly to the aerial, and a Marconi magnetic detector for receiving. The power for the coils was provided by batteries of large dry cells, and the range of both stations was limited. At Port Said the wireless plant was installed in the lighthouse, a familiar landmark to all who have had occasion to pass through the Canal.

Although these two stations did excellent work, after a little time it became apparent



The Oil Engine

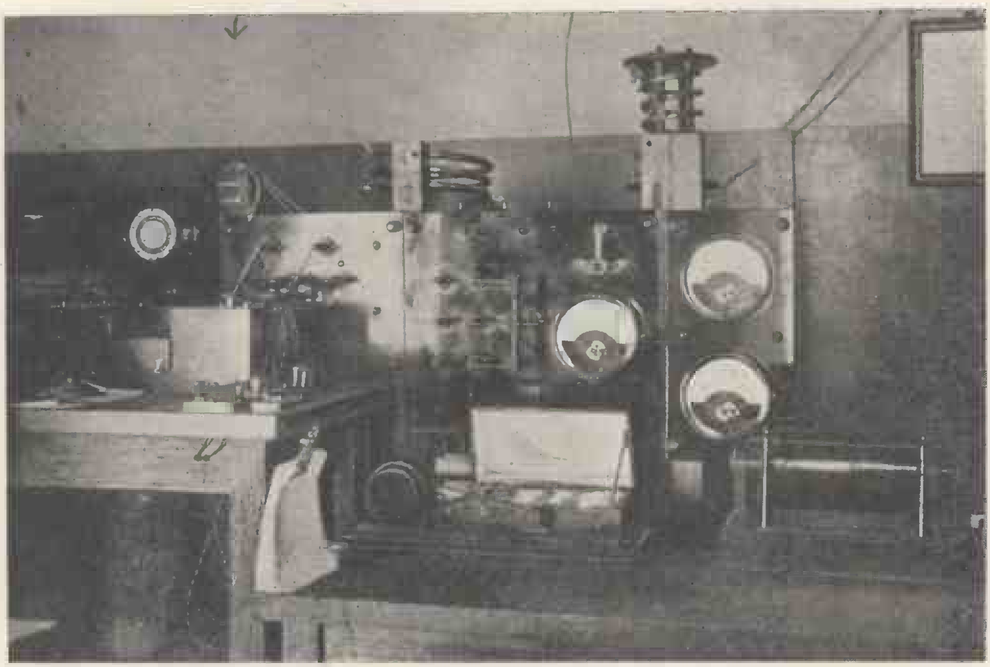
that something more powerful was needed, and an entirely new station, on a different site and equipped with much more powerful apparatus, was commenced at Port Said. When this was finished, the smaller station on the lighthouse was dismantled, and that at Suez also removed. The reason for the last step was that the new station was sufficiently powerful to handle all the traffic which had previously been dealt with by both stations, and its range extended to the whole length of the Canal and beyond.

Port Said, as we know it nowadays, owes its existence solely to the Canal and the traffic which passes through it. Almost every steamer, whether east or west bound, stops some hours at Port Said for the purpose of replenishing her bunkers with coal, and in the case of mail steamers, to transfer mails with the fast packets *Isis* and *Osiris*, which run to and from Brindisi. A considerable passenger traffic has also to be catered for at certain times of the year, fast trains conveying tourists and others to and from Cairo and other Egyptian pleasure and health resorts. A number of large hotels have been erected to provide accommodation for these transient visitors, and a colony of rapacious and very cosmopolitan hawkers earn a more or less honest living by selling Eastern curios and other wares to the confiding European. It is at Port Said the new traveller to the East receives his introduction to Oriental life, and if on leaving he has not learnt the meaning of "baksheesh" it is no fault of the industrious inhabitants.

The wireless operator who is acquainted with the eastern route knows that he may expect to hear the distinctive musical note of "S.U.B." (Port Said) several hundreds of miles to the west, and on favourable nights, when "atmospherics" are not too frequent and strong, communication can be effected from as far away as Malta. The continual stream of traffic which passes through the Egyptian station relates to coaling, mails, passengers, stores, and every conceivable kind of shipping business, whilst passengers make extensive use of the wireless facilities for communicating with their friends and relations. A not inconsiderable amount of wireless traffic is normally exchanged with vessels trading between the Black Sea and Egypt, but, of course, during the war this is temporarily suspended.

The station itself is situated in a large building known as "Navy House," from the courtyard of which rises the tall mast which supports the aerial. Navy House was at one time, many years ago, the residence of a wealthy Dutch trader, and the building is of a typically early colonial type, with balconies surrounding an inner square or courtyard. A part of the house is now unoccupied, and the footsteps of the visitor echo sadly through the great rooms and corridors. When one stands on the verandah shaded from the bright eastern sunlight, listening to the harsh intermittent singing of the wireless spark, it is difficult to avoid dwelling on the changes that have taken place since the Dutchman and his family last occupied their eastern home. If in

The Dynamo and Switchboard for charging Accumulators.



A View in the Instrument Room,

the midnight hours the shade of this merchant should ever pace the corridors it would surely be strangely disturbed by the blue-white flash which sends forth so many winged words into the night.

The installation, which is of a composite system, has a power of some five kilowatts. Current for transmission is supplied from a large battery of accumulators, which are periodically charged from a dynamo driven by an oil-engine. In the photograph, which shows the dynamo, an accumulator-charging switchboard will be noticed. In the centre of the board is placed an automatic " cut-out," which protects the cells in the event of the engine stopping by accident or the charging current being reversed. The photograph of the oil-engine will perhaps be of interest to amateur photographers, as it received half a minute exposure whilst the machine was running full speed. The impression of motion which is conveyed by the blurred spokes seems to add considerably to the effectiveness of the illustration.

The accumulator room and the room containing the oil-engine and dynamo are both situated at a little distance from the operating room, so as to avoid interference from the noise of the engine. In the machine-room there is also situated a motor-generator, which converts the direct current from the accumulators into alternating current for the transmitting plant. The controls of this machine are placed within easy reach of the operator in the instrument room, and thus it can be started and stopped in the minimum of time.

The power and control leads are carried overhead across the courtyard to the operating room, which also contains the wireless transmitter. In this room the receiving instruments are arranged immediately in front of the operator on duty, and the transmitting instruments to the right of him. On the left is a large switchboard with measuring instruments and the necessary controls for the motor - generator. Reference to the illustration will show the transmitting key on the right-hand side of the table.

The transmitting instruments contain a step-up transformer, an oil condenser with copper and glass plates, and " open " type jigger with a copper-tube primary and secondary, and a non-synchronous rotary discharger. The discharger is contained

Receiving Instruments and Power Switchboard.

in the small box, the lid of which is open and which can be observed in the illustration. The white light seen in the box proceeds from the spark, which was in operation for a few seconds during the time the photograph was being taken. A small separate motor is used for driving the discharger, and as this is often still speeding up when the operator commences to send, the musical note from it heard on board ship often mounts in tone during the first few words, with rather peculiar effect. In a similar way, when the operator is finishing a message he sometimes cuts off the motor during the last few words, so that by the time " Gdbi " is reached the spark sounds quite melancholy. The note variations, however, make little difference in the audibility of the signals, and it is an advantage to have the motor stopped during receiving.

The aerial lead is conveyed through the side of the room to the instruments. The aerial itself is of a modified umbrella form, and is held aloft by a tall wooden mast.

For the purpose of measuring the radiation and checking the efficiency of the transmission, hot-wire ammeters are provided with means of placing them in the aerial circuit. These can be seen on a switchboard on the right of the illustration, which shows the instrument room.

The receiving instruments have a wide range of wave-lengths, and are of the inductively-coupled type. Reception is effected on crystal detectors, which are rapidly interchangeable.

In a room adjoining the operating room are situated the land lines to the Eastern Telegraph Company and the Egyptian State Telegraphs. Should calls from these come through, an indicating lamp lights immediately in front of the operator on duty, and he can then see that the calls are answered. During the busy hours a telegraphist is always on duty on the land lines, and a small window in the wall enables the messages to be handed directly from one operator to the other. In this way a message received by wireless is put on to the land line in the minimum of time, and *vice versa*.

The staff accommodation is very comfortable, and is situated in Navy House itself, so that the operators can come on watch and go off duty to their quarters without any delay. The wireless conditions in this part of the world are not by any means ideal, as atmospherics are at times very strong and troublesome. Owing to the large number of vessels equipped with wireless passing through the Canal, the traffic is very considerable, and Mr. Robinson, the genial superintendent, is to be congratulated on his efficient staff and the despatch with which the traffic is handled.

And so daily as the vessels come and go with their merchandise and living freights this station speeds out its messages across the Mediterranean waters and over the desert sands to Suez.

Little did the Dutchman think, when in those old days he sat out on the balcony calculating the time of arrival of his trading

Mr. Robinson, the genial Superintendent.

Street Scene in Port Said.

ship, that one day in the future a dozen argosies a hundred miles away would almost in a dozen moments announce their coming, by means of quiet invisible waves in the imponderable ether, the existence of which had not even occurred to him.

The Merchant Service Man

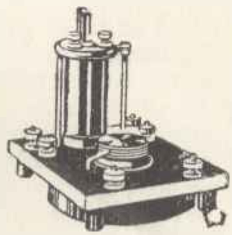
By DOUGLAS R. P. COATS

WHEN you've fêted Tommy Atkins at the finish of the War,
And he's had the credit given which is due:
When you've sung about Britannia, and you've cheered for Johnny Tar,
Who has kept her ever Mistress of the blue;
When the nurses and the doctors and the "coppers" all have been
Duly praised—and they'll deserve it, I admit—
Will you kindly then remember Mr. Mercantile Marine,
Who has also helped and done his little bit?

He is dodging German cruisers in the open southern seas,
With his hatches full of contraband of war;
He is navigating channels where the mines are thick as peas,
And with half the lights extinguished on the shore;
From your colonies he's bringing many sturdy British sons,
And from ev'ry place that's red upon the map;
He is carrying your horses, ammunition, aye, and guns,
And he's really quite a useful sort of chap.

While your Johnny Tar is busy holding "Billy's" fleet at bay—
In the metaphoric sunshine, be it said,
Mr. Merchantman is toiling, making metaphoric hay,
And he's working so that England may be fed.
In his twenty thousand tonners, in his cockleshells and tanks;
Or in aught a trifle larger than a tub;
Full laden to the Plimsoll—he is worthy of your thanks
Who supplies the Mother Country with her grub!

The ENGINEERS Note Book



Whilst we usually devote the pages under this heading to the consideration of the practical problems with which the wireless engineer is confronted in his work, and to the publication of hints and notes on engineering matters, we venture to think that we cannot do better this month than devote our space to a matter which is of vital interest to the nation at this juncture, and which must appeal particularly to our engineer readers, whose work is of such high importance and is so ungrudgingly accorded to the Motherland.

The Mobilisation of Invention.

THE urgent need for the application of all our national resources to the successful prosecution of the present war has called forth many excellent ideas, particularly with regard to scientific research. We therefore welcome the appearance of the following circular, which has been issued by the Hon. Secretary of the National Inventions Development Association :—

"The news has just been published that "the French Government has decided to "ask the Academie des Sciences to nominate "a number of military officers to serve in a "consulting capacity on Commissions, de- "voting themselves to the study and inves- "tigation of inventions likely to be of "service to the Allies in the war. An "important movement looking to a like "result has been in existence in this country "for several months. Its most recent "development was an influential meeting "held in London, on June 9th, at the office "of a prominent War Relief Organisation; "Admiral Lord Charles Beresford, M.P., "presided, and on the motion of Admiral the "Hon. Sir E. R. Fremantle, the project of a "*National Inventions Development Associa- "tion* was cordially approved and com- "mended to public support. Messrs. Jack- "son, Pixley & Co., Auditors and Accoun- "tants, 58 Coleman Street, E.C., were "appointed Hon. Treasurers, and the Hon. "Secretaryship was entrusted to Mr. E. "Jerome Dyer, Alderman's House, Alder- "man's Walk, London, E.C., who is widely "known as the organiser of the Vegetable "Products Committee, which with 230 "branches throughout the country is now "sending over 100,000 lbs. of fresh fruit "and vegetables every week to the North "Sea Fleet.

"So far as the Government is concerned, "it has already been stated semi-officially "that the authorities are not likely to be "able to find time to 'investigate more than "'a small proportion of the undeveloped "'inventions submitted.' The promoters "of the new body were told that this is all "that can be expected of Government. They "think that the time of the ablest officials "is fully occupied, and that as it is mani- "festly undesirable that any but highly "competent persons should pronounce judg- "ment upon inventions and discoveries "which may be of vital importance, what is "needed is that men of equal competence "with those in Government service, but "now in private practice, should be got "together into one body for this special "work. Accordingly, the various societies "and institutes representing scientific pro- "fessions will be invited to nominate "representatives to serve on the Associa- "tion's General Committee, and to appoint "expert consultants and advisers in their "respective branches.

"In the first place, all inventions, etc., "will be considered by a small staff of men "sufficiently qualified to sift the promising "from the impracticable. Inventions of "merit will be promptly referred to the "expert consultants. Inventions will be "patented where this is necessary, the "inventors' rights being fully safe-guarded. "Practical tests will then be made, and if "these are satisfactory the Government "will be approached. Funds are to be "raised by public subscription, and specific "donations, payable upon successful application of the invention, will be invited to "provide rewards for notable improvements in submarines, air-craft, aerial "weapons, trenching and sapping appliances, etc."

In the columns of the *Times* many letters from eminent men have lately appeared on this subject, notable among them being expressions of opinion from Mr. H. G. Wells, Sir Hiram Maxim and Dr. J. A. Fleming. In view of the important part played by wireless telegraphy in the world conflict now progressing and the eminence of Dr. Fleming in this particular sphere, readers of THE WIRELESS WORLD will be especially interested to read what the famous scientist has to say on the subject. In the *Times* for June 15th, Dr. Fleming writes as follows:—

"It would be difficult to overstate the "importance of the discussion on the above "subject in your columns which was "initiated by the letter of Mr. Wells. At "the present moment the scientific ability "of this country is in the position of the "magnetic molecules of iron as regards "external magnetic effects. They produce "no result until some external magnetic "force compels them all to orient them"selves in the same direction.

"There is no want of ability, but there is "an entire absence of external directing "power. Nay, rather, special steps have "been taken to inhibit scientific activity "in directions which might assist the nation.

"Take, for instance, the subject of electric "waves, which might be used as an imple"ment of warfare in certain ways I forbear "to point out for obvious reasons. It was "unquestionably right for the General Post "Office to put a stop at the outset of the "war to all amateur wireless telegraphy, "to prevent German spies conducting their "communications with antenna wires put "up a chimney.

"Is it, however, an advantage to the "country that all the expert knowledge on "the subject outside certain official circles "should be cast on one side and neglected?

"A few days ago an eminent electrical "engineer was sitting in my room here, and "said to me, 'I am too old to enlist, or even "'to do manual work in the manufacture "'of shells, but I have a considerable "'scientific knowledge which I am just "'yearning to employ in the service of the "'country, yet I cannot find any person in "'authority who will tell me how to do it.'

"This sentence expressed concisely not "only my friend's feelings, but my own, and, "I am confident, that of hundreds of other "scientific men as well. At the present "moment, after ten months of scientific war"fare, I myself, although a member of "several scientific and technical societies "and a Fellow of the Royal Society as well, "have not received one word of request "to serve on any committee, co-operate in "any experimental work, or place expert "knowledge which it has been the work "of a lifetime to obtain at the disposal of "the forces of the Crown. It is not enough "to make vague suggestions as to the detec"tion of submarines or destruction of "Zeppelins. Rough ideas have to be "hacked into shape, reduced to practice, "and tested on a large scale. All this "means organisation, expenditure, assist"ance, and definite practical experiments. "It seems to demand a special Government "department, which shall enlist in its ser"vice trained and experienced investigators "for definite ends. This war will be won "in the laboratories and workshops almost as "much as in the field, and it will only be won "when the Government organise the scien"tific intellect of the country as well as the "manual labour with that single purpose."

Dr. E. H. Griffiths, Principal of University College, Cardiff, in a letter to the *Times* of June 16th, says that our energies appear to have been chiefly employed in endeavouring to find the means of neutralising the advantages obtained by our enemies due to their application of the principles of science to the purpose of warfare. He believes that this merely defensive attitude is due to no lack of scientific ability or inventiveness on our part, but rather to a want of organisation of our intellectual reserves. Dr. Griffiths goes on to point out that amongst the flood of suggestions which are received every week, some at least must be of value, and the Government can scarcely be expected to spend its time searching for "a diamond "in such huge masses of blue clay." The association to which we have made reference above will, we think, prove exactly what is required in organising for the Government the scientific and inventive genius of our countrymen.

Administrative Notes

Brazil.

DR. PEREIRA GOMEZ, President of the United States of Brazil, in his message to the National Congress at its opening on May 3rd, made reference to the control of wireless telegraphy which is exercised by that Republic. Owing to the extensive coastline of the country, considerable difficulties have been encountered by the Brazilian Government in restricting the use of wireless and in suppressing clandestine installations. The Brazilian people themselves are unquestionably friendly to the Allies, but the difficulties with which the Government was faced on the outbreak of hostilities were not lessened by the fact that, as in the case of the United States, the country contains a large number of German settlers, who naturally did all they could for their own side.

The use of wireless telegraphy apparatus by ships of belligerent nations is prohibited by Article 6 of the Regulations of Brazilian Neutrality.

According to the notice by the Ministry of Marine dated August 24th, and the circular notes sent by the Ministry for Foreign Affairs on September 15th and 16th to the Embassies and Legations of the various belligerent countries, the use of wireless telegraphy by foreign merchant vessels, without distinction of nationality, is for the duration of the present war subject to the following regulations :

1. In the case of all foreign ships entering Brazilian ports, the Port Authorities will cause to be sealed up or enclosed all radio-telegraphic apparatus until the departure of such vessels.

2. All ships, if they remain in the port for more than forty-eight hours, will be obliged to take down the antennæ.

3. Ships detained in the ports must keep their aerials dismantled and must have the radio-telegraphic receiving apparatus and the rooms containing such apparatus sealed up.

4. The harbour masters are authorised to arrange with the commanders of ships detained in Brazilian ports an hour during which the rooms containing the wireless apparatus may be opened, in order that the persons in charge of them may clean and make proper provision for the preservation of the said apparatus.

The Brazilian President finally dealt with the means taken by the Government to suppress secret wireless stations, and stated that the General Department of Telegraphs had issued instructions for a most strict supervision to be exercised by means of the inspectors of various districts so that all private installations might be discovered.

* * *

Panama.

With reference to the new navy wireless station at Darien, to which we referred under " Administrative Notes " in our June number, it has now been announced that the first daylight message from this station to the navy radio station at Arlington, overlooking Washington from the south bank of the Potomac, was received on April 30th. It was the first official message between these two links in the chain of high-power radio stations that the U.S. Navy will have in operation between Washington and the Philippines next winter. Until the receipt of this all messages from the Navy Department to the Canal Zone had to be sent at night and be relayed. In the future these messages will be handled day and night *via* the new Darien Station. The distance from Arlington to the Canal Zone is 2,000 miles, and the sending and receiving radius of the new Darien Station is stated to be about 4,000 miles. The opening of the direct communication will effect a material saving to the Government in cable tolls, as it is expected that in a short time all official telegrams of the Government to the Canal Zone will be handled by the Arlington-Darien radio route. It is not intended for the present to handle commercial messages over this route, as the business of the Government with the vessels of the Navy and that of the War Department with the Canal Zone will be of sufficient volume for the capacity of the plant.

The transmitting plant at Darien is of the continuous wave type.

* * *

Russia.

The Russian authorities have decided to erect and equip a radio-telegraphic station at Nicolaieff, in the Odessa district, for the purpose of receiving time-signals from the Eiffel Tower, Paris.

* * *

South Africa.

In a White Paper issued on May 21st, containing a report of His Majesty's Astronomer at the Cape of Good Hope, it is stated that arrangements have been completed, and are in working order, for the daily transmission of a wireless time signal for the use of shipping in South African waters through the medium of the Union Government wireless station at Slangkop. The system is actuated automatically throughout.

This service of radio-time signals will be of inestimable value to shipping in South African waters. By means of it vessels within range of the stations can ensure a precision of standard time which it would otherwise be impossible for them to obtain, and the new facilities should make for additional safety in navigation. The Cape Town and Durban stations are open night and day and work on a 600-metre normal wave. A special clock at Cape Town Observatory is adapted to give automatically a series of signals extending over an interval of half a minute. The signals are transmitted at 11 p.m. Union time, which is equivalent to 9 p.m. Greenwich mean time, and shortly before that hour the clock is brought into conformity, daily, with the Observatory standards. The time signal proper, which is preceded by the usual warning signal, consists of twelve dashes, each of about three-quarters of a second in duration, divided into five groups, the commencement of the separate dashes corresponding exactly with the following Greenwich mean times :

Group I.	Group II.	Group III.	Group IV.	Group V.
H. M. S.	H. M. S.	H. M. S.	H. M. S.	H. M. S.
8 59 30	8 59 38	8 59 44	8 59 48	8 59 54
8 59 32	8 59 40	—	8 59 50	8 59 56
8 59 34	—	—	—	8 59 58
				9 00 00

By means of a special relay the time signal is simultaneously transmitted to the Cape Town and Durban wireless stations, the signal to the latter station passing over the land telegraph wire connecting Cape Town and Durban, a distance of 1,100 miles. In addition to the time signals, both stations transmit each day at 1 p.m. a report in plain language containing information concerning the meteorological conditions prevailing on the whole coast of the Union of South Africa.

* * *

United States.

We are informed that the American Marconi Company's station at Miami, Florida, is now transmitting press messages on a wave length of 550 metres instead of 1,610 metres.

WIRELESS AND COALING THE FLEET.

One of the lesser-known uses of wireless telegraphy in warfare, and one which has an important bearing on the efficiency of our Fleet, is the rapid summoning of colliers for the replenishing of a war vessel's bunkers. A collier packed to the hatches with coal gets into touch by wireless with a battleship whose bunkers require refilling. On sighting the parent vessel the supply ship manœuvres into the right position, about 400 feet astern of the battleship, and then despatches a small boat carrying the cables, one set of which stretches from the masthead of the supply vessel. When it reaches the warship the cables are made fast on the port and starboard sides of her stern, and the two lines being brought to the right tension, the two ships travel on in a straight line fastened together, whilst from the mast of the collier to the deck of the warship stretches a transport cable for carrying coal bags. By means of wheels running on the cable the load is forced by automatic winches along the sloping transport line at the rate of some 3,000 feet per minute. This apparatus enables about sixty tons of coal to be transferred every hour across the gap of water separating the vessels. It will be readily realised that Mr. Marconi's invention, in being the means of rapidly summoning the colliers, adds considerably to the speed at which the whole operation can nowadays be carried out.

NOTES OF THE MONTH

WHEN so many novelists and writers, in dealing with wireless telegraphy, exhibit so complete an ignorance of the simplest principles of the science as to spoil their stories entirely for those who know, it is refreshing to find that Mr. William Le Queux, in the June number of the *Royal Magazine*, has contributed a story which is both interesting in itself and from the technical point of view practically blameless. Under the general heading of "The Spy Hunter," the author in question introduces a new series of "spy" stories under the title of "The Green Blackbird." He tells how a young Marconi operator, working in conjunction with the authorities, was instrumental in ferreting out a hidden wireless installation on the East Coast, and thus bringing to book the German spies who were operating it. The illustrations are for the most part correct from the wireless point of view, although for some reason the artist has drawn in the first picture what appears to be a transmitting jigger immediately adjacent to the receiving instruments. As the remainder of the apparatus has been depicted in "correct" Marconi style, it is unfortunate that this error should have crept in.

Perhaps the talented author will pardon us for pointing out one or two points in the story which might create a wrong impression. For example, the operator who is supposed to be telling the story states, when speaking of the Poldhu news service, "It was the usual old story . . . brought to a conclusion by those eternal quotations from the German newspapers upon European affairs. In common with every wireless operator on the high seas, I have always wondered why we have been so constantly compelled to swallow German opinion by wireless. . . ."

We would not comment on the above were it not for the fact that the story is introduced by the following note :

"No man knows more of the Secret Service of the countries now at war than Mr. William Le Queux. . . . The following story is the first of a thrilling series based upon facts within his own personal knowledge, and which, owing to the strict censorship now necessary, it is only permissible to publish in the guise of fiction. . . ."

In these circumstances the reader might quite possibly take the statement concerning the predominance of German opinion in Poldhu news to be a true record of fact. We scarcely need say that the suggestion is totally unfounded. Before the outbreak of war the news programme commenced with extracts from the leading articles of the *Times*, *Le Temps*, and the *Koelnische Zeitung*. No other German newspapers whatever were quoted, and the remainder of the message was composed of ordinary news. The Poldhu press messages are reproduced in various ocean newspapers on board not only British, but French, Italian, Dutch, and other steamers, so that it is necessary for the bulletins to have an international character, and for this reason three leading European newspapers were quoted. It would be as true to say that French opinion was thrust upon the public by wireless as to suggest that German opinion was forced upon the readers of these newspapers. With regard to the statement "In common with every wireless operator I have always wondered . . .," etc., the writer of this note spent some years at sea as a wireless operator and never once heard anything from his fellow operators which would indicate that any such wonderment existed.

Mr. Le Queux is also slightly in error as to the abbreviations used at sea. In the story we find "TQ" given as "Am I through?" and "DF" as "You are now through." Both of these abbreviations are novel and are certainly unknown to any of the ordinary mercantile operators. The same remark applies to "CCC," which is given as "Outward foreign."

These, however, are minor points, and detract very little from the interest of the story. Mr. Le Queux is to be congratulated on having produced a yarn which is of great interest both to the general public and to the wireless expert.

* * *

On June 16th a message was received from Petrograd by the Marconi Company and delivered to the Speaker of the House of Commons. It consisted of a complimentary announcement sent on the occasion of the official inauguration of a new and powerful wireless station erected by the Russian Marconi Company for the Russian Government.

The text of the message ran as follows :—

To the Speaker, House of Commons, London.

On the occasion of their visit to the largest Russian wireless station, which was built during this war, the Chairman and the members of the Duma send their best wishes to you, to the British nation, and to the Allied Army, and are firm in the faith that the definite victory will soon come for the happiness of all nations and to the glory of the Allied arms. God save England!

In replying to the Russian complimentary message, the Speaker transmitted by the same radiotelegraphic means the following answer :—

To the Chairman, The Imperial Duma, Petrograd.

The Speaker of the House of Commons has received with much interest and gratification the message from the Chairman and members of the Russian Duma; he reciprocates their good wishes, and prays for the success of the Russian arms. Long live the Tsar! Long live the Russian people!

* * *

Amongst the legislative changes due to the present war we must record the postponement of compulsory wireless on board British merchant ships. Readers will remember that at the enquiry held to investigate the tragedy of the *Titanic* the need for wireless equipment on board practically all merchant ships was strongly emphasised, and as a result certain provisions were made in the Merchant Shipping (Convention) Act, 1914. This Act stipulates that, after a certain date (originally July 1st, 1915) all British ships carrying fifty or more persons, and also foreign ships entering British ports, must carry an efficient wireless telegraph installation. The Board of Trade has now announced that the coming into operation of the Act has been postponed until January 1st, 1916.

* * *

We have pleasure in calling our reader's attention to another page of this issue on which we give a full and illustrated account of Dr. Fleming's new instrument, the "Campograph," brief particulars of which were given in our last month's report of the Tyndall Lecture at the Royal Institution. The "Campograph" is not only an extremely interesting invention, but is destined to play a very important part in future wireless research.

We also print a report of Dr. Fleming's second Tyndall lecture at the Royal Institution, in which he dealt further with the fascinating subject of photo-electric phenomena. This, together with our previous report of the first lecture, furnishes by far the fullest and most complete account which has appeared of these two interesting and important discourses.

* * *

In dealing with the naval and military possibilities of American intervention, a writer in the columns of the *Manchester Dispatch* alluded recently to the possession by the American Fleet of a specially powerful torpedo directed and worked by wireless. A weapon of similar design is said to have been submitted to the Italian Admiralty some few months ago by a native inventor. In view of the extremely practical interest which the Italian Government has always demonstrated in the invention of its illustrious son, Mr. Marconi, we may feel assured that any such device will be submitted to thorough trials and, should it prove practicable, will assuredly be adopted.

CARTOON OF THE MONTH

British Wireless Station receiving the Hymn of Hate.

The Wireless Transmission of Photographs.

By MARCUS J. MARTIN.

Article 4.

CLOCKWORK and electro-motors are the sources of driving power that are most suitable for photo-telegraphic work, and each has superior claims depending on the type of machine that is being used. For general experimental work, however, an electro-motor is perhaps most convenient, as the speed can be regulated within very wide limits. For a constant and accurate drive a falling weight has no equal, but the apparatus required is very cumbersome, and the operation of winding both tedious and heavy. This method of driving was at one time universally employed with the Hughes printing telegraph, but it has now been discarded in favour of electro-motors, which are more compact, besides being cheaper to install in the first instance.

Synchronising and isochronising the two machines are the two most difficult problems that require solving in connection with wireless photography, and, as previously mentioned, the synchronising of the two stations must be very nearly perfect in order to obtain intelligible results. The limit of error in synchronising must only be about 1 in 500 in order to obtain results suitable for publication.

The electrolytic system is perhaps the easiest to isochronise as the received picture is visible. On the metal print used for transmitting, and on the commencing edge, a datum line is drawn across in insulating ink. The reproduction of this line is carefully observed by the operator in charge of the receiving instrument, and the speed of the motor is regulated until this line lies close against a line drawn across the electrolytic paper. Although this may seem an ideal method, there are one or two considerations to be taken into account. Unless the decomposition marks are made the right length, and are properly spaced, however good the isochronising may be, the result will be a blurred image. Anyone who has worked with a selenium cell will know that it cannot change from its state of high resistance to that of low resistance with infinite rapidity, and the effects of this inertia or "fatigue," as it has been called, are more pronounced when working at a high speed. When working, the effects of this inertia would be to increase the time of contact of the relay, F (Fig. 31), as the current from E would flow for a slightly longer period through R to F, than the period of illumination allowed by J. This, of course, would mean a lengthening of the marks on the paper. Results would also differ greatly with different selenium cells. There is a method of compensation by which the inertia of a cell can almost entirely be overcome, but it will add greatly

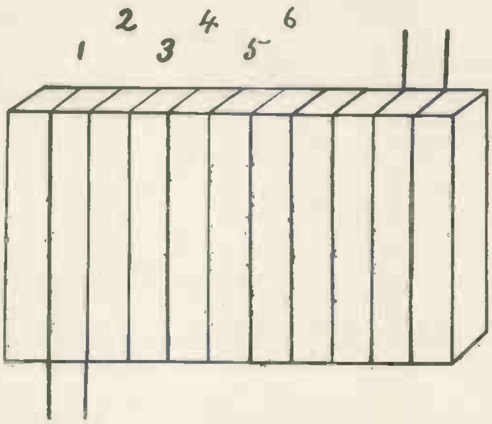


Fig. 33.

to the complications of the receiving apparatus.

As a selenium cell has been occasionally mentioned throughout these articles, the following brief description may perhaps be of interest. A selenium cell in its simplest form consists merely of some prepared selenium placed between two or more metal electrodes, the selenium acting as a high resistance conductor between them. The cell used for commercial purposes is usually made as follows. A small rectangular piece of slate, porcelain, or other insulator, is wound with many turns of pure platinum

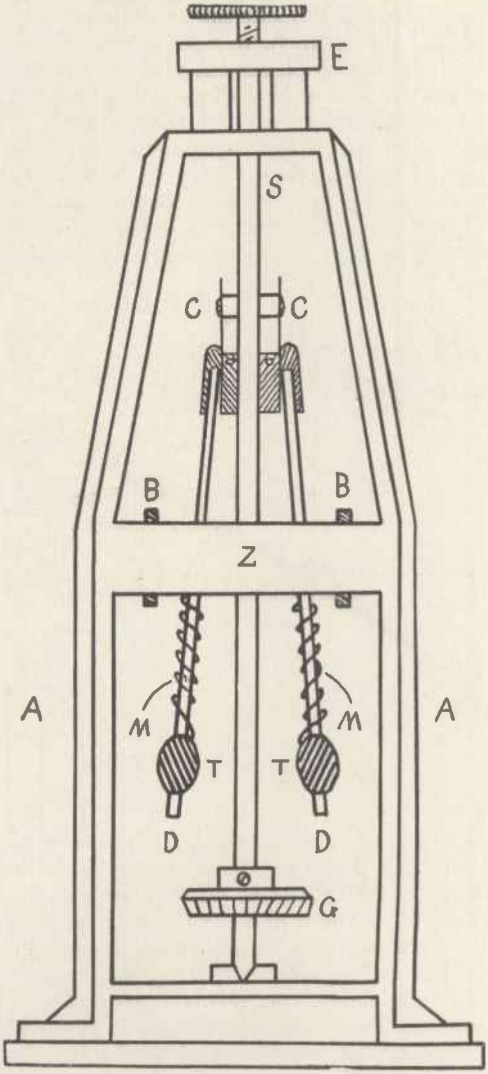


Fig. 34.

wire. The wire is wound double, as shown in Fig. 33, the spaces between the turns being filled with prepared selenium. The selenium is prepared by being kept at a very high temperature, when it assumes the crystalline form in which it is sensitive to light. The light is apparently absorbed and made to do work by varying the electrical resistance of the selenium. A strong light falling upon a selenium cell lowers its resistance, and *vice versa*, the resistance of a cell being at its highest when unexposed to light. The resistance of cells the same size may vary from 50 to 200,000 ohms, or more.

In using an electro-motor with any optical method of receiving, there are two methods available. The first is an arrangement similar to that used by Prof. Korn in his early experiments with his selenium machines. The motor used for driving has several coils in the armature connected to slip rings, from which an alternating current may be tapped off, the motor acting partially as a generator, besides doing good work as a motor in driving the machine. This alternating current is conducted to a frequency meter, which consists of a powerful electro magnet over which are placed magnetised steel springs having different natural periods of vibration. By means of a regulating resistance the motor is run until the spring, which has the same period as the desired armature speed, vibrates freely. The speed of the motors at the two stations can thus be adjusted with a fair amount of accuracy.

Another method is to make use of a governor similar to those employed in the Hughes printing telegraph system. A drawing of the governor is given in Fig. 34. It consists of a metal frame of the shape shown, which supports an upright steel bar, S, whose ends turn on pivots. This bar is rectangular in section. The gear wheel, G, is fastened near the bottom of this rod, and gears with a similar wheel on the shaft of the driving motor (not shown). Suspended from the broader sides of S are the two flexible arms, D, each carrying a brass ball, T. These balls are not fastened to the arms, but can slide up and down, being held in position by the wire springs, M, one end of each spring being fastened to the screw, C. These screws work in a slot cut in the upper part of S, and are connected to the adjusting screw, E. When E is turned the screws are raised or lowered accordingly, and also the balls on the arms, D. Fastened to the arms are two brushes of tow, B, but these revolve inside, just clearing the inner surface of the steel ring, Z. Upon the motor speed increasing above the normal, the arms, D, and consequently the balls, T, swing out, making a larger circle, causing the brushes, B, to rub against the steel spring, Z, setting up friction, which, however, is reduced as soon as the motor regains its ordinary working speed. By careful adjustment the speed of the motors can be kept perfectly constant. The object of having the balls, T, adjustable on D is to provide a means of altering the motor speed, as the lower the balls on D the slower the mechanism runs, and *vice versa*.

A simple and effective speed regulator, devised by the writer, is given in the drawings 35 and 36. It comprises two parts, A and B, the part A being connected to the driving motor and the part B working independently. The independent portion, B, consists of an ordinary clock movement, M, a steel spindle, J, being geared to one of the slower moving wheels, so that it makes just one revolution in two seconds. This spindle, which runs in two cone bearings, carries at its outer end a light pointer, D, about two inches long, to the underside of which is fastened the thin brass contact spring, S, which presses lightly upon the ebonite ring, N. The portion A comprises a spindle, pointer and contact spring, similar to those employed in B, the spindle, J' being geared to the driving motor by means of F, so that the pointer D' makes a little more than one revolution in two seconds. By means of a special form of brake on the driving motor, the speed is reduced, so that both pointers travel at the same rate—*i.e.*, one revolution in two seconds. By careful adjustment the two pointers can be made to revolve in synchronism * and when this is obtained, the contact springs, S and S' pass over the contacts, C and C', completing the circuit of the battery, B, and lamp, L. When working properly the lamp, L, lights up once every second.

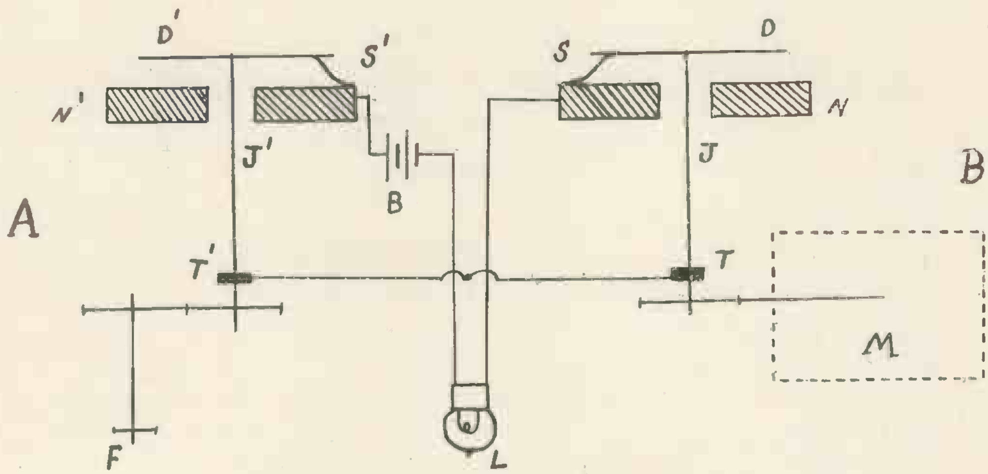


Fig. 35.

This regulator is an excellent one to use for experimental work, although it depends a great deal upon the skill of the operator, but good adjustment should be obtained in about two minutes. It is a good plan to insert a clutch of some description between the driving motor and the machine, so that the regulator can be adjusted prior to the act of receiving or transmitting, the machine being prevented from revolving by means of a catch. The motor used should be powerful enough to take up the work of driving the machine without any reduction in speed. The clocks, M, can be regulated so that they only gain or lose a few seconds in 24 hours, which gives accuracy in working sufficient

* Two clocks would isochronise if their hands travelled at precisely the same rate round the dials, but would not synchronise unless they registered the same time as well.

for all practical purposes. Connection is made with the contact springs S, S¹ by means of the springs T, T¹, which press against the spindles J, J¹.

Another important point is the correct placing of the picture upon the receiving drum. It is necessary that the two machines, besides revolving in perfect isochronism, should synchronise as well; begin to transmit and record at exactly the same position on the cylinders—*i.e.*, at the edge of the lap, so that the component parts of the received image shall occupy the same position on the paper or film as they do on the metal print. If the receiving cylinder had, let us suppose, completed a quarter of a revolution before it started to reproduce, the reproduction when removed from the machine and opened out would be found to be incorrectly placed, the bottom portion of the picture being joined to the top portion, or *vice versa*, and this means that perhaps an important piece of the picture would be rendered useless, even if the whole was not spoilt. It is evident, therefore, that some arrangement must be employed whereby synchronism as well as isochronism of the two instruments can be obtained.

There are several methods of synchronism that are in constant use in high-speed telegraphy, in which the limit of error is reduced to a minimum, and some modification of these methods will perhaps solve the problem, but it must be remembered that synchronism is far easier to obtain where the two stations are connected by a length of line than where the two stations are running independently. In one system of ordinary photo-telegraphy synchronism is obtained in the following manner. The receiving cylinder travels at a speed slightly in excess of the transmitting cylinder, and as its revolution is finished first is prevented from revolving by a check, and when in this position the receiving apparatus is thrown out of circuit and an electro magnet which operates the check is switched in. When the transmitting cylinder has completed its revolution (about 1/100th of a second later) the transmitting apparatus, by means of a special arrangement is thrown out of circuit for a period, just long enough for a powerful current to be sent through the line. This current actuates the electro magnet, the check is withdrawn and the receiving cylinder commences a fresh revolution in perfect synchronism with the transmitting cylinder. As soon as the check is withdrawn the receiving apparatus is again placed in circuit until another revolution is completed. As the receiver cannot stop and start abruptly at the end of each revolution a spring clutch is inserted between the driving motor and the machine.

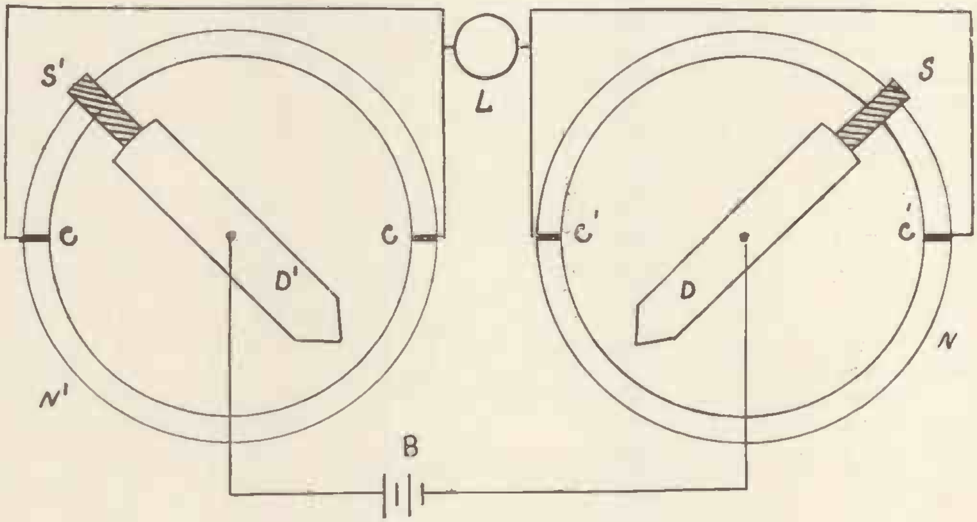


Fig. 36.

Although a method of synchronism similar to this may later on be devised for wireless photography, the writer, from the results of his own experiments, is led to believe that results good enough for all practical purposes can be obtained by fitting a synchronising device whereby the two machines are started to work at the same instant and relying upon the perfect regulation of the speed of the motors for correct working.

The method of isochronism must, however, be nearly perfect in its action, as it is easy to see that even with only a very slight difference in the speed of either machine this error will, when multiplied with 40 or 50 revolutions, completely destroy the received picture for practical purposes.

From what has been written in this and in the preceding chapters it will be evident that the successful solution of transmitting photographs by wireless methods will necessitate the use of a great many pieces of apparatus, all requiring delicate adjustment and depending largely upon each other for efficient working. As previously stated, there is at present no real system of wireless photography, the whole science being in a purely experimental stage, but already Prof. Korn has succeeded in transmitting photographs between Berlin and Paris, a distance of over 700 miles. If such a distance can be worked over successfully, there is no reason to doubt that before long we shall be able to receive news pictures from America with as great reliability and precision as we now receive messages.

In nearly all wireless photographic systems devised up to the present the chief portion of a receiver consists of a very sensitive galvanometer, and although good results have been obtained by the use of such instruments, they are more or less of a nuisance, as the extreme delicacy of their construction renders them liable to a lot of unnecessary movement caused by external disturbances.

A galvanometer of the D'Arsonval pattern used by the writer was constantly disturbed by a person walking about the room, although placed upon a fairly substantial table, and for the same reason it was impossible to attempt to place the driving motor of the machine on the same table as the galvanometer. For shipboard work it will be evident that the use of such a sensitive instrument presents a great difficulty to successful working, and a good opening exists for some piece of apparatus (to take the place of the galvanometer) that will be as sensitive in its action but more robust in its construction.

While experimenting with the device given in Fig. 26, the writer introduced improvements that may, when perfectly developed, solve the problem of a suitable receiver, it being practically unaffected by external disturbances besides being capable of recording signals at a speed as high as 250 a second. A method of synchronising has also been developed which, by means of a very simple adjustment, can reduce the limit of error to 1 in 1,000 very easily.

In concluding these articles on radio-photography the writer would like to express his thanks to Messrs. Wratten and Wainwright for their permission to use extracts from their work *Reproduction Work with Dry Plates.* Also to the proprietors of *Electricity* for allowing him to reprint portions of articles that have already appeared in their journal on this subject.

WIRELESS MUSIC AT SEA.

THE *Adelaide Advertiser* recently contained an account of the novel experience of the wireless operators on board the American steamer *Port Kembla,* which arrived at Fremantle, W.A., from New York early in April. Shortly after the steamer left New York, one of her operators, who had the receivers to his ears, was surprised to hear a human voice come from his instrument. Listening intently he was able to hear the voice call "Hullo Philadelphia," to which the answer came "Hullo Boston," followed by a further call from the first station, "Stand by for a little music."

After a slight interval the grating sound of a gramophone came to his ears, followed by the rendering of the song "Sister Susie Sewing Socks for Sailors." The operator could hear each note as plainly as if the gramophone were in the wireless room.

On the arrival of the *Port Kembla* at Bermuda, it was learned that other operators had experienced the same musical treat, and it was eventually ascertained that the reason for it was that some experiments were being carried out by a wireless telephone at Boston.

Doings of Operators.

IT is sometimes said that the excitement of a wireless operator's life is more imaginary than real, and that the chance for the average man of a thrilling experience is small, to say the least. When it is considered that during the course of a year not one vessel in a hundred experiences even a slight mishap, the statement would appear to be borne out by hard facts. Statisticians with time to spare could no doubt show that the chances of adventure in wireless are smaller than in many seemingly dull and uneventful professions; whilst the chance of more than one exciting episode coming the way of any individual operator would tax the decimal system of enumeration.

Whether or not such thoughts as these passed through the mind of Mr. E. T. Shrimpton when he joined the Marconi Company we cannot say, but at the present time he is thinking that there is a lot of wisdom in the old saying that "the exception proves the rule." It will not be without interest to consider the reasons which have led him to this belief.

Mr. Shrimpton on first joining the Marconi Company was engaged upon clerical work in Marconi House. Thinking, however, that the open-air life of a wireless operator would prove more congenial, he undertook a course of study, and in due time was appointed to the operating staff. Five days after joining he was appointed to his first ship and commenced his operating career.

For some reason the number thirteen is supposed to be unlucky, but Mr. Shrimpton was not superstitious. If he had been he might have demurred at joining the Company in 1913. Probably he did not notice that his appointment to the operating staff dated from the 26th day of the month (thirteen twice) and that he was instructed to take duty on his first ship on the 31st (thirteen backwards). Incidentally, we may remark that the vessel in question, the s.s. *Cobequid*, is stated to have had thirteen officers.

All went well with the subject of our notes until in January, 1914, the vessel on which he found himself struck a rock off the Canadian coast and became a total wreck. It is scarcely necessary to point out that the date was the thirteenth.

Of course, thirteen cannot really be unlucky, or Mr. Shrimpton would not have been saved. As it was he suffered no hurt, and in due course was appointed to another ship.

The next vessel to which the new operator was appointed was the s.s. *Kaipara*, and on this he remained for several months. On the thirteenth day of the war a large vessel with four funnels made her appearance on the horizon and in a most objectionable manner compelled the *Kaipara* to heave to. She proved to be the notorious *Kaiser Wilhelm der Grosse*, whose raids on merchant shipping were a feature of the early days of the conflict. The passengers and crew of the *Kaipara* had to pack up their few belongings and were transferred to the German pirate, which promptly sank the *Kaipara* and sailed away.

Mr. Shrimpton and the others made the best of things and congratulated themselves that they were not sunk at the same time as their late vessel. Eleven days later the Britishers were transferred to the attendant German collier *Arucas*, and had all their doubts as to whether a war was really in progress promptly dispelled by a shower of 6 in. shells from the British cruiser *Highflyer*. Mr. Shrimpton, with his usual good luck, avoided any injury, and a little later was landed at Las Palmas.

Arriving home, the subject of our article received an appointment to another vessel, the s.s. *Cluny Castle*, on which he made an uneventful voyage. On January 16th he was transferred to the s.s. *Drumcree*, and made a voyage across the Atlantic. It must have felt pleasant to settle down to a quiet, uneventful life again. It was certainly rather annoying when at the beginning of a second voyage on this vessel a German submarine made her appearance on the surface of the sea close to the ship. The submarine proceeded to fire a torpedo, which struck the *Drumcree* amidships and smashed up the wireless cabin in excellent fashion. The condition of the cabin after the explosion would have delighted a Post Office Examiner in fault tracing, as everything was nicely out of adjustment. Fortunately, Mr. Shrimpton had previously given a distress call before the dislocation occurred. He tells us that the silence cabin doors were blown off their hinges, the short-wave condenser thrown across the room, the coil wrenched off its base, and the thick shelf in the silence cabin broken through. The nicely disarranged accumulators filled up what vacant space remained on the cabin floor.

In spite of the force of the explosion and the damage which it effected, the ship did not immediately sink, and by good fortune a Norwegian steamer near by was able to take the *Drumcree* in tow. Mr. Shrimpton was just meditating on his invariable luck when a second torpedo finished matters and the entire crew transferred to the rescuing steamer.

Mr. Shrimpton is now ashore recovering from a wound in the scalp caused by some falling apparatus, and his cheerfulness regarding the whole of his experiences is a good example for many who have been through a far less trying time.

* * *

It is remarkable that whilst we were preparing the foregoing notes we should receive a visit from another wireless man to whom adventures have not come singly. Mr. Douglas R. P. Coats, who is a native of Gravesend, first entered the telegraph service with the Pacific Cable Board, but like many another telegraphist, felt the call of wireless and the sea, and in 1913 joined the staff of the Marconi Wireless Telegraph Company of Canada. After serving some little time on that company's land stations at Quebec and Montreal he was appointed to the s.s. *City of Sydney*, a steamer trading between the St. Lawrence and St. John's, Newfoundland. She was not a large steamer—some 2,500 tons gross—and when the winter set in and closed the St. Lawrence for shipping, she made a passage to St. John's, Halifax, Nova Scotia, and New York. On March 17th, 1914, at 3.30 a.m. the *City of Sydney* struck a reef outside Halifax in the midst of a thick fog. Wireless distress calls were sent, and a speedy answer obtained, but owing to the weather and the dangerous shoals by which the vessel was surrounded, the rescuing vessels could not at first approach nearer than about a quarter of a mile. Finally the crew and the passengers (thirteen of them, by the way) were saved by the lobster catcher *Rosemary*, and safely conveyed to port. The officers of the *City of Sydney* remained behind after the others and were taken off later in the day by the tug *Togo*.

Mr. D. R. P. Coats.

After this exciting adventure Mr. Coats was appointed to the s.s. *Morwenna*, and later to the Donaldson steamer *Lakonia*, on neither of which ships did anything of an unusual nature occur, but another transatlantic vessel to which Mr. Coats was sent took part in a collision and had to put into Hull. On leaving this vessel our friend rejoined the s.s. *Morwenna*, and, strange to relate, this vessel, too, was the victim of a collision and had to put back for repairs. When these were effected Mr. Coats again took duty on the vessel and all went well for several trips. But all was not to continue peacefully. Having tasted a little of adventure Mr. Coats was to have still more. The s.s. *Morwenna* called at Cardiff for bunkers in May of this year and on the 25th left for her next port. On the 26th (twice thirteen again), in the middle of the morning, an enemy submarine was sighted on the port bow about two miles distant. The captain of the *Morwenna* immediately turned his vessel round and attempted to " run for it," but the superior speed of the submarine prevented his escape. The wireless distress call was sent out, and answers received, but before assistance could arrive the German pirate had commenced to shell the merchantman. The decks from bow to stern were swept by shells from the submarine's two guns, one of the shells completely wrecking the Marconi cabin, which Mr. Coats very fortunately had just vacated. One member of the crew was killed and several injured as a result of the pirate's cultured and humane methods and, finally, a torpedo sent the good ship *Morwenna* to the bottom. The force of the explosion was so great that the foremast was blown right into the air. In about three minutes the ship had sunk from sight, the last of her to be seen being the stern, and the crew made away from the scene as best they could. About this time a little trawler made her appearance in the vicinity and steered straight for the scene of the wreck. With all their usual consideration for humane principles the Germans turned their attention to shelling the rescuing vessel, which nevertheless came onwards without a pause. Shell after shell exploded round the trawler as nearer and nearer it came. Suddenly there was a quick movement on the part of the brave little fishing vessel, and in a moment from the masthead there fluttered the famous tricolour of Belgium! Still the shells were falling, but not a single one exploded on the trawler and at last the pirate ceased fire and moved away, closing down her hatches as she went. When the *Morwenna's* crew were rescued the captain grasped the hand of the fisherman and said, " By Jove! I never thought anyone would have come through those shells!" The reply was simple and modest: " A Belgian never turns back, sir!"

Two of the ship's boats were so seriously damaged that they were of little value, so these were cut adrift, but the remainder were taken in tow by the trawler. In a little while all the rescued crew were safely ashore at Milford, where willing hands attended to their wants.

Mr. Coats is just as cheerful about his adventures as Mr. Shrimpton is about his. This is the proper British spirit, which always comes out in times of emergency. If the German Secret Service should obtain a copy of this issue of THE WIRELESS WORLD, will they kindly note the fact?

Mr. Coats, in addition to being an experienced wireless operator, is a poet of no mean ability. Contributions from his pen have appeared in several of the leading Canadian papers, and his recent poem, entitled " The Merchant Service Man," has been reproduced in several London and provincial newspapers. With the author's kind permission we are printing it on p. 220 of this number. Such a poem, coming from the pen of one whose acquaintance with the perils of the sea is actual and not imaginary, and whose emotions have been stirred not by a passing fancy but by the vivid reality of wrecks and bursting shell, breathes the true spirit of Britain and her peoples.

As to the " Thirteen " problem, you can make of it what you will. The superstitious will probably say that the fatal number accounted for the young men's perils, whilst their antagonists will maintain that the men had remarkably good luck. Anyway, both sides will be quite satisfied.

MARCONI HOUSE NEWS.

STAFF FIRE BRIGADE.

The First Annual Competition amongst the members of the Marconi House Staff Fire Brigade was held on Friday, May 21st, for the Challenge Cup presented by the Company.

Five teams of three men each competed, the test consisting of two drills.

The winning team, Messrs. E. E. Hughes, J. Foster and J. Moore, completed the drills in 2 minutes 57 seconds, being an excellent record, and 16 seconds better than the second team.

Mr. J. Westhrop, the house fireman, who had trained the teams, superintended the competition.

Mr. Godfrey C. Isaacs, in presenting the cup to the winning team, complimented them and the fireman on their performance.

RIFLE CLUB.

The result of the May Handicap Competition was as follows:—

1. Mr. W. J. Collop (Accounts Dept.) ... 92
2. Mr. R. Price-Smith (Engineers' Drawing Office) 90

For the third spoon, presented by C. B. Clay, Esq., Mr. W. Holloway and Mr. A. Dalgairns tied with a score of 90. The tie was shot off, and resulted in favour of Mr. Dalgairns (Engineers' Drawing Office).

Wireless Gardening

or, High-Frequency Horticulture

By P. W. HARRIS

I APPROACHED the house with a feeling of trepidation born of intense respect and reverence for one who was undoubtedly the greatest wireless experimenter living. I trembled still more when I thought of the great responsibility which was resting on my shoulders. I was to interview Mr. Sparkington Gapp on behalf of THE WIRELESS WORLD. It was quite clear in my mind that if the interview came off badly, millions of readers of that magazine would angrily retrace their steps to the bookstalls to demand the return of their threepences, whilst special trains would bring further thousands to protest outside the editorial offices. With such thoughts in my mind I braced myself together, and, mounting the steps with great importance, endeavoured to send "V's" on the bell. Although I tripped over the top step and was precipitated against the door with considerable force, I still retained my dignity when the door opened and the footman picked me up.

"I wish to see Mr. Sparkington Gapp," I said.

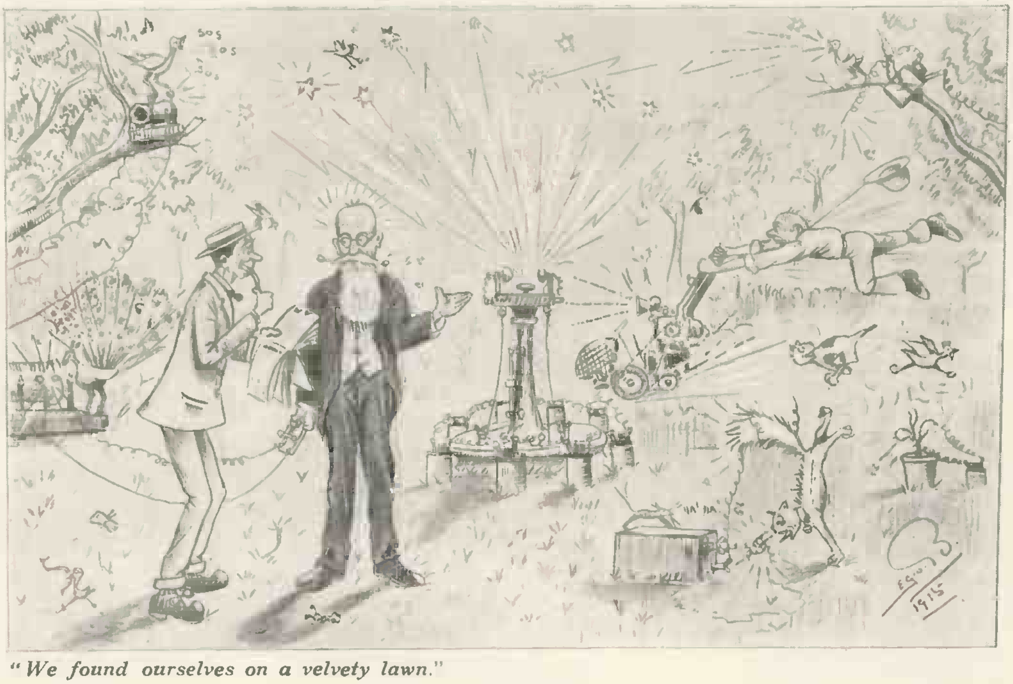
"Yes, sir," replied the footman. "Your call-letters, please?"

"W.W.," I answered briefly.

"O.K., R.D., Stdbi," was the reply as the man disappeared.

"Bitis," I observed, and sat down.

Whilst waiting I had an opportunity of remarking the luxurious nature of the surroundings amongst which the great scientist spent his time. In the large hall where I sat fingering the brim of my hat statues amid palms were distributed on every side. On the left I noticed a female figure delicately carved out of zincite and resting on a bornite pedestal, whilst on the right I remarked a



"We found ourselves on a velvety lawn."

silicon figure of Mercury poised on a brass point. At the far end could be seen a carborundum statue of Pan playing tunes on a potentiometer. From a distant room came sweet strains from the band of a magnetic detector, accompanied by a lilting melody from a multiple tuner.

Mr. Gapp now advanced towards me and bowed with a characteristic curve. He then rectified himself, and asked to what he owed the pleasure of my visit. I explained to him that THE WIRELESS WORLD was anxious to publish an account of the wonderful wireless garden he had formed and in which he spent so much time, and that if he would only favour me with an interview the thousands of amateur and professional wireless experimenters throughout the kingdom would be eternally grateful.

"You are welcome to all the information I can give you," said Mr. Gapp, smiling. "Since the outbreak of war, and owing to the restrictions placed on all ordinary wireless working, I have spent a considerable time in the garden investigating and experimenting on somewhat novel lines. Perhaps you will be so kind as to accompany me."

With this the great experimenter rose and led me past the crystal statues through a French window into the famous garden. We found ourselves on a velvety lawn, in the midst of which a fountain threw a delicate spray of electrolytic into the air. Rare birds piped notes of various frequencies, and a peacock was quenching its gap in an ornamental basin.

"On the left you will notice my chief gardener operating the rotary lawn mower," commenced the scientist. "It is of the synchronous variety, and gives, as you will observe, a clear musical note. The distance of transmission is considerable, to judge from complaints I have received from the neighbours."

"For what precise purpose," I queried, "is the ingenious apparatus being used at the moment?"

"I find that it affords an excellent means of shortening the wave-length of the grass," was the gracious reply.

As we paced the broad gravelled walks together my wonder and admiration increased by leaps and bounds. On every hand could be seen fresh evidence of the marvellous creative power possessed by the great inventor. We turned a corner and came upon a magnificent croquet lawn, whose brilliant verdure spoke eloquently of the care that had been bestowed upon it. In the centre stood a nickel-plated stand with a circular top, which rotated and glistened in the afternoon sun. From it there shot in all directions a whirling shower of water drops.

"The Radiation of thé Onion Bed."

"And that," I queried, "is another of your inventions, is it not?"

"That," answered my guide modestly, "is what I term my rotary aquifier. I designed it expressly for the purpose of increasing the damping of the lawn. As an example of the value of pure research, I might mention that shortly after it was erected my wife happened to be sitting beneath it, thinking it might be some sort of protection from the sun. When my gardener turned on the water (or H_2O, as my children call it), my wife was not only highly damped, but suffered all the symptoms of shock-excitation. Whilst the connection between shock-excitation and high damping has been investigated before, I think I may justly claim to be the first to demonstrate it in so effective a manner. Unfortunately Mrs. Gapp does not seem to appreciate pure science."

I expressed a few words of sympathy and instanced other great men whose studies had been interfered with in this way—Mrs. Euclid, I believe, had strong views. Mrs. Diogenes is also said to have interfered with her husband's correspondence classes. Mr. Gapp thanked me for my sympathy, and magnanimously remarked that women had their uses. This, after some thought, I agreed with, although I had not looked at the subject in that light before.

"You play croquet here, I presume?" I next queried.

"At times we do," Mr. Gapp replied, "although, owing to my uncertainty regarding the inductance of the hoops, my own score is not usually as high as it might be. I presume you are acquainted with the game? A series of impulses is given to a spherical body by means of an instrument which resembles the hammer-break of an induction coil. Although by design the spherical body should pass through a turn of inductance, resembling the primary of a jigger, nevertheless, from carefully compiled statistics, I find that in 99·9 cases in 100 the spherical body, or ball, as it is termed, hits the inductance and does not traverse it. I believe it is a case of molecular attraction, but I am loth to pass an opinion at the present stage of my researches."

Again I was deeply impressed. Here was a man to whom even a game, a pleasant sport, gave opportunity for grave and interesting scientific research. I thought of Newton and the apple, and laughed aloud with derision. Newton! Who was Newton to be compared with Sparkington Gapp?

With such pleasant converse we occupied a few moments until our wanderings led us into the vegetable garden. Noticing a twitching of my nasal organ, Mr. Gapp remarked that since he had commenced wireless gardening he had increased the radiation of the onion-bed to at least 25 amperes. This, he continued, would account for my nose acting as a sensitive detector. With an S. G. Brown relay he hoped to make the smell of onions audible.

The inventor next pointed out an elevation in the corner of the grounds. "Allow me to bring to your notice the Heaviside Layer on the Manure Heap," he said. "With its assistance the capacity of my vegetable marrows bids fair to reach two microfarads. There seems much to learn in that direction, and whilst the common variety of wireless expert spends his time arguing, I hope to attain something practical."

"Wonderful!" I commented with admiration. "And tell me, have you any other vegetable researches in progress at the moment?"

"Several, my dear sir, several!" came the answer. "Here, for instance, is my latest apparatus for the examination of potato-electric phenomena. In conjunction with my eminent friend Professor Boilingbroke Spudd, I hope in the autumn to stagger the world. But I regret my time is limited. Please convey to the readers of THE WIRELESS WORLD my best wishes, and tell them that even in these troublous times pure wireless research can still go on. Detectors may be locked in cupboards; inductances are seen no more; the aerials are bottom uppards; Excelsior, Excelsior!"

And with these poetic sentiments echoing in my ears I made my departure.

A PRIMITIVE WIRELESS TELEPHONE.

People who spend their time in belittling great inventions, attributing great inventions to any but the proper source, have now the chance of their life with regard to the wireless telephone. The researches of Mr. Marconi and other scientists in this direction will in future go for naught. The *African Mail* of recent date gives a short account of the interesting experiences of Mr. James Chaplin, of the American Museum of Natural History, in his recent six years' expedition along the banks of the Congo. Among the many wonderful stories of native and animal life that Mr. Chaplin has brought back with him, not the least curious is his account of the "wireless telephone" used by the natives in the forest country of the Congo. It is a wonderfully efficient system, and is quite unlike the Morse or any other that we use. The natives make noises on drums which will carry quite ten miles, these noises resembling the sounds of words in their own language.

The Campograph

An Instrument for the Delineation and Photographic Recording of Physical Curves

DR. J. A. FLEMING recently described, and exhibited to the Physical Society of London, a new and ingenious instrument he has invented for recording by photography or projecting on a screen physical curves of various kinds. This instrument he has called a campograph (from καμπὴ a curve and γραφω I draw). The instrument enables a curve such as the resonance curve of a wireless telegraph transmitter, or the characteristic curve of a wireless detector, or the hysteresis curve of a sample of iron wire to be projected and rendered visible on a screen, or to be photographed in a few moments on a photographic plate. It will be seen, therefore, that the instrument will have great uses in connection with radio-telegraphy and many other branches of physics. The appearance of the instrument is shown in Figs. 1 and 2—Fig. 1 showing the arrangements for projecting the curve on a screen, and Fig. 2. for photographing it on a plate.

The instrument comprises a long rather narrow mirror, which is pivoted on an axis parallel to its long diameter. This mirror is carried on supports with its long axis

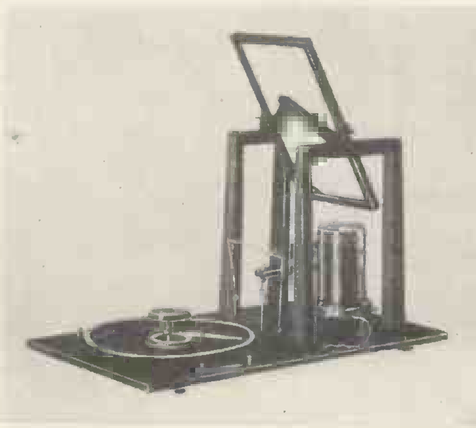


Fig. 1.

horizontal. Its axis carries a lever which is constrained by a spring, and also has on it an adjustable block to which a string is fastened. When the string is pulled the

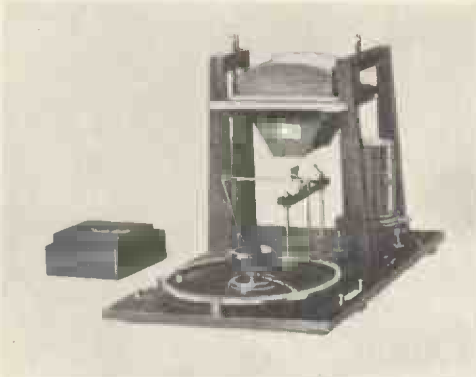


Fig. 2.

mirror is tilted through an angle proportional to the pull of the string.

Over this mirror is fixed another mirror slung on an axis at right angles to the first, which can be arranged and fixed at any angle ; or else a photographic camera having a cylindrical lens takes its place.

On the same base board is fixed a mirror galvanometer, or a mirror magnetometer, and a beam of light from an arc lamp lantern falls on the mirror of this instrument, and is then reflected to the narrow tilting mirror, and then from the fixed mirror it falls on the screen, or else it enters the photographic camera. A second element in the invention is a device Dr. Fleming calls a circular potentiometer for producing a continuously varying voltage or potential difference between two terminals.

It consists of a thin wooden or ebonite hoop about 1 foot in diameter, which is wound over with insulated high-resistance wire in one layer of close turns. The two ends of this wire are brought to two terminals called the battery terminals. The silk or cotton covering is rubbed off the wire on the top edge of the hoop, so as to expose

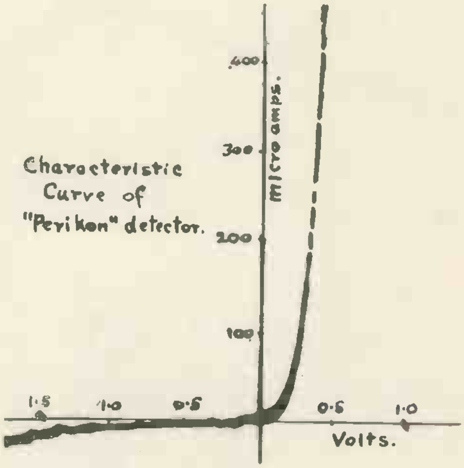


Fig. 3.

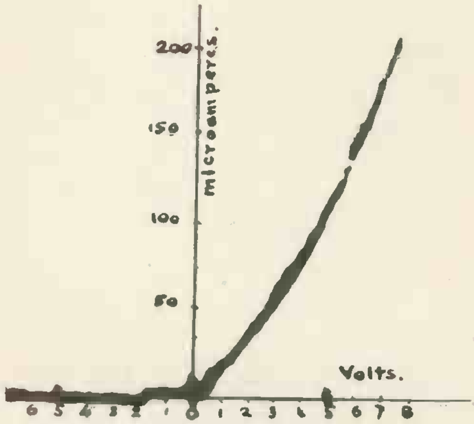
the metal wire. This hoop is fastened down on the base board. At the centre of the hoop is pivoted an axis which can be rotated by a large milled head. This axis carries a brass radial arm, the end of which rotates with rubbing contact on the bare turns of eureka wire wound on the hoop. There is a terminal in connection with the centre point of this wire on the hoop, and one in connection with the axis of rotation of the arm, and these two terminals are called the potentiometer terminals. It will be evident that if a battery, say, of 10 cells has its poles attached to the battery terminals, it will make a fall of potential down the wire, and that if the radial arm is turned into various positions, we can create between the potentiometer terminals any required fraction of the half-battery voltage in either direction.

The string which pulls over the tilting mirror is then attached to the rotating axis of the radial arm in such manner that when the arm is rotated the tilting mirror is pulled over and moves the spot of light on the screen through a distance exactly proportional to the angle of rotation, and therefore to the potential difference created between the potential terminals.

Suppose, then, that we place a galvanometer on the board and connect in series with it any conductor, say, a crystal detector, and also join the two in series across the potential terminals. Then on turning the radial arm we shall apply to the detector any required voltage one way or the other. and the galvanometer will be traversed by the corresponding current. Hence the spot of light falling on the screen or photographic plate will have two motions given to it—viz., a horizontal motion proportional to the applied voltage, and a vertical one proportional to the resulting current. Hence it will describe a curve called a characteristic curve, which shows the relation of current and voltage for the detector under test. In Fig. 3 is shown such a curve for a Perikon detector or Zincite-Chalcopyrite rectifier.

In Fig. 4, the same for a Fleming oscillation valve or glow lamp detector, it will be seen that the curve reveals at once the unsymmetrical conductivity of the contact, the current being greater for a voltage applied in one direction than in the opposite.

Again, suppose we substitute for the detector a long magnetising helix containing an iron wire, and replace the galvanometer



" Characteristic Curve of Carbon-filament Valve No. 12.

Fig. 4.

by a mirror magnetometer. We can then make the horizontal movement of the spot of light be proportional to the voltage applied to the terminals of this helix, which is a measure of the magnetising force on the iron, and the vertical movement is proportional to the resulting magnetisation of the iron. Hence the spot of light then

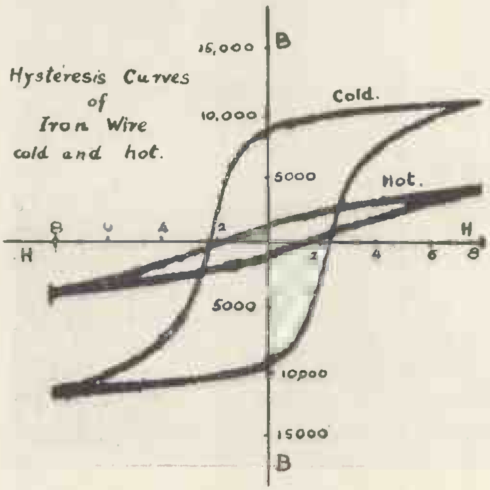


Fig. 5.

describes a magnetic hysteresis loop for the iron or other metal (*see* Fig. 5). In this manner we can use the campograph to study the effects of heat, oscillations, or mechanical shocks, etc., on the hysteresis of iron or steel. In the third place we can employ the instrument to describe a resonance curve and obtain a decrement as follows :

The circular potentiometer is removed, and in its place is fixed a condenser of variable capacity with rotating plates, the condenser being so made that its capacity is varied by rotating an axis proportionately to the angle of rotation. The string attached to the tilting mirror is then wound round the axis of this variable condenser. On rotating the axis it moves the spot of light horizontally through a distance proportional to the change in the capacity of the condenser. The condenser circuit is then completed by an inductance, and a hot wire thermo-electric ammeter inserted, the thermocouple of which is connected to a low resistance galvanometer placed on the base board. The spot of light will then be given two motions, one a horizontal one proportional to the change in the capacity of the condenser, and the other a vertical one proportional to the galvanometer current.

Suppose, then, that this condenser and inductance forms a cynometer or wave-meter circuit, and is brought near to the circuit of any wireless transmitter. The oscillations set up in the condenser circuit will create a thermo-current, and the value of this will depend upon the degree to which the condenser circuit is in tune with the transmitter. If the condenser capacity is varied gradually, the spot of light will then rise and fall on the screen, and describe a resonance curve (*see* Fig. 6), from which by the usual methods we can obtain the decrement of the transmitter. In this manner we can in a few seconds photograph a resonance curve of a transmitter or any other oscillatory circuit.

The photographs here given in the illustrations must not, however, be taken as examples of the best that can be done with the curve-tracer. The sharpness of the lines depends upon the smallness of the spot of light, and this, again, upon the perfection of the mirrors. In the case of the photographs here given only ordinary student's galvanometers and magnetometers were used, having very imperfect mirrors, but by the use of specially formed mirrors it is possible to obtain far better results, and Dr.

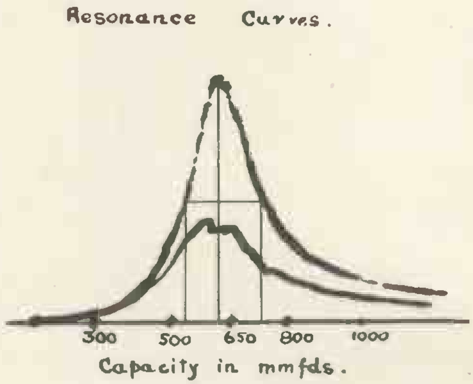


Fig. 6.

Fleming hopes soon to improve the instrument in this respect very greatly. It will then form a very useful addition to instrumental resources.

General view of Battery Park, New York.

A Monument in New York

To those who saved life but lost their own

BATTERY PARK, New York, has received a new decoration. It is no Iron Cross bestowed for the slaughter of the helpless and unresisting, but a Memorial to Wireless Operators who have died at their posts, saving life instead of destroying it.

"Yonder simple and beautiful testimonial "to manly courage and noble self-sacrifice in "the face of tremendous odds will stand an "elevating influence to the thousands daily "passing along the sea wall of this great "city." Such are the words in which one of the American orators taking part in the opening ceremony referred to the wreath crowned column and basin. Our illustrations adequately indicate the general appearance of the memorial, which, although of classic form, is wrought not in marble but in the unclassic material of sea-shells, sea-weed and sea creatures. The idea of the monument was conceived during the time when the world was just recovering from the shock of the *Titanic* tragedy. Originally intended to be known as the "Philips Memorial," and to constitute a tribute to the gallant young Englishman who lost his life at the post of duty on that occasion, the project widened out as time proceeded. The initial contribution to the fund came from the *New York Times*, and was closely followed by a subscription from the Marconi Company; whilst Harold Bride, Philips's wireless assistant on the *Titanic*, contributed the first amount sent by a private individual. Under the direction of Mr. C. C. Galbraith, a permanent fund for the relief of the widows and families of wireless operators who died in the performance of duty was established, and already a number of appropriations have been made in furtherance of this good work. Thus, as it stands, the memorial represents simultaneously a tribute to the honoured dead and a reminder of our duty towards those they left behind them.

The Hon. George McAneny, Mayor of New York, performed the unveiling ceremony. He dwelt feelingly upon the life-saving side of wireless telegraphy, and emphasised the double character of the memorial to which we have referred above. He expressed peculiar gratification that amongst those present at the time when he addressed them was Jack Binns, the hero of the first spectacular instance which emphasised the capabilities of radiotelegraphy in this respect.

The administration of the fund has been vested with the officials of the Maritime Association of the Board of New York, and representatives of the Administration attended the ceremony. Amongst the assemblage gathered within the enclosure there were noted Mr. James C. Perkins and Mr. and Mrs. Kuehn. These latter possess a peculiarly close personal interest in the monument, for the names of their sons appear upon the column.

The full list on the Roll of Honour as it stands at present covers the following names :—

George C. Eccles, steamship *Ohio*, August 26th, 1909 ; Pacific Coast.

Stephen F. Sczepanck, steamship *Pére Marquette*, Car Ferry No. 18, September 9th, 1910 ; Lake Michigan.

Jack Philips, steamship *Titanic*, April 15th, 1912 ; Atlantic Coast.

Lawrence Prudhunt, steamship *Rosecrans*, January 17th, 1913 ; Pacific Coast.

Donald Campbell Perkins, steamship *State of California*, August 18th, 1913 ; Pacific Coast.

Clifton J. Fleming and Harry Fred Otto, steamship *Francis H. Leggett*, September 18th, 1914 ; Pacific Coast.

Ferdinand J. Kuehn, steamship *Monroe*, January 30th, 1914 ; Atlantic Coast.

Walter E. Ecker, steamship *Admiral Sampson*, August 25th, 1914 ; Puget Sound.

Adolph J. Svenson, steamship *Hanalei*, November 23rd, 1914 ; Pacific Coast.

Space is left blank for others, whose fate is at present " on the knees of the gods." " The Marconi Tradition " is sure to claim further tribute in the future. Only the other day we narrowly missed having further names to add. We refer to the occasion of the crime of the *Lusitania*, almost equal in its magnitude to the disaster of the *Titanic*, but differing from it in the fact that it was caused not " by the hand of " God " but by the work of men—if the perpetrators of the crime can be judged not to have forfeited the right to be so considered.

The design was presented gratuitously by the firm of Messrs. Hewitt & Bottomley, and the key which turned on the water was handed to Park Commissioner H. C. Ward by Mr. W. L. Bottomley. The Commissioner in accepting the responsibility of keeping the monument for the public pledged the resources of his department, and stated that the task represented for him " not a " duty, but an honour."

Commodore F. B. Dalzell, of the U.S. Navy, introduced the Rev. Raymond Meagher, D.O., who pronounced the benediction and delivered a short address, in which, after extolling the performance of duty under difficulties, he passed on to contrast the old-time attitude of the Church towards science and the view taken by that same body in modern times : " To-day in " the person of Marconi we extol science " because science is truth," said the reverend gentleman.

* * *

Most of the exploits which have won for their heroes a place upon this column are well known to our readers, but a note or two on the subject may stand not inappropriately here.

The earliest in point of date was Stephen F. Sczepanck, who perished on September 9th, 1910, on Lake Michigan. Car Ferry No. 18, was carrying a long train filled with passengers between Ludington (Michigan) and Milwaukee, a distance of about 100 miles. The ferry boat struck a rock just after Sczepanck had announced their approach to the Milwaukee station. He sent out the signals of distress, and after receiving assurances of rescue, he passed along the whole length of the train,

The Unveiling Ceremony.

D

stopping at every seat to reassure passengers who had been thunderstruck to find, when stepping from the coaches, that the decks were already awash. There was room on the small boats for everyone but four—three officers and the wireless operator. The latter returned to the wireless room and was seen no more.

George Eccles perished on an Alaskan reef on August 26th, 1909. The *Ohio* went ashore, and in the midst of an indescribable turmoil, Eccles stuck to his post and summoned rescuers, who unfortunately went off forgetting him altogether. They attempted to return ; but too late ! a mountainous wave lifted the *Ohio* from the reef, she disappeared in the seething waters, and Eccles was never seen again.

The story of the great *Titanic* disaster of April 15th, 1912, is so familiar that it is almost superfluous to remind readers how Jack Philips, although worn out from seven hours' unremitting toil just in front of the disaster, superintended the rescue messages, and remained at his post until the last of the lifeboats had gone. Rescued from the icy water, he died from exhaustion and exposure during the night.

Lawrence A. Prudhunt is the youngest but one of the band; he was operator on the *Rosecrans*, when she was wrecked in the Pacific on January 17th, 1913; he refused to take his chance of rescue in the boats in the hopes that, by sticking to his post, he might expedite the arrival of the rescuers.

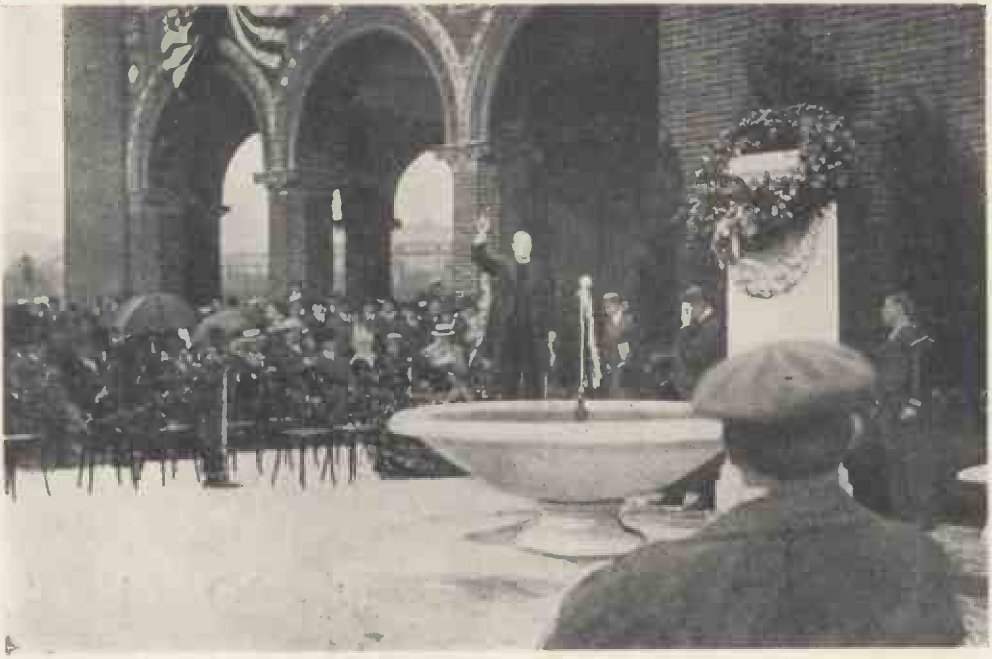
Donald C. Perkins was on the *State of California* when she struck a reef in Gambia Bay, Alaska, August 18th, 1913. In his case, also, a sense of duty kept him directing the rescuers until it was too late to save himself.

Ferdinand J. Kuehn was the operator on the *Monroe*, which went down on January 30th, 1914, in 12 minutes after a collision in the fog off the Virginia Coast. His work had been done ; but on going on deck he found a woman who had not been supplied with a life preserver, he took off his own and saved her at the expense of his life.

W. E. Reker was the wireless man on the s.s. *Admiral Sampson*, which sank after collision with the *Princess Victoria* off Seattle (Washington), August 25th, 1914. Here, again, the steamers were victims of a dense fog. As the cargo of his vessel consisted of oil, the horrors of fire were superadded to the situation, and Reker found too much work to do to think of his own safety. He shared the fate of the captain side by side with him on the bridge.

The youngest on our roll is Clifton J. Fleming, aged only 17 years : he and Harry F. Otto were lost in the wreck of the *Francis H. Leggett* off the Oregon coast, September 18th, 1914. The ship foundered after having been breached by heavy seas. Here, again, we have the case of a youth who sacrificed his life for a woman's. The floating timber to which they clung was not sufficient to support the pair, and he dropped quietly off.

A. J. Svenson perished with the *Hanalei* on November 23rd, 1914 ; the vessel grounded on Duxbury Reef, 15 miles north of San Francisco, and only the utmost heroism and ingenuity on the part of the wireless operators succeeded in the saving of the survivors. His comrade's comments form his most fitting epitaph : "Throughout our "terrible experience he remained cool and resource- "ful, upholding in an exemplary manner the trad- "tions of the Marconi service."



The Reverend Raymond Meagher, D.O., pronouncing the Benediction.

Wireless in the American Army

The Marconi 2 Kilowatt Cart Set

THE situation which so recently arose in Mexico, together with the firm tone of President Wilson's Note to Germany, has drawn the attention not only of Americans themselves, but of the world at large, to the state of preparedness for war which exists in the American Army and Navy. The vital and increasingly important part played by wireless telegraphy in the present conflict of nations is fully realised by the Government of the United States, and as a result the wireless equipment of the U.S. Forces is of a thoroughly up-to-date nature. In the Navy, radiotelegraphy has long been assiduously studied, and on the completion of the Panama Canal and the Canal Zone stations exhaustive tests with long-distance communication were undertaken. In the Army a large amount of important work has been done with portable stations.

The Marconi Cart Set described in this article is practically standard with the United States Army Signal Corps for general field service, and has been designed and constructed by the Marconi Wireless Telegraph Company of America. The complete installation, with sectional masts, aerial and aerial counterpoise, guys, etc., is carried in two carts, which are shown in the accompanying illustration. Every part has been designed for the maximum of portability commensurate with strength and efficiency, and the rapidity with which the apparatus can be set working after "halt" has been called is not the least remarkable feature.

The two carts are termed the "Power Cart" and the "Instrument Cart" respectively. The former contains the power plant, consisting of a four-cylinder, four-cycle gasolene engine, coupled direct to a 2-kilowatt, 500-cycle, 220-volt alternating

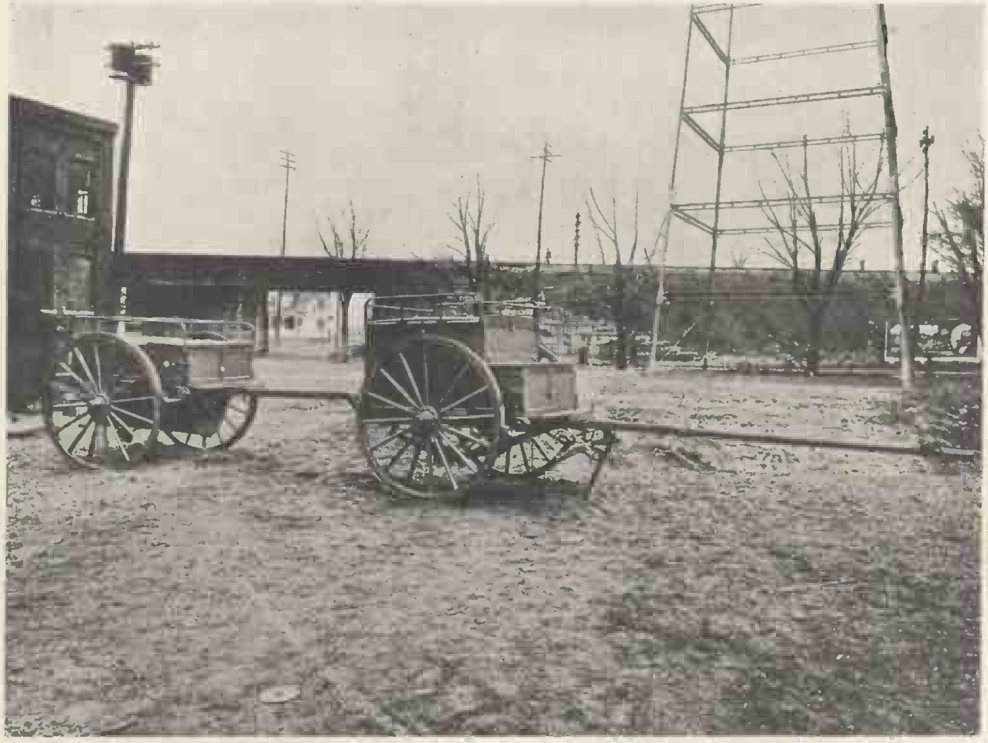


Fig. 1. Complete Installation on Two Carts. Instrument Cart in front, Power Cart behind.

Fig. 2. Power Cart.

current, and 500-watt 110-volt direct current generator. The direct current serves the purpose of exciting the field of the alternator. In addition to the power plant, this cart has provision for carrying the mast, antenna, guys, and the counterpoise. Connection to the Instrument Cart is made by a flexible cable.

For the storage of gasolene two tanks are provided, one on each side of the engine, with a total capacity of sixteen gallons. The tanks are piped together and have separate shut-off valves.

The Instrument Cart contains the 500-cycle transformer and the high and low frequency apparatus for both sending and receiving. On the rear panel is mounted the oscillation transformer, aerial tuning inductance, with the necessary arrangements for rapid changing of wave-length and a special ammeter in the aerial circuit for indicating the radiation. The spark-gap, with motor and blower, together with a protective device for the motor, and one of the operating keys are mounted on the bottom in front of this panel. In the interior of the cart (and well protected) is situated the 500-cycle, oil-cooled, closed-core type resonance transformer, with a protective device, the switch connections for changing from sending to receiving; the transmitting condenser; the coils and working parts of the jigger and the aerial tuning inductance; besides the generator field rheostat. The 500-cycle ammeter, voltmeter and wattmeter are mounted on a separate panel over the driver's seat.

For the purpose of connecting the aerial and counterpoise (which latter takes the place of an earth connection) two porcelain insulators are provided on the top of the cart. These can be seen in the illustration on page 247. A portable wave-meter is also carried. The receiving instruments, which are of the Marconi standard 101 type, are mounted in shock absorbers, and occupy the space underneath the driver's seat, as shown in the illustration. The receiving batteries and the control handles for the generator field rheostat, the switch for changing from sending to receiving, and the second operator's key are all conveniently to hand. On the doors at the rear of the cart are two portable lamps and four spare condenser units.

Coming now to a more detailed description of the apparatus, Fig. 2 shows the rear of the Power Cart. The two tanks for gasolene can be clearly seen one on each side of the cart, and funnels for filling are visible above. Underneath will be noticed the starting handle for the engine. The flexible cable which connects the Power Cart with the Instrument Cart plugs on each end will only fit into the plug socket in one position, so that it is only necessary to push them well in and note that the five spring clips within the socket are making proper connection.

Fig. 3 shows a side view of the Instrument Cart with the casing removed. The transmitting inductances, which are wound in the form of flat spirals, can be seen at right angles to the plane of the picture. The variation of inductance is brought about by means of sliders which are attached to radial arms in such a manner that when the rod to which the arm is attached is rotated the inductance is regularly varied. The dark body which can be distinguished between the inductances and the driver's seat is the 500-cycle transformer. On the top of the cart the aerial lead-in insulator and the earth counterpoise insulator will be noticed.

The transmitting condenser, which does not appear in the illustration, is situated on the other side of the cart, and comprises a number of tubular glass units, each with electrolytically deposited copper coatings. The discharger is of the quenched-gap variety, and consists of a number of circular plates separated by insulating gaskets in such a way that the sparking space is air-tight. A motor blower cools the plates with a strong current of air. The discharger and blower are placed at the rear of the cart immediately behind the inductances already mentioned.

When operating, the transmitter gives a pure musical note with a frequency of one thousand sparks per second. It will be

Fig. 3. Instrument Cart

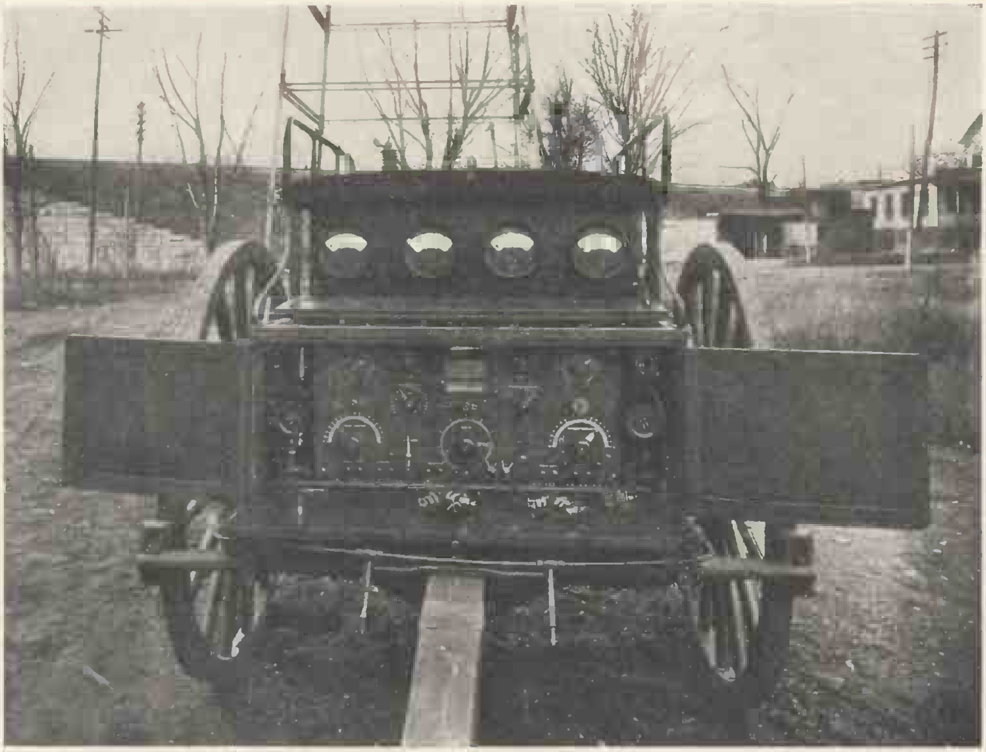


Fig. 4. Instrument Cart, showing Operating Table.

noticed in the foregoing description that two transmitting keys are mentioned. One of these, situated on the operating table, is in use during the ordinary operations of sending and receiving; the other, at the rear of the cart, is very convenient for use when adjustments of the transmitter are in course of being carried out.

Fig. 4 shows the front of the Instrument Cart with the operating table open. On the panel at the top the ammeters and voltmeters can be seen. Immediately below these is located the receiver, with its various capacities and inductances. The handle in the space to the right of the receiver controls the field rheostat, and that in the space on the left the switch for changing from sending to receiving. The operating key will be noticed on the right-hand side of the table, immediately adjacent to the right hand pair of telephones. The receiver itself consists of an inductively-coupled transformer with two crystal detectors and the necessary accessory apparatus mounted on an ebonite panel, and contained in a mahogany case. In the aerial circuit the aerial tuning inductance is varied by circular switches making contact with rings of studs and a variable condenser and can be connected in series with the aerial tuning inductance, in shunt with it, or cut out entirely. By varying the inductance and capacity, wave-lengths between very wide limits can be " tuned in." In the secondary circuit the inductance can be varied over a wide range by means of a ten-stud switch, and a variable condenser enables capacity to be shunted across the inductance when required. Two crystal detectors are provided, one of cerusite and the other of carborundum, either of which can be switched into circuit as needed. A potentiometer for the carborundum detector is controlled by a rotary switch.

A further handle controls the variable coupling between the primary and secondary, and a pointer connected with it runs over a scale marked in degrees. Finally, a buzzer enables the detectors to be tested and adjusted with facility.

Wireless Telegraphy in the War

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

A NUMBER of paragraphs have been recently going the round of the daily Press announcing the difficulties that our German enemies are at present finding in communicating directly between their country and the United States. It has for some years past been a matter of pride to the Teutonic heart that, thanks to their excellent wireless installations, they have had ample means of direct communication between Berlin and America. They have made full use of their opportunity, and the facility has enabled them to bring all sorts of influence to bear upon American public opinion in favour of the Austro-German Alliance. All through the winter months wireless communication has gone on fairly continuously, but now that warmer weather has made its appearance the great German stations at Sayville (Long Island) and Tuckerton (N.J.) are finding considerable difficulty owing to adverse atmospheric conditions. Our newspaper paragraphists have sought for an explanation in the natural electric phenomena recurrent at this period, and generally known as the *Aurora Borealis*. *Post hoc* is not necessarily *propter hoc*, and evidence as to the connection between the *Aurora* and radio-telegraphic troubles is up to the present a little conflicting. The investigation of the matter is interesting, and we shall hope to take an early opportunity of dealing with it a little more in detail.

The general problem of adverse atmospheric conditions at certain different periods of the year has confronted those engaged in commercial long-distance communication ever since they first commenced operations. Up to the present the only way of overcoming the difficulty appears to be that of providing a considerable reserve margin of power. It is for this reason that the Marconi Transatlantic and Transpacific stations are put in possession of a power considerably in excess of what is required under normal conditions. At periods of "static" interference these reserves of power are brought into the firing line, and "our positions maintained in their entirety"!

As far as it is possible to ascertain from the Press reports, this lack of reserve power would appear to be one of the causes that lie at the root of Germany's present difficulty in trans-ocean communication. We read, of course, claims (which keep perennially "cropping up"!) of long-distance communication established with small power. These communications more or less belong to the class of "freaks," possible only in favourable weather circumstances, and cannot be classed with commercial services, for which it is essential to maintain day and night communication over the whole year.

* * *

The modern Huns have been treating with the contempt so truly characteristic of savage tribes the war power of the United States: "let them think" was the phrase employed by the egregious Dernburg. Even highly placed German diplomatists have not hesitated to express their contempt of diplomatic pressure backed by what *they* consider feeble military resources. Nevertheless, despite this attitude on their part, it has been recently pointed out that America claims to have three monster weapons of war "snugly hidden up her sleeve." These comprise the most powerful demolition explosive in the world, and a wonderful submarine designed by Edison, which, according to the American claim, "inhales its own oxygen from the water." Over and above this they are believed to have available a number of *wireless torpedoes* possessing a speed of sixty miles an hour, with a range of 28 miles. Being under the control of a special wireless device it is claimed that within its range "it can be made to go anywhere until it finds its mark."

Lord Mersey, President of Court of Enquiry into "Lusitania" outrage, leaving the Court with Capts. Davis and Speeding, Nautical assessors.

It is not often that a man engaged in fighting a foreign government in civil courts is called away and his case hung up in order that he may take part in fighting that same government in active military operations. The career of Senatore Guglielmo Marconi has been full of incidents out of the usual order of human affairs, and once again the abnormality which in his case has become so frequent as to be almost normal, has occurred. At the very moment when he was in the thick of a fight against the encroachment by the German Government against the fruits of his genius in the American Courts his country declared war, and his king summoned him to fight the same enemy for public rights as he was engaged in combating on personal grounds. The case against the company using the Telefunken system in the United States (really the German Government) was therefore hung up and Senatore Marconi hastened to his native land. The summons came direct from King Victor Emanuel through the Italian Ambassador in Washington. Senatore Marconi's connection with the Italian Navy has for many years been of the closest character, and the Senatore himself is a close personal friend of the Duke of the Abruzzi, the supreme Italian Admiral. In view of his intimate knowledge of the Italian Marine, Senatore Marconi's *Ipsissima Verba* are worth recording:

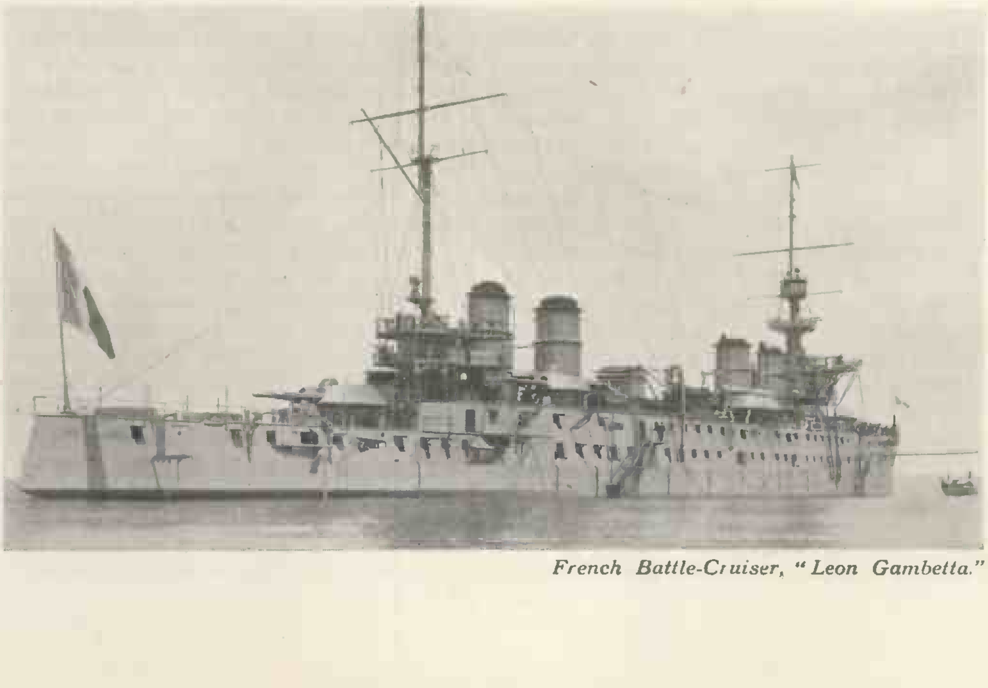
"He says the Italian Navy is perfectly "fit, its officers and men are perfectly "trained. Since the war in Europe started "several new ships have been commissioned, "amongst which figure a number of the "Dreadnought type."

The Commanding Officer is the Duke of the Abruzzi, and the world knows what a fine and capable type of seaman he is. Under his direction the fleet has been undergoing a constant training in marksmanship and manœuvring exercises, and never before has the fleet been so ready as now.

The essential necessity for preserving wireless apparatus in active working under all circumstances has been very sadly instanced in the case of the *Léon Gambetta*. This powerful battle cruiser of our French Allies was torpedoed twenty miles off the Italian coast on April 28th last. The fact that she was proceeding at no more than seven knots afforded an opportunity to an enemy submarine for choosing the best spot in which to torpedo her. The vital point, therefore, situated amidships abreast of the engine-room was struck, and the explosion wrecked the dynamos, immediately plunging the vessel in complete darkness *and rendering useless the wireless apparatus.* On the larger number of British vessels, mercantile as well as naval, although the dynamos are used under normal conditions for working the wireless, a supplementary system of accumulators is usually arranged for when the vessels are fitted by the Marconi Company. These supplementary arrangements have proved their utility over and over again in cases where—as with the *Léon Gambetta*—the injury to the ship entailed cessation of normal working. Accounts giving particulars as to times, etc., are not yet to hand in sufficient detail for us to speculate profitably as to the possibility of saving some of the gallant French sailors had wireless been able to exercise its customary function of instantly summoning aid. Very fortunately, vessels of the Italian Navy were in close proximity, and rushed with extreme gallantry to the rescue of the ill-fated Frenchmen so closely related to their Italian rescuers—not only by avocation but by consanguinity. The French must feel a sad pride in the gallantry displayed by Admiral Sénès and Commander André Deperiere, who refused to leave the ship. Just before she took her final plunge a stirring shout arose from the deck of the *Gambetta*: "Here we die for our country—"Vive la France!" whilst the survivors in the solitary boat which had managed to keep afloat re-echoed their cry of "Vive la "France!"

* * *

The latest terror which the *Daily Mail* has sketched for the benefit of its readers is the "aerial torpedo which is proposed (*sic*) to be used by the new super-Zeppelins." This marvellous creation is made of aluminium, filled with gas, sustained by gas and controlled by "wireless." A wonderful creation truly! Only a few weeks ago the *Sphere* brought out a series of interesting drawings of suggested possibilities for aerial torpedoes directed by "wireless" which were highly ingenious and not outside the bounds of possibilities as far as we know them. But the possibilities



French Battle-Cruiser, "Leon Gambetta."

The latest "Dumping Ground" of Austrian Aircraft bombs. Venice—the Grand Canal and Rialto Bridge.

of aerial torpedoes being controlled by such weak installations as are possible on Zeppelins in face of the powerful land stations in the neighbourhood of which they would have to operate draws a larger cheque upon the bank of our credulity than we are willing at present to honour.

*   *   *

The news of the gallant successes of the British submarine which torpedoed a large German transport in Panderma Bay recently does not appear, on the face of it, to bear much reference to "wireless." This 8,000 ton victim of our gallant seamen constituted not merely a transport, but a travelling wireless installation of a very powerful character. It is claimed that her installation enabled the German Embassy, Constantinople, to so direct the operations of the *Goeben* and *Breslau* as to enable those steamers to escape from their British pursuers and take refuge in the Golden Horn. It is sometimes forgotten that vessels fitted with powerful installations are often even more useful than land stations on account of their mobility. There can be little doubt that the *Corcovado* and the *General*, one of which was sunk, have proved extremely useful to the German authorities and their Turkish Allies in the Black Sea and in the Sea of Marmora.

*   *   *

Motor transport of all descriptions is playing a far more important part in the present European struggle than in any previous wars. A large number of machines are being utilised by ourselves and our Allies. These are mostly of the four-wheel drive type, this form having proved to be the most suitable for use on fields or rough country unprovided with roads. A collapsible wireless mast, sometimes nearly 100 feet high when fully extended, is carried on a specially strengthened roof. When these machines are ready for use they present a ludicrous likeness to a gigantic maypole. The radius of such wireless outfits amounts roughly to 200 miles as far as despatching is concerned, whilst the distance from which messages may be received is very much greater. The same motor which propels the cars drives the small electric generator, whence the apparatus obtains all the electricity required for working.

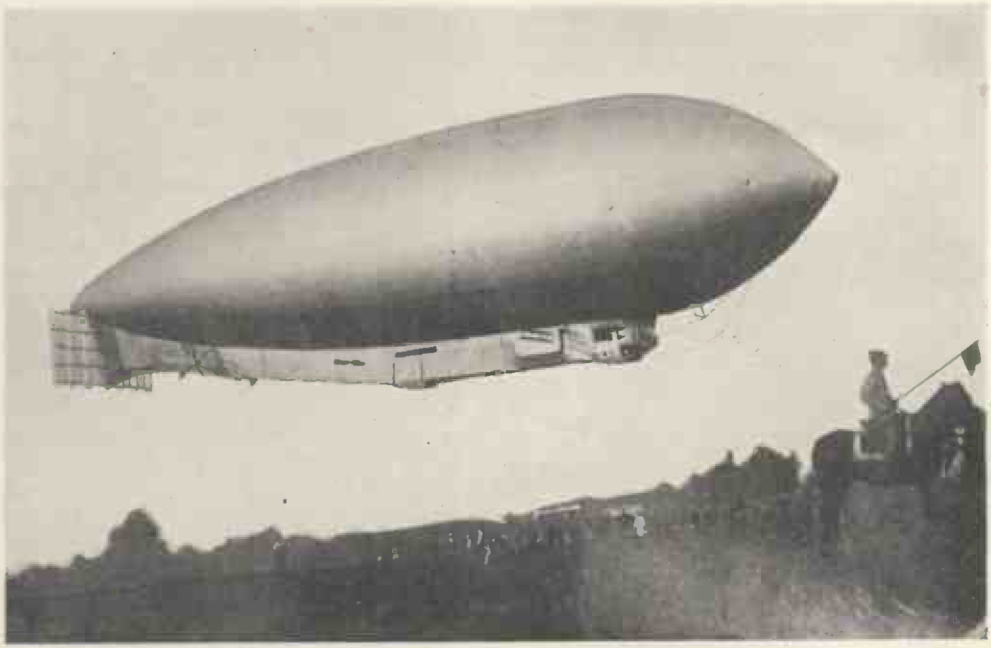
*   *   *

Our issue for February, 1915 (page 719), contains an interesting letter from a German lady resident at Kamina in the earlier days of the war when the wireless station there was in full working activity. The British despatches above referred to show that the fighting followed the same lines at Kamina, in Togoland, as that in other outlying portions of the once proud German Colonial Empire. Combined land and sea operations (in which the British displayed a skill which has become traditional) resulted in the unconditional surrender of the chief town of the colony, preceded by German destruction of their own wireless station, which was carried out with the same thoroughness as that described in our last (May) issue with respect to Duala in the Cameroons. Despite the fact that Colonel Bryant (commanding the British) had been obliged to notify the German Governor of flagrant breaches of the "laws of war," he himself in his letter of protest asked the truculent German to convey to *Baroness Coletli, the wife of the designer of the wireless station at Kamina*, that her husband was safe and sound and a prisoner in British hands. Moreover, in order to save the women of the beleagured garrison from the horrors of warfare, he offered to give permission for them to pass out under a flag of truce.

It is conduct such as this (which contrasts most favourably with that of the enemy) that is very largely responsible for the goodwill towards the British so prevalent in neutral countries, and for the reverse sentiments which are being increasingly aroused everywhere by the Austro-German Allies.

* * *

Captain A. S. Greene, Commander of the *Nebraskan*, an American steamer which was torpedoed off the Irish coast at the end of May, narrates a somewhat curious experience. He was going along on his regular way quite comfortably, and resting in his own State Room, when suddenly a violent shock occurred, which "felt as though the "ship was being blown out of the water. "Almost immediately there was a terrific "explosion." Investigation showed that the forward part of the vessel had been almost completely wrecked. The mast, the derricks, and the booms were lying on the deck, whilst the hatchways had been blown clean away. The lower hold was full of water, and the vessel appeared to be rapidly settling by the head. The crew were ordered to take to the boats, whilst the wireless operator set to work the SOS signal. The



The "Forlalini" type of Airship used by our new Italian Allies. The car is a rigid structure forming part of the actual balloon.

boats hovered round the ship, and—as nothing further seemed to happen—they rowed up, examined her, and returned. There can be little doubt that the *Nebraskan* was torpedoed; the chief engineer saw one of those missiles approaching the ship just before the explosion.

* * *

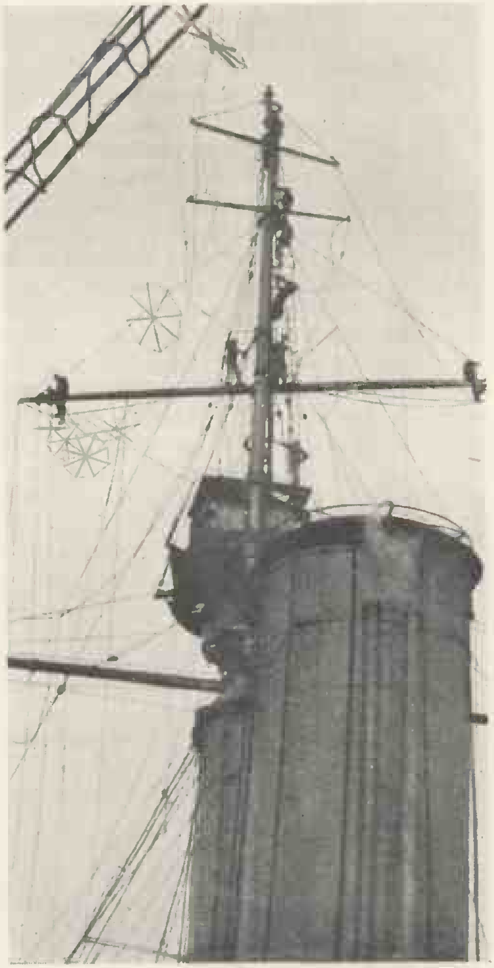
It is hardly too much to say that her salving was largely due to the confidence inspired by the fact that through "wireless "telegraphy" it was possible to communicate and ask for help at any time. The vessel was ultimately manœuvred under her own steam into Liverpool. Many a steamer unprovided with such safeguarding apparatus has been abandoned by her crew and left to drift helplessly to and fro at sea, useless to her owners and dangerous to other vessels. The Crookhaven land wireless station received the call of the *Nebraskan*, and was able to *keep in touch* with what was occurring all the way through.

* * *

On the recent occasion, when the White Star Liner *Megantic* (14,878 tons), outward bound from Liverpool with a large number of passengers, was saved from being torpedoed by a German submarine pirate, the Admiralty and people ashore were kept fully in touch all the time. The *Megantic* announced, when 60 miles south of Queenstown, that the German submarine had been sighted, and all the time that she was zigzagging at full speed she sent message after message, until finally she was able to announce that she had succeeded in shaking off her treacherous foe.

* * *

We have heard a very great deal with regard to secret wireless stations in England and other parts. There can be little doubt that no end of espionage is going on, but few of these tales of secret wireless apparatus have stood the test of examination. The case, however, in which figured the parish priest of Caporetto, recently captured by the Italians, seems to be genuine enough. After the legions of modern Rome had entered Caporetto, it became plain that the enemy's information concerning movements of troops was somewhat too detailed to be accounted for in any other way but treachery. Information was given by the rector, and under the high altar of the church itself a wireless apparatus was discovered. The traitor priest was tried and shot at Udine.

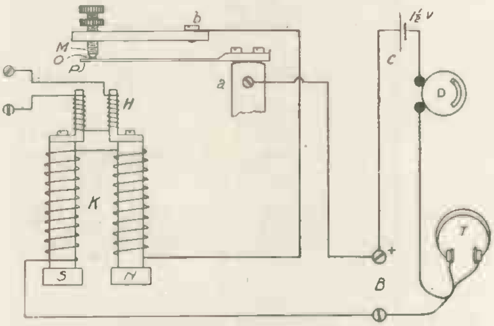


Repairing Wireless at Sea.

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.*

N. H. E. (Fulwood, Preston, Lancs) is troubled with a problem in connection with Mr. S. G. Brown's telephone relay. Speaking of the principle of the instrument he says: "It seems to depend on the principle of the ordinary microphone, but what I fail to understand is the action of the so-called 'self-regulating' winding, K. Suppose a slight E.M.F. across the terminals A causes the magnetism of H to be increased a little. Then the pressure between the contacts M and P is slightly reduced, and the resistance is correspondingly increased. This would therefore reduce the value of the current through the winding, K, and consequently would tend to demagnetise the magnet, thus neutralising the effect of the original E.M.F. across the terminals, A. In his description Mr. Brown says 'The contact pieces are opened to an infinitesimal degree to form the microphone by the fine adjusting screw, W, and by the action of the local current, which passes through the contacts and self regulating winding, K. The local current thus assists to form the microphone and to keep the instrument in adjustment.' I see that the arrangement would tend to obtain a uniform pressure between M and P, but although this is a desirable feature provided one understands it to mean 'a uniform pressure *apart* from the effect of signals,' it seems to be the last thing one should aim at *during the actual reception of signals*, for the object is to get as great a variation of resistance between the contacts as possible."



Answer.—We think that N. H. E.'s enquiry is of sufficient interest to warrant our reproducing it practically in full, as the problem has very likely occurred to a number of our readers. As regards the principle of the instrument, if the metallic circuit of a dry cell be interrupted by a minute opening or space of the order of 5×10^{-7}cm., the metal at the point of interruption being platinum, the current will continue to flow round the circuit and across the opening, and any slight alteration in the length of the space, which can be called the conduction space, will vary its resistance and greatly affect the value of the current which flows round the circuit. The dimensions of the conduction space are so small that it is difficult to ensure and maintain it by mechanical means. The current which flows across the space is, therefore, made to do its own adjustment, very much in the same way as the current that passes through the arc of an arc lamp is made to strike and maintain the length of the arc.

By the action of the local current through the winding, K, the space is formed and afterwards maintained. Now we come to the important point raised by our correspondent. The regulating winding must not, of course, act when traversed by the rapidly varying telephonic currents. Many of the descriptions which have appeared omit to mention that a special arrangement to overcome the difficulty has been devised. The iron under the coil is surrounded by a close circuited copper sheathing, and when the telephonic currents traverse the winding, K, eddy currents are set up in the copper. By mutual induction these destroy the self-induction of the coil, and in this way the action of the winding, H, on the reed, P, is not interfered with.

It will be noticed that our correspondent is slightly in error regarding the working of the relay. He speaks of the "pressure between the contacts M and P." The relay does not work by virtue of any variation in resistance of a *contact*, but by the alterations in resistance of a microscopic *gap*.

W. J. H. (Timaru, New Zealand).—We regret that we cannot depart from our practice of not publishing constructional details of patented apparatus. By the time this answer appears you will have had an opportunity of perusing the instructional article on the calculation of inductance, and this, together with the others that have appeared, should greatly assist you in your studies. There is an error in the first part of your letter which is apparently leading you wrong. You say the book says the wavemeter in question should have for a range of 100 to 750 metres, "a fixed induction of about 15 mhys., and the maximum capacity should be 10,000 cm. (3.3 mfds.). 10,000 cms. is *not* 3.3 mfds. If you calculate the equivalent of 10,000 cms. in microfarads, and then compare the statement in the first book you quote with that in the second, you will see in what particulars the two agree. You might then work out the wave-lengths obtainable with the capacities and inductances given, and you will soon see which is wrong.

We are very glad to hear that your society is devoting its time to theoretical study during the suspension of practical working, and shall be very glad to hear from you on any points which present difficulty.

Wm. H. R. (London).—We regret that we cannot publish information of the nature you mention during the present emergency.

E. K B. (Sydney, New South Wales).—Thanks for your interesting letter. It is by no means certain that the gasometer would interfere with your reception when you are able to erect a station after the war. Do not attach too much importance to the station being on elevated ground. Not being acquainted with your locality, which is more than a few minutes' walk from our offices, we could scarcely express an opinion as to the best site to choose. With regard to your second query, although a "plain aerial" radiates very strongly damped waves which affect a receiver tuned to almost any wave-length, if the aerial in question has considerable capacity, such as would be the case if there were a long, low horizontal component, the radiated waves would be sufficiently persistent to give a good building-up effect with a receiver tuned to the particular wave-length. You do not give sufficient particulars of your friend's receiver to indicate to us whether this tuning effect was a spurious one, as sometimes happens when a receiver is wrongly or badly designed.

A. J. H. (Forest Gate) asks a number of questions which are of such a nature that we cannot deal with them during the time that the present restrictions are in force.

INSTRUCTION IN WIRELESS TELEGRAPHY

(Second Course)

(XII.) The Receiving Circuit.

[The dislocation of our arrangements, due to the war, has prevented us from completing, in our last Volume, the second course of Instructional Articles. These are being continued in the third Volume, and we hope to arrange for the Examination (full particulars of which are given on page 333 of our issue of August, 1914) to be held in the early autumn of this year. The present is the twelfth of the second series of articles, which will deal chiefly with the application of the principles of wireless telegraphy. Those who have not studied the first series are advised to obtain a copy of *The Elementary Principles of Wireless Telegraphy*, which is now published, price one shilling net, and to master its contents before taking up the second course of instruction.]

THE ELECTROLYTIC DETECTOR.

779. This detector in its most usual form consists of a small vessel containing an acid solution, sulphuric or nitric acid being the ones chiefly used. In this are placed a fine platinum wire and a lead plate. The platinum wire is fixed on a screw so that the distance of its tip below the surface of the liquid may be adjusted. For a sensitive detector the wire must be very fine, and in one form this is obtained by using Wollaston wire, which is made by covering a fine platinum wire with silver and drawing the composite wire till its diameter is as small as is practicable. When this is put into the acid the silver is dissolved off, leaving a platinum wire of extremely small size.

By means of a battery and adjustable resistance a potential is applied similarly to that used for a crystal, and high resistance telephones are included in the circuit.

The action of the cell as a detector is due to the annulment of the polarisation which is set up by the applied potential. The resistance falls and an intermittent current is sent through the telephones.

Another form is due to Fessenden. This has two fine platinum wires dipping into acid, or the vessel containing the acid may be divided into two parts by a partition with a fine hole between. In this case when oscillations are applied the resistance increases, due to the heating effect of the current, the heating being localised round the fine wires or the small hole, and hence if a steady potential be applied a greater current will pass in one direction than in the other.

THE MAGNETIC DETECTOR.

780. This detector, on account of its reliability and robustness, is still widely used in places where these qualities are of importance, as in ship installations. It requires a minimum of additional apparatus to fit it for the reception of signals with a suitable aerial. It is, however, not so sensitive as most of the more modern detectors. It consists of an endless band of a number of strands of fine iron wire, which are silk-covered, both to insulate them one from another and to increase the strength without diminishing their flexibility.

The band passes through a small glass tube on which is the primary winding; which consists of a short length of a single layer of fine copper wire.

Over the primary is placed a bobbin wound to a resistance approximately that of the telephones used, which are connected in parallel with it and are of 120 to 180 ohms per pair.

A magnet is placed with one pole as near the bobbin as possible, the other pole being tilted up away from the band. A second magnet is fitted and adjusted to diminish a "breathing" sound heard in the telephone.

To keep the band moving it passes round two large discs, one of which is actuated by a clockwork, which must be silent. The speed at which the band moves largely depends on its tension, and means must be adopted to vary this in order that it may move at a sufficient speed. This is usually done by an adjustment on the second pulley by which it can be moved backwards or forwards relatively to the first. A fan governor is provided to prevent the clockwork running down too fast. The primary can be connected in the aerial circuit and then only requires a tuning inductance and condenser to receive signals, or the primary can be connected in series with a secondary circuit of small inductance and relatively large capacity which is inductively coupled to the aerial.

The action as a detector is as follows: The slowly moving band is magnetised by the magnet, but owing to the hysteresis of the iron the magnetic state of the band at any particular point lags behind what it would be for the strength of the field at that point if the band were stationary. When the oscillations pass through the primary winding the effect is to annul this hysteresis effect, and a sudden change in the magnetic state of the band results. This change induces an electro-motive force in the surrounding secondary bobbin, which gives a signal in the telephones.

Several other forms of magnetic detector have been proposed, a description of which will be found in Dr. Fleming's "Principles of Electric Wave Telegraphy and Telephony."

THE FLEMING VALVE.

781. If, in a highly exhausted tube or bulb, such as an incandescent electric lamp, two electrodes be sealed, one of which can be heated, then when both electrodes are cold the space between them is practically non-conducting, except for very high voltages.

If the electrode be heated, however, there is an appreciable conductivity in the space, and a fraction of a volt will send a current between the two electrodes. But the current only flows when the cold electrode is at the higher potential (*i.e.*, is positive to the hot electrode).

Hence the device is a rectifying one, and if an alternating current be applied to it an intermittent direct current will be obtained. The hot electrode is made in the form of a lamp filament, either of carbon, tungsten, etc., and in practice is constructed to work with a battery of from 4 to 16 volts. The cold electrode is usually a metal sheath surrounding the filament.

If the characteristic curve of this detector be plotted it is found that keeping the heating voltage, and hence the temperature of the filament, constant, the current between the electrodes is at first proportional to the applied voltage.

At a certain point the current increases more rapidly for a given increase in voltage and continues to do so till a point is reached when the current remains practically constant for a considerable increase in voltage.

On further increasing the voltage a second point is reached at which the current increases again until another stationary value is attained.

If a steady potential be applied between the filament and sheath and adjusted to the point where the current begins to increase more rapidly, the valve is in its most sensitive condition for receiving signals, and may be used on the same circuits as carborundum or other high resistance crystals. The valve is a very sensitive and reliable detector.

THE USE OF BALANCED CRYSTALS FOR DIMINISHING THE STRENGTH OF ATMOSPHERICS.

782. Most crystals require an applied potential to bring them to their most sensitive condition for receiving signals. This potential is that for which a given small additional oscillatory potential gives the largest rectified current through the detector and telephone.

If a smaller applied potential be used the oscillatory potential has to be greater in proportion to give the same rectified current or strength of signal in the telephone—in other words, the detector is less sensitive.

Consider the curve shown in Fig. 1, which represents diagramatically the characteristic of a carborundum crystal, then if OB be the applied potential and BC the potential due to the oscillations, the increase in current due to this is KP, and this is the value of the intermittent current in the telephone which gives the signal strength. If the applied potential be OC and the oscillation potential be CD = BC, the signal current is QL, which is much larger than KP, giving stronger signals.

Suppose, now, a strong signal act on the detector working under the above conditions. Let BE be the oscillation potential for the first case, then UM is the signal current. For the second case the potential is CF = BE, and the current is VN.

If we have two exactly similar crystals connected to one circuit, and so arranged that they rectify in opposite directions, then if the applied potentials be the same value, as OC, every oscillation which reaches them sends equal currents in opposite directions through the telephones. Now, if the applied potential of one crystal be reduced to OB, an oscillation of potential BC will send a current equal to KP in one and QL in the other direction, the strength of signal in the telephone being due to the difference between these values, which is about *two-thirds* of QL in the diagram.

If a stronger signal of strength, BD or CE, be received, the current in the telephone will be VN—UM, which is only *one-fifth* of the strength of VN.

Hence strong signals are reduced in much greater proportion than weak ones, so that the method affords a valuable means for reducing the strength of atmospherics and jamming signals without appreciable weakening of the required signals.

The method can only be applied to crystals which are absolutely steady in their behaviour, like carborundum. It is not necessary for the two crystals to be absolutely the same; in fact, the balancing is best attained if one has a steeper characteristic than the other.

This method of reducing atmospherics is due to Mr. H. J. Round of the Marconi Company, and has been patented. A method also devised by Mr. Round, which has, however, been superseded by that described above, consists in coupling the aerial to two separate detector circuits—one tuned to the wave-length of the signals, and the other thrown out of tune to a certain extent. The detectors are connected to the same telephone (or telephone transformer) in opposite senses. In this case the atmospherics come through in equal strength on both receivers, and hence are neutralised in the telephones, but the required signals only give signals in one.

THE MEASUREMENT OF THE STRENGTH OF SIGNALS.

783. The measurement of the strength of received signals is one of the most important investigations which can be carried out in practical wireless telegraphy. It is not only of importance in giving figures in reference to the efficiency of the apparatus which is in use, but it is essential for supplying data by which theories concerning the propagation of electric waves round the earth, the effect of daylight and darkness, and many other subjects, can be elaborated and tested. Investigations into the properties of detectors are of little value unless accompanied by these measurements.

For some purposes it is necessary to directly measure the actual current received by an aerial, for others an indirect determination will suffice, whilst in many cases all that is required is a comparison of strength of received signals under certain conditions.

784. The measurement of small high-frequency currents can be made by various forms of thermal indicators, such as the thermo-junction and galvanometer, or the Duddell thermo-galvanometer.

The thermo-junction consists of a short length of high-resistance wire, the ends being soldered to suitable connectors. To the centre is soldered a thermo-electric couple consisting of short lengths of, say, bismuth and constantan in the form of fine wires. The other ends of these wires are soldered to stout connectors. The fine resistance is connected in series with the

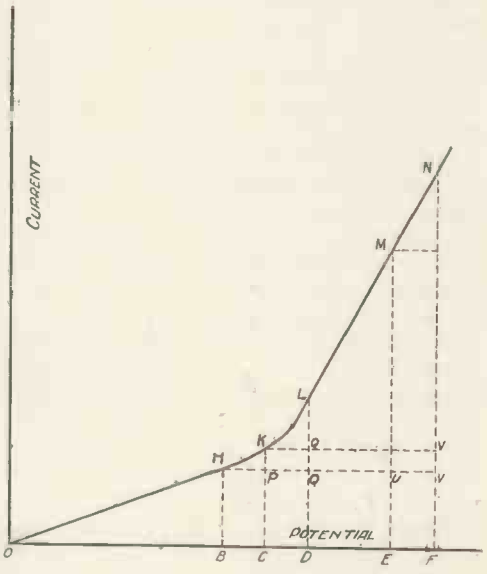


Fig. 1.

aerial, or more usually in a circuit coupled to it, and the free ends of the thermo-junction are joined to a low-resistance galvanometer, either of portable or mirror type. By placing the thermo-junction in an evacuated vessel, it can be made more sensitive.

785. The Duddell thermo-galvanometer consists of a fine wire resistance called a heater, and a thermo-junction. The latter is connected to a single loop of wire, which is suspended in the field of a permanent magnet, and has a mirror attached for registering the deflection, the combination forming a galvanometer. These instruments are suitable for measuring received signal currents of moderate strength, and have the advantage that they can be calibrated with direct current.

The Duddell thermo-galvanometer, in particular, is very useful, as its sensitivity can be varied by using heaters of various resistances, and also by varying the distance between the heater and thermo-junction by means of a screw provided for the purpose.

One disadvantage is that, when in the aerial circuit these instruments register the total current received at the time, including that due to signals, atmospherics, and static discharge. Moreover, as the galvanometer takes some time to reach its maximum deflection, it often requires signals of some duration to be sent specially for the test. In using these instruments, the higher the resistance the smaller the current which can be measured, but it is not possible to insert very high resistances in an aerial circuit without modifying its behaviour.

786. The method which has been adopted for measuring the strength of signals by several observers is as follows :

The aerial is inductively coupled to a detector circuit, and also to a closed wave-meter circuit, all tuned to the same wave-length. The wave-meter is excited by a buzzer, or other means, so that it induces a current in the aerial. A thermo-junction or thermo-galvanometer is included in the wave-meter circuit (or a circuit coupled with it), so that the strength of signals given by it may be watched and kept constant.

The signals in the detector circuit given by this local circuit may now be compared with those which are being investigated by some means such as those mentioned below.

By using sufficiently strong oscillations in the wave-meter circuit, the actual current induced in the aerial can be measured by a thermo-galvanometer, and hence the relationship between aerial current and signal strength in the detector circuit may be deduced.

787. For comparison of strength of signals the following methods are employed.

A telephone in series with the detector has a resistance box connected in parallel with it, and the amount of resistance required to shunt the telephone to bring the signals to a certain standard of strength is noted.

This method is convenient, since it only requires a resistance box in addition to the aerial and detector circuits, and may be used at a portable station, where the use of galvanometers, etc., is difficult.

The strength of the signals is deduced from the value of the shunt. Both the resistance and inductance of the telephone should be measured, and its impedance for the frequency of the signals calculated for obtaining the true shunt value. Even then the method is not very trustworthy, since it is difficult for an observer to always judge correctly when the signals are reduced to the standard strength.

788. In many cases it is possible to connect a sensitive ordinary direct current galvanometer in series with the detector and measure the rectified current. The more sensitive a galvanometer is, the longer is its periodic time, and hence it becomes difficult to use, since the conditions may alter whilst it is taking up its full deflection. There are, however, now some galvanometers which are very sensitive and have a quick period.

For this method a preliminary calibration of the detector, giving the galvanometer deflection for wave-meter currents of known strength, is required. Unfortunately, for most detectors the deflection is proportional to the square of the oscillatory current, and hence is very small for weak signals.

A paper on "Methods of Measurement of the Strength of Wireless Signals," by Prof. E. W. Marchant, will be found in the *Electrician* for May 28th, 1915, and should be read in conjunction with his paper in the March number of THE WIRELESS WORLD.

789. For comparison of strength of signals a very convenient and, at the same time accurate, method is as follows.

The aerial is coupled to a detector circuit using a Fleming valve or carborundum crystal. By means of the potentiometer, adjust the potential till the detector is at its maximum sensitivity, adjusting the coupling between the circuits, if necessary, to avoid very strong signals. Note the position of the slider of the potentiometer, or connect a voltmeter to measure the voltage applied by the potentiometer. A pivot galvanometer, with resistance in series, will make a suitable voltmeter for this purpose. Now, move the potentiometer slide back towards zero of potential, until the signals are just not heard, which can be done with great exactness, and measure the *change* in applied potential.

This potential may be taken as a measure of the voltage applied by the signals to the crystal or valve, and the signals can be compared by means of these potentials. In using a Fleming valve the current through the filament must be kept constant, and for a crystal the adjustment must not vary during the test, hence only carborundum is suitable.

It will be noticed that the method does not depend on any judging by ear of a standard strength of signal, and is free from error due to this cause.

Among the Wireless Societies

Notes on Meetings and Future Arrangements.

Institute of Radio Engineers.—At the regular meeting of the Institute of Radio Engineers held at Columbia University on the evening of May 5th, Mr. Benjamin Liebowitz presented a paper on "The Pupin Theory of Asymmetrical Rotors in Unidirectional Fields." The paper dealt first with a simple circuit having no resistance, and with a periodically varied inductance, showing in a simple manner that an infinite number of harmonics are generated therein. Leading on to the Pupin theory of two circuits, one of which is radiated in the field of the other and upon which a constant voltage is impressed, it is shown that the general theory may be simplified to the extent that it becomes analogous to the first case. The explanation of Pupin's theory to the case including condensers was then taken up, and a general application to the theory of the Goldschmidt radio frequency alternator was made.

* * *

Radio Society of Western Pennsylvania.—More than 150 amateur wireless operators and experimenters are members of the newly organised Radio Society of Western Pennsylvania, which holds monthly meetings at the University of Pittsburgh, Pittsburgh, Pa. Dr Powers, of the School of electrical engineering, will give a series of lectures on recent advances in the technique of wireless operation. The university is also arranging to have its own model wireless station co-operate with amateurs in high schools of western Pennsylvania.

INTERNATIONAL ENGINEERING CONGRESS, 1915.

It is announced from San Francisco, Cal., U.S.A., that an International Engineering Congress, under the auspices of the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the Society of Naval Architects and Marine Engineers, and the American Institute of Electrical Engineers, is to be held in that city during September. Numerous places of interest will be visited.

SHARE MARKET REPORT.

There has been a steady investment demand in the share market, more especially for the shares of the parent company, it being rumoured that the company is very busy with work in connection with the war. Prices: Ordinary, $1\frac{5}{16}$; Preference, $1\frac{3}{4}$; Marine, $1\frac{1}{4}$; American, 10s. 3d.; Canadian, 5s.

The LIBRARY TABLE

"EVERY BOY'S BOOK OF ELECTRICITY."
London : Percival Marshall & Co. 1d.

This little book, issued at the modest price of one penny, sets out to give a very simple introduction to electrical apparatus and the uses of electricity. Having carefully perused its pages (there are sixty-three of them), we have come to the conclusion that the task has been achieved remarkably well. In the first pages we find some electrical terms explained in simple language, and a brief consideration of "What is Electricity ?" Various types of primary cell are next considered, followed by descriptions of simple accumulators. Dynamos, motors, electric lighting, and X-rays all find their place in the descriptions, and telegraphs and telephones are duly noticed, The final chapter deals with "How to Become an Electrical Engineer." Wireless telegraphy has six pages allotted to it, and is quite lucidly treated. It is, perhaps, rather a pity that, whilst the coherer receiver is illustrated and described and reference is made to the crystal detector, the extensively used magnetic detector is entirely overlooked. As the majority of ship installations have this latter type of detector, we trust that in future editions some mention will be made of it. One other little point is also worthy of mention. It is stated that "the operator listens at a telephone, and adjusts his apparatus to suit the note he wants to hear." We think it is not made sufficiently clear that there is an important difference between the audible *note* of the spark and the inaudible wave frequency to which the apparatus is tuned.

These, however, are minor points, and only serve to emphasise the value of the rest of the book. As a "start off" in the study of electricity this little treatise should be of great value to many boys, and may lead quite a number to become serious students.

* * *

"MICROMETERS, SLIDE GAUGES, AND CALIPERS : THEIR CONSTRUCTION AND USE."
By Alfred W. Marshall, M.I.Mech.E., and George Gentry. London : Percival Marshall & Co. 6d. net.

We know that among our readers there are a large number with a mechanical turn of mind who in normal times spend many pleasant hours in constructing wireless apparatus, and, judging from descriptions and photographs which from time to time reach this office, some of our subscribers have reached a high level of mechanical skill. On the other hand, it is evident that a good proportion would benefit vastly from a little study of engineering principles and design. We often find an otherwise ingeniously constructed piece of apparatus marred by a fault in design which would have been avoided had the constructor spent a little more time in studying engineering.

Careful design and construction entails careful measurement, and this can only be undertaken with proper instruments. In the book under review we have an excellent little manual devoted to micrometers, slide gauges and calipers, written in such a way that much can be grasped in little time and without superfluous reading—and dealing not only with the principles of the instruments in question, but with their construction and use. Practically all the matter is, of course, known to the trained engineer; but there must be a very large number of our readers who will welcome such a book.

As an instance of the value of this little volume to the experimenter who possesses a workshop and a few tools, but who has not had any real engineering training, we would draw attention to the particulars given in Chapter I. regarding calipers. Here the authors show that the engraving of the scale of registering calipers is not the simple thing it appears to be on the surface, but involves the use of very accurate geometrical dividing devices. Again, it is pointed out that manufacturers of calipers often finish off the points rounded, with the idea of allowing for the extreme wear to which they are subjected. In the case of registering calipers, however, an element of inaccuracy creeps in, in proportion to the size of the point, which renders it absolutely necessary to have as sharp measuring points as are consistent with strength. How this error arises is very clearly explained. A clear understanding of such matters constitutes an essential feature of a young engineer's training.

In Chapter III., on " Vernier Scales and How to Read Them," there is much of value and interest to the young mechanic, and in Chapter V. a good deal regarding the details of micrometer construction which might with advantage be perused by more experienced workers. The final chapter deals with " Hints on Reading and Using Micrometers."

Altogether the book is an excellent one, and its price (6d.) is low enough to bring it within the reach of everybody.

* * *

" OUR GOOD SLAVE ELECTRICITY." By Charles R. Gibson, F.R.S.E. London : Seeley, Service & Co. 3s. 6d.

In a series of volumes which Mr. Gibson is bringing out, expressly meant for the reading of the young, he tells in a most interesting way the wonderful stories of many sciences. It is not everyone, however gifted, who has the knack of bringing his knowledge to the level of a child's mind, and there are few of us who at one time or another have not been at our wits' end to know how to satisfy the curiosity of children in the realms of the natural sciences. To the young the wonders of natural history and geology and electricity, when properly explained, are like so many interesting fairy tales; and it is in the form of a story that Mr. Gibson deals with his subject, and he deals with it in such a way that, while maintaining scientific accuracy throughout, there is no lack of interest in all he tells.

In the first chapter of the book under review the author summarises in brief the various wonderful things that our " good slave " does, and, by reminding the reader of the means of communication upon which we had to rely prior to the application of electricity, he brings home very vividly to our minds the wonderful benefits which our " slave " now helps us to enjoy.

The discovery of electricity is dealt with in the next chapter, and the author shows that although Dr. Gilbert three hundred years ago named the unknown agency from the Greek word elektron (amber), it was not until the reign of Queen Victoria that electricity became a true slave. He then goes on to describe the taming of the " slave," and points out how, in the first days of applied electricity, people were inclined to look upon it rather as an enemy than as a friend. Other chapters deal with the present-day applications of electricity, such as the telegraph, both wire and wireless; the lighting of houses and streets; electric traction, hospital work, and many other important uses to which it is put.

We hope in future editions the error will be corrected on page 67 which shows the letter *q* as two dashes alone, instead of two dashes, a dot, and a dash. We notice that in the chapter on wireless telegraphy there is no mention whatever of Mr. Marconi's name. Seeing that we find reference to both Clerk Maxwell and Hertz, this will probably occasion some surprise, particularly when we consider that practically every child has heard the name *Marconi*, and would naturally look for it in such a book as this. Surely the part played by Mr. Marconi in the discovery and development of " wireless " merits a passing mention!

Another little point is that Mr. Gibson in his explanation of the reception of messages deals solely with the coherer. As the coherer is as extinct as the dodo, and as we can safely say not one ship in a thousand fitted with wireless ever carries a coherer on board, it would have been much better to have given a simple explanation of aural reception by means of a telephone headpiece.

The book is admirably illustrated with both photographs and sketches, and we notice with pleasure the plates showing children performing simple experiments.

Although this delightfully lucid book is primarily designed for "the rising generation," we can safely say that most of the "grown-ups" will peruse it to the end before it finally reaches the nursery.

* * *

"BROWN'S SIGNAL REMINDER" (All Methods). By D. H. Bernard. Glasgow: James Brown & Son. 9d. net.

This handy publication consists of four cards of convenient size bound together with linen at the top edge, and printed in colours with the International code flag signals, distant signals, semaphore, Morse code, and other signals used at sea. In these times, when hostile vessels may be sighted at any moment, it is important that all concerned with navigation should be thoroughly acquainted with signalling in all its forms, for upon rapid signalling the safety of a ship may depend. Until all ships are fitted with wireless there must occasionally come times when flag and semaphore signalling have to be resorted to, and by lack of sufficient knowledge the person signalling may cause many errors and much exasperation. This "Reminder," which can be slipped into the pocket, will come as a great help to many. Wireless operators will no doubt make use of it for ready reference to those forms of signalling which are outside their sphere.

* * *

"QUESTIONS AND SOLUTIONS IN TELEGRAPHY AND TELEPHONY." By H. P. Few. London: S. Rentall & Co. 2s. 6d. net. (Postage 3d.)

This book, which has already run into four editions, aims at providing students preparing for the City and Guilds Examination in the ordinary grades of telegraphy and telephony with a reprint of the questions that have been set since 1904, together with their solutions. In the new edition the section containing solutions to questions set at the Departmental written examinations, for Overseers and Assistant Superintendents, has been extended, and a special feature is the inclusion for the first time of questions set in the *oral* examinations by the departmental examiner. Whilst, as above mentioned, the book is primarily designed for students preparing for the City and Guilds Examination, any student of telegraphy and telephony would do well to work through the questions and compare his answers with those given. The solutions are well illustrated by line drawings and diagrams, and an index enables any special subject to be traced with ease.

THESE ALSO.

"They also serve who stand and wait."

NOT only those who on the battle's plain
Brave the swift death, nor they that moanless face
The weary hours in corridors of pain;
Not only these shall win themselves a place
On honour's roll, but also those whose days
Are spent in toil amid o'ershadowed ways.

Such as must bear the furnace' flaming breath,
Who with firm hand, true eye, and wondrous skill
Fashion to form the messengers of death,
Such as apart, steadfast, and unnoted, still
Their vigil by the lonely hearth-fires keep,
Women who hope, and pray, but must not weep.

And these the guardians of the midnight sky,
And such as keep the pathways of the sea,
Hearts big with courage, resolute and high,
Fearless to face whatever terrors be,
Eager to answer to their country's call,
And on her altars gladly off'ring all.

When all the glorious, bitter tale is told,
When we shall count our heroes, name by name,
Such as have come through suff'rings manifold
Such as endured, and strove, and overcame,
Among the great, the noble of our race,
Shall not these also find a fitting place?

T. IDDON.

Foreign Notes

Australia.

The proposal recently brought before the Chamber of Commerce Conference in Australia has brought into the Australian Press a considerable amount of "copy" dealing with the question of the equipment of coastal steamers with wireless telegraphy. The Sydney Press rightly emphasises, with regard to coastal services, both passenger and cargo, the importance of wireless fitting.

"The necessity and value of wireless "telegraphy to owners of this particular "class of vessel is almost as great as its "value to owners of oversea vessels. In the "case of most oversea ships it will in the "near future be compulsory; but in recent "years, and without compulsion, wireless "telegraph equipments have been almost "universally adopted for both passenger "and cargo ships. There is hardly a ship "of any size coming into Sydney from "oversea ports now without an equipment."

The extract given above is taken from one of the great daily newspapers of Sydney. The Australian Press generally emphasises as the main points in favour of the universal adoption of radio-telegraphy:

(*a*) The additional safety of navigation.

(*b*) The opportunity afforded shipowners of communicating amended instructions at any time.

(*c*) The convenience of knowing exactly the expected time of arrival in port.

They point out that all three considerations involve a saving of expenses, which applies equally to coastal and oversea traders. They take considerations (*a*) and (*b*) as self-obvious, with special emphasis upon the fact that if the exact hour of arrival is known the shipowner is released from paying a staff uselessly to await arrival, consignees are able to save both money and time with regard to cartage and other means of conveyance.

We are glad to observe that the system advocated by the Marconi Companies of "the provision and maintenance of wireless "communication by those who are expert in "this work" is recommended, in preference to its undertaking by the shipowners themselves. Experience extending over a number of years has now demonstrated this to be the most satisfactory method from all points of view.

* * *

Canada.

In the course of a recent debate on the Marine and Fisheries Department Estimates in the Canadian House of Commons, the navigability of the Hudson Bay route was one of the subjects of discussion. The Hon. J. D. Hazen, Minister of Marine in the Dominion Cabinet, announced that during the coming season the first wireless station will be placed on the Hudson Strait. This station will be able to work with those at Port Nelson and Le Bas. In answer to a question put to him, Mr. Hazen replied that more than one station would be required on the Strait in order to keep in touch with ice conditions. Twelve beacons had already been erected in the Strait. With an improvement of facilities the trade of a large area, *via* this route, would be certain to considerably increase.

* * *

United States.

We learn from New York that the judges sitting in the Circuit Court of Appeals have given their decision affirming the order of Judge Hough to grant a preliminary injunction restraining the de Forest Radio Telephone and Telegraph Company, the Standard Oil Company of New York, and Dr. Lee de Forest from infringing the fundamental Marconi and Lodge patents relating to wireless telegraphy. The defendants had maintained it was unfair that they should be restrained from the using the de Forest system, pending the decision of the patent action brought by the Marconi Wireless Telegraph Company of America against the Atlantic Communication Company. They urged this on the ground that the Marconi Company had recently raised the price charged to steamship companies for the use of its system to $100 a month for each vessel. Judge Hough, in granting the injunction, stated that owing to the expenses of operation and litigation to which the

Marconi Company had been put in the past, no fair return had so far been made on its invention. He also upheld the contention of the Marconi Company that it was only fair, in reckoning the rental they charged to steamship companies for the use of their apparatus, the cost of the establishment and maintenance of shore stations should be taken into account.

The Circuit Court of Appeals in affirming the ruling of Judge Hough also denied the motions to make void or modify the injunction.

* * *

During the trial, in Brooklyn, of the suit brought by the Marconi Wireless Telegraph Company of America against the Atlantic Communication Company, referred to on p. 198 of our June issue, Mr. Marconi, who was so important a witness in the case, was suddenly called to Italy in connection with the war.

For this reason the judge announced that the trial would be adjourned for two months, and that if Mr. Marconi was still unable to attend at that time a further adjournment would be ordered by the court. At the time of the adjournment the action had been in progress three weeks.

* * *

Australia.

A South Australian correspondent sends us a copy of an amusing letter which was received by an officer of one of the State post and telegraph organisations at the time when the erection of the first Australian Commonwealth wireless stations was under consideration. It may be mentioned that the official in question was not even remotely connected with the wireless proposals. The letter reads as follows :

" SIR,—Understanding the system of Mar-
" coni telegraph, with the exception of the
" sending and receiving instruments, I beg
" to apply for same. I would require a
" little tutoring with a scientific Marconi
" telegraphist. Hoping this may meet with
" a favourable consideration, and the
" Government will find a good use for the
" telegraph.

" I remain,

" Your obedient servant,

" ——."

German Wireless Outrivalled

OUR contemporary, the *Sporting Times*, recently contained an amusing skit on German "Wireless," from which we give below some extracts :

" An official telegram from the German
" headquarters, dated May 19th, says :

" ' North of Ypres, on the west side of the
" ' canal, and at several other places in this
" ' sector, we brilliantly evacuated our
" ' advanced positions after a severe struggle,
" ' and withdrew from them the forces that
" ' had become panic-stricken. Up until
" ' now, in this sector, there has not been
" ' the least indication of our fresh advance.

" ' Yesterday one of our Zeppelins dropped
" ' bombs on the fortified citadel Pigton-
" ' cum-Slush, and completely demolished
" ' the Orphanage and Sanatorium, which
" ' probably contained a great quantity of
" ' ammunition. The armoured pleasure
" ' boat *Skylark* had twenty or thirty bombs
" ' dropped somewhere near it.

" ' In the North Sea a squadron of cruisers
" ' under the command of Admiral von
" ' Ingenohl, ventured a quarter of a mile
" ' beyond our mine field, but on sighting
" ' an armoured British trawler they soon
" ' showed their superior speed, and returned
" ' safely without casualties.'

" The following official telegram from
" Turkish headquarters, dated May 20th,
" states :

" ' Yesterday, in the Dardanelles, we sank
" ' the British super-Dreadnoughts *Lion*,
" ' *Tiger*, *Hippotamus*, *Skunk*, *Botfly*, and
" ' *Paregoric*, together with a large number
" ' of destroyers, submarines, and aircraft.

" ' On the Asiatic side and in the Sea of Mar-
" ' mora there is nothing further to invent.'

" An official telegram from Austrian
" headquarters, dated May 20th, says :

" ' On the Dukla-Dwina sector we made
" ' our usual week-end retreat, and during
" ' the operation we captured a great
" ' number of exploding shells. In the
" ' Bukovina our Third Army Corps made
" ' a brilliant sortie into an enfiladed posi-
" ' tion, and have not yet returned.' "

A Night of Peril

By RALPH BAILEY.

VICTOR OSBORNE lay in a nursing home, recovering from the effects of wounds he had received three months previously. He had been before a Medical Board at the Admiralty, and much to his disappointment had failed to impress upon the faculty that he was once more fit for service.

He decided to see a specialist, with the result that he had made rapid progress, and looked forward with great excitement to presenting himself for survey once more. His exit from the firing line had been swift and sure, but during that short period he had sufficiently distinguished himself to obtain his promotion.

By his bedside sat his fiancée, Phyllis Roper, a young girl not yet twenty, whose love had, if possible, grown stronger since he had once more been given back to her. They had agreed not to consider matrimony until the war was over, but fate had proved too strong, and they were only waiting till he should shake the dust of the nursing home from his feet before the ceremony should take place.

" Victor, I feel I cannot let you go from me again," she said, and then, lowering her voice to a whisper, " those horrible hours of anxiety till you came back——"

" Poor old girl, cheer up ; I'm afraid your wish will come true—they are not likely to let a crock like me have another go at them."

" You have done your share," she eagerly replied. " Now I am going to have you, they shall not take you away again——"

At this moment their conversation was disturbed by a knock at the door, and the nurse entered.

" A telegram for you, Sir."

" A telegram," he said, wondering. " Must be old Aunt Clara coming up to town, she mentioned in her letter that she might be coming up. Open it, Phyl, let us hear the worst."

Phyllis broke it open, and as she read on, anxiously clutching the small piece of paper, she uttered a loud exclamation of joy.

" Well—don't keep it all to yourself," cried Victor, " out with it."

" Read it," she said cheerily, scarcely knowing how to suppress her feelings.

Victor grasped the wire, and slowly read aloud the contents :

" You have been appointed in Command of the Wireless Station at Crome. Proceed forthwith. Admiralty."

" Well, haven't you got anything to say ? " burst in Phyllis excitedly.

" Yes," replied Victor. " Damn ! "

. . . .

A few days later he arrived at Crome to take up his appointment. The wireless station had only just been installed, and was one of the most powerful in existence, lying on the rugged coast of Scotland, miles from everywhere. What concerned him most for the moment was a suitable dwelling place close to the station, for he had been through the marriage ceremony the day before leaving town, and this matter was therefore of no small importance as far as he was concerned. He happened to be extremely fortunate, for within a quarter of a mile of the wireless station lay one solitary bungalow, furnished, but deserted by the owners, who had had it specially built, and then been utterly dissatisfied when it was completed.

Having made the preliminary preparations in connection with his future domain, he set to work to organise the defence of the station. Fifty men of the National Reserve formed the guard under Lieutenant Croft, a man somewhat ancient for his seniority, but who had volunteered on the outbreak of hostilities in order to free younger men for more active service. Victor found in him a most congenial and welcome companion ; a perfectly invaluable asset to the comfort of no man's land.

The entanglements and general defence

Strolling after dinner.

having been prepared, the guards were posted, consisting of one sentry in each blockhouse surrounding the compound, one on the engine house, and one on the bungalow which was on the boundary of the enclosure.

Victor, having satisfied himself that all the arrangements were in order, sent for the Senior Engineer, a man of great energy, who took little interest in anything outside his own work. He had started as an operator, but owing to his abilities and zeal his merits had received exceptional consideration, and he had been appointed to the wireless station as Engineer-in-Charge.

"Ryan, I want you to connect up a line to my bungalow as soon as possible, in order that I can hear all the messages that go out —also an alarm bell in the camp, which I would like connected to the sentry box outside the engine house."

"I will have them fixed up at once, sir," replied the other, and the rapidity with which the work was carried out only proved to Victor that they had undoubtedly got the right man in the right place.

Two days later Phyllis arrived. She was blissfully happy—how could she feel otherwise? She had been released from the great strain of anxiety and worry, and everything had come right—and here, in the wilds of the Scottish coast, she was alone, or practically so, with the man she loved. What else mattered?

The routine was somewhat monotonous, but Victor grew to like it, satisfying himself that he was at present physically unfit to go to war, and he was therefore serving his country in the best possible way. At midnight a programme was sent out giving the general news to all ships afloat.

At 3 a.m. the important programme commenced. At this hour all messages from the Admiralty were sent out to the Fleets in code, giving them instructions of vital importance. Victor Osborne listened each night to the messages as they were despatched, following them word for word, in order that there should be no deviation after he had once signed them as correct.

One beautiful evening Phyllis and Victor strolled down to the cliffs after dinner. The night was beautifully clear, with a gentle breeze from the sea, scarcely perceptible, but sufficient to cool the air, which had made it almost impossible to remain indoors. To the westward clouds had gathered along the horizon, but at intervals the moon would reveal some craft steaming on its mysterious journey, for men-of-war and merchantmen alike were subject to the same uncertain treatment at the hands of the enemy.

Presently Phyllis spoke.

"It seems impossible to realise all the horrors," she said; then, after pausing a moment, continued: "One sees a ship to-night peacefully gliding its way down the coast, and then to-morrow we may read of its destruction, with all the details of brutal and sordid treatment which accompany it."

"Don't think of it, Phyllis; we should be thankful we can be so happy—they could not have appointed me to a safer and more peaceful spot. Let us be happy while we can."

They turned from the sea, and silently walked back to the bungalow. Victor knew the horrors and Phyllis imagined them. And so, as they turned their footsteps in the direction of home, they each were thinking of the suffering and sorrow which was rapidly increasing throughout the country.

"Come back to earth," he said suddenly, as he realised that they had both become rather engrossed in their thoughts—and then, with a merry little laugh, they stepped on to the verandah.

Phyllis retired to bed, while Victor proceeded to his office, which he had fitted up to his own satisfaction in order that he could listen to all outgoing messages. He realised himself that it was not much of a job, but he intended to carry it out conscientiously, since he had been given it. Croft usually dropped in for a whisky and soda about eleven o'clock, and on this particular evening saw no reason for departing from his usual custom.

"Hello, Croft! Is that you? Come in," called out Victor.

"I was wondering whether you had got back," shouted the other from the verandah. "I saw you go out. Lovely evening, wasn't it? Didn't see any submarines, I suppose?"

"No," said Victor, laughing. "The moon is a bit too sprightly to-night."

"*Was*, you mean," put in Croft. "Those clouds to the westward seem to be coming over, and it is as black as pitch outside now."

"Oh, well, I don't expect they will trouble us here. Help yourself," he said, passing him the decanter. "The programme will be starting soon—I always follow it right through, just in case——"

"Yes, you cannot be too careful. Well, good night, Commander," and stepping out into the verandah, he walked back to the camp across the compound, having satisfied himself that the sentries were at their posts and everything was correct.

At five minutes to twelve Victor put on the ear pads, and at midnight the programme commenced. He had grown so accustomed to following it, that he took it in quite mechanically, leaning back in his armchair with his pipe as his sole companion, and all the lights throughout the station extinguished.

It must have been about a quarter past one, when the signalling suddenly ceased—an incident to which he paid little attention, for minor breakdowns were frequently causing slight delays. He readjusted the ear pads, and then, refilling his pipe, settled himself in his chair, and listened for the programme to continue.

It must have been ten minutes after the interruption that he rose from his chair, and walked over to the window leading out on to the verandah. The blind was down, but as no lights were showing from within, he drew it back and quietly opened the door. He then removed the ear pads and stepped out. As he did so the noise of the spark reached his ears across the compound, some three to four hundred yards distant, but plainly audible on such a still night, with a light breeze blowing towards the bungalow. Instinctively he put the ear pads on, but he could hear nothing through them; removing them once more, he listened intently to the spark.

Reading the good news.

"Strange, very strange," he muttered; then suddenly he gripped the rail of the verandah, for the spark was not sending out the usual programme. "What was that?" he reflected. "178—234—numbers—the Secret Code."

Instinctively he jumped to the conclusion that something singular was happening. He paused for a moment to think, then, slipping back into the office, snatched up his revolver, and passed out on to the verandah again. In a low voice he addressed the sentry. There was no reply. He stepped down from the bungalow, and as he did so he stumbled against something on the ground. Instantly he was down on his hands and knees, groping about to find out the nature of the object which was obstructing his way.

Suddenly he stood up and gripped his revolver, but not a sound reached his ears beyond the dull angry throb of the spark. His hand was wet, covered in blood, and at his feet lay the sentry, motionless, stabbed through the back.

Meanwhile, the signalling was going on. The ground was soft, and consequently he was able to make his way over to the "Engine House" noiselessly. When he was within fifty yards he went down on his hands and knees again, and in a few minutes reached the sentry box. The sentry was nowhere to be seen, and he calculated that he must have met with the same fate as the other.

Quickly he reached for the Alarm Bell, then waited, "Curious," he thought, "I should be able to hear it quite clearly from here." He pressed it again, and then the truth dawned on him: *the wires had been cut*.

He glanced towards the bungalow, and instantly the situation became apparent to him. The wires to the bungalow from the engine-house had been cut as well.

For the moment the thought occurred to him to rush over to the camp, and then he realised the delay. Crawling close up to the engine-house he climbed on to a box from which he could manage to see inside, provided the blind was not drawn fully down. There was only an inch uncovered, but it was quite sufficient.

He was quite dumfounded at the sight which met his eyes. At the signalling

"A German Officer, with the secret code in hand, was standing close by."

key—operating with apparent composure—sat Ryan, and on either side of him a German bluejacket with fixed bayonet. A German officer, with the Secret Code book in his hand, was standing close by; at the door two men guarded the entrance. What should he do? He must act at once. There was only one way—he must stop the signalling, which was obviously decoying the battle-fleet into a neighbourhood infested with submarines.

He took a piece of paper from his pocket, and scribbled something on it, clutched it in his left hand, then he cocked his revolver. His aim must be true; one shot suffice. He worked himself into a position from which he would be able to get a steady aim, then fired. Quickly he peered through the small space between the blind and the window sill, a smile of uncertainty playing on his lips. Ryan lay dead at the foot of the signalling key. For a moment his guard seemed taken aback, but the sound of the shot brought four more bluejackets into view. Two more shots rang out, and one of them dropped.

A slight movement behind caused Victor to turn; he was only just in time, for as he dropped from his position a shot pierced his left shoulder. As he fell to the ground he saw a figure silhouetted against the sky. There were three rounds left in his revolver; he couldn't afford to miss, so he waited. Presently the figure began to move towards him, but within ten yards of Victor he fell, a huddled mass, shot through the body.

Victor, thinking he was dead, began to crawl away to a safer refuge, an action which might have proved fatal, but fortunately the darkness saved him. His last victim had fallen, mortally wounded, but had rallied sufficiently to fire one more shot. An inch lower, and nothing could have saved Victor's life, but as it was the shot struck the top of his head, fracturing the skull.

The sound of hurried footsteps reached his ears. He could dimly see the forms of some twenty to thirty men outlined against the sky, but his strength was fast leaving him. It must be the guard, he thought; they had heard the firing. He tried to shout, but he was too weak; he had lost much blood and was growing faint and dizzy. He recollected someone bending over him, and with a superhuman effort muttered, "Croft. My left hand." Then he became unconscious.

* * *

It was not till five days later that Victor showed signs of returning to life. The doctor was standing by his bedside and a nurse, who had been summoned from the nearest town. He had just recovered consciousness, and the news had been conveyed to his wife.

"Croft," he muttered. "I must see Croft at once."

Fortunately Phyllis was not in the room as he uttered his first words, for it would have been heart-breaking to have heard any other name except her own after such a trial.

"I must see Croft," he went on, "please send for him at once. And now," he almost sobbed out, "where is Phyllis? Let her come to me; let me see her, if only for a minute."

And so Phyllis came. She could have cried with joy and sorrow, but, straining every nerve to remain calm, she went quietly to the bedside and held his hand, while they just remained silent, with all the most perfect love passing from one to the other without a single word.

"Now I must go," she said quietly, "and you must promise me to obey the doctor, and you will soon be quite all right again."

He promised, and when she had gone he sank back into a natural, peaceful, and perfect sleep, forgetting all that had passed and the excitement of seeing Croft.

Some hours later he awoke, and found Phyllis sitting by his bedside.

"Will you be very good," she said, "if I grant you a little favour?"

"Yes," he said, "very," and tried to smile.

"Well, then, you shall see Mr. Croft."

He had almost forgotten Croft for the moment, but the name seemed to agitate him, and he anxiously gasped out:

"Yes, quickly. I forgot Croft. Where is he?"

After extracting a further promise to remain calm, Croft was admitted. He had scarcely crossed the threshold when Victor blurted out:

"You found the paper in my hand?"

"Yes," replied Croft. "It was brought

to me, and everything came right. We found three more bluejackets in the engine-house, and they surrendered, with the officer, without further opposition, after which your instructions were carried out."

He then handed the slip of paper to Phyllis, on which were written the following words:

"Germans sending messages to British Battle Fleet. Cancel as soon as possible."

. . . . .

A week later Victor had passed all danger and was rapidly recovering, although the doctor announced that it would be a couple of months before he could leave his bed. This was of little importance to Phyllis or Victor; those hours and days were full of happiness, slowly and steadily recovering, while the anxiety was well recompensed by the joy in nursing him back to life.

A few days before he was to be allowed up Phyllis entered his room, scarcely able to conceal her excitement and joyful spirits.

"Vic, I have some good news for you," she said.

"Oh," he grunted. "Have I been granted a month's sick leave?"

"No," she replied. "Vic, I hardly know how to tell you; my heart is so full, I am so proud. Can't you guess?"

"No; give it up."

"You have been awarded the Victoria Cross."

Then she leaned over the bed and kissed him, and though he had braved the tempests and fortunes of war in the North Sea, and practically saved the situation single-handed a few weeks previously, his courage failed him and he cried like a child.

Presently she stood up and, looking into his eyes, said:

"Aren't you proud, Vic?"

To which he replied: "Nothing matters to me, you dear child, except you."

And so they stayed for hours, happy and contented, till they were disturbed by a knock at the door.

"Come in," cheerily shouted Victor, though he scarcely recognised the sound of his own voice. Then, as the door opened, Croft stepped in.

"Let me congratulate you, Commander," he said. "I am so glad."

"Thank you, Croft," he replied, "though it is you I must thank for my life, for had you not arrived at that critical moment they would probably have finished me." And then he added, as if suddenly recalling some forgotten link, "How about Ryan—what became of him?"

"Ryan is dead," said Croft quietly.

"I'm sorry," replied Victor, "very sorry; he was a good man, but I weighed everything up in my mind before I fired—and I came to the conclusion it was the only way."

"There is no need to be sorry," replied the other. "It *was* the only way."

For the moment Victor could not quite understand, and he felt that underneath Croft's words lay some hidden meaning.

"Why, what do you mean?" he said hesitatingly.

"I mean," said Croft, "that after Ryan's death the papers in his room were gone through, and he met the only fate that he deserved. *He was a spy.*"

PERSONAL PARAGRAPHS.

Readers of this magazine will be well acquainted with the name of Lieutenant-Commander Hubert Dobell, one of the Marconi Company's most experienced engineers, who prior to the commencement of the war so ably conducted the Questions and Answers column in our pages. We are sure all will hear with regret that this gallant expert is now a prisoner of war in Germany. At the time of his capture Lieutenant-Commander Dobell was engaged upon observation work, and as a result of the aeroplane in which he was flying being subjected to shrapnel and rifle fire, his companion the pilot was wounded and the machine had perforce to descend into the German lines. Lieutenant-Commander Dobell is in the captured officers' camp at Bischofswerder, unhurt and well treated.

Lt.-Commander Dobell.

Congratulations to Mr. F. J. Linnell, who has just received his commission as Flight Sub-Lieutenant in the Naval Air Service. In the time long ago when peace was still unbroken Mr. Linnell was a wireless telegraphist in the Marconi Company, having entered that service in 1909. On the outbreak of hostilities he volunteered for active service in a "wireless" capacity, and received an appointment as Warrant Telegraphist, R.N.R. Apparently the close alliance between wireless telegraphy and aviation is partially responsible for Lieutenant Linnell's appointment, and his many friends in the radio service will join with us in wishing him every success in his new sphere of activities.

Mr. F. J. Linnell.

On page 202 of our June issue we announced that Sergeant A. H. Brown, formerly a wireless operator in the Marconi Company, had obtained a commission as second lieutenant in the 10th Battalion Seaforth Highlanders. We now have much pleasure in reproducing his photograph.

Second-Lieut. A. H. Brown.

Mr. C. F. Warren.

We regret to announce the death of Mr. C. F. Warren, killed in action on May 26th last. Mr. Warren was attached to the publishing staff of this office, and joined the 24th County of London Regiment (The Queen's) at the end of August last. Although only holding a junior position, he showed marked ability, and was exceedingly popular with those with whom he came into touch. As one who entered thoroughly into the social as well as business side of the office, he will be greatly missed by his fellow-workers.

We have the pleasure of announcing the marriage of Mr. J. E. Catt and Miss Dorothy Harrison, which took place at West Kensington Park Wesleyan Chapel on June 3rd. Mr. J. E. Catt is chief petty officer in the Royal Naval Air Service, and before the war was in the land operating service of Marconi's Wireless Telegraph Co. Mrs. Catt was formerly engaged in the telegraphic service of Birmingham. Many friends in the Marconi service will be glad to hear of their colleague having taken rank amongst the benedicts.

Mr. J. E. Catt.

We regret to record the death of Mr. Richard Kerr, the genial and well-known lecturer on astronomy, microscopy and other scientific subjects. Mr. Kerr passed away on May 19th, at sixty-five years of age, after suffering greatly from a complication of disorders. For the last two years he had shown signs of breaking down in health, partly owing to anxiety and the difficulty of getting and fulfilling a sufficient number of engagements to keep him fully employed. He frequently lectured on wireless telegraphy, and spoke proudly of an early acquaintance with Senator Marconi, when the latter first visited this country. One incident in relation to wireless telegraphy and the late Mr. Kerr is perhaps worth recording here. By arrangement with the Home Office he was lecturing to the prisoners at Portland on the subject of wireless telegraphy, and the audience were much interested. On arrival home Mr. Kerr found that a member of the burgling fraternity, probably possessed with a sense of humour, had broken into his house and removed several articles of value !

The late gentleman was an artist of no mean ability, and drew the illustrations for his lantern slides and books with his own hand. He was also an author of several interesting books, such as "The Hidden Beauties of Nature," "Nature, Curious and Beautiful," and "Wireless Telegraphy Popularly Explained." Much sympathy will be felt for the late lecturer's widow and four children.

BRITISH COMMAND OF THE SEA.

A LETTER from a Birmingham surgeon of an armed liner of 18,000 tons which has been scouring the seas since September in search of enemy ships and commerce raiders, contains, *inter alia*, some gratifying compliments on the service of war news sent out nightly by wireless from Poldhu. He speaks, moreover, in the most glowing terms of the officers (mainly R.N.R.) with whom he is serving. One little extract from his long letter is worthy of special mention, because it emphasises a point in the present situation which frequently escapes notice :

"We were rather curiously placed the "other day when we actually anchored for "a few hours off a neutral port, right in "amongst a crowd of German ships, while "a consort steamed to and fro outside "keeping watch. The nearest one was a "fine liner with guns on board, stowed "away below, which she cannot mount in "neutral water, and would find it a longish "job to do at sea. She dare not come out "the neutral limit without them, and so is "practically helpless. If she did slip out "and get them mounted she had better keep "out of our way, as this ship would soon "polish her off."

Few people realise the amount of German shipping which is thus lying, helplessly eating its head off, in neutral waters.

SANG-FROID.

A WIRELESS operator attached to the Royal Flying Corps in France has written to Mr. A. King Davies, a solicitor at Maesteg, in Wales, a cleverly-worded description of his doings. Amongst other incidentals he appears to have been struck by the *composure of everybody and everything*.

"The birds sing in the thick of bursting "shells, cows quietly graze, and horses are "entirely undisturbed. One day I got a "surpassing surprise. Picture a country-"side of what was once well-farmed land, "now absolutely torn to tatters, furrowed "with huge gaping holes, the railroads "torn to shreds, with their metals twisted "like writhing snakes, whilst shrapnel is "bursting at a little distance off, and "might easily find you at any moment. "But between you and the bursting shells "you may observe a Belgian farmer, sitting "quite composedly on a horse-drawn rake, "putting the finishing touches to a lucky "spot in the fields."

Mr. Powell seems to have been so struck with the Belgian's coolness as to have vented his astonishment in a burst of laughter at what he avers appeared to him "almost to amount to cheek!"

WIRELESS IN THE COURTS.

CASTLE EDEN, in County Durham, is the latest place to record a prosecution for the possession of wireless apparatus contrary to the provisions of the Defence of the Realm Act.

William R. Walker, a school teacher, aged 26, was fined five guineas for this offence. A police sergeant visited Walker in April last, and was shown parts of a dismantled aerial which had been taken down shortly after the commencement of war.

Walker remarked to the sergeant that he had never been able to transmit anything, and that the only thing he could receive was the time signal from Paris, as he did not know the code. Henry Dunthorne, Post Office Engineer at Newcastle, said the apparatus formed the dismantled parts of a wireless receiving set, and that it would have been possible to put it together for receiving messages in about two days. It was not a transmitting set at all. In May the military authorities advised that the man should be warned, and no further proceedings taken. This was duly done. Subsequently, however, the authorities deemed it advisable that he should be prosecuted.

The Chairman of the Bench, in trying the case, said the defendant had been foolish enough not to protect himself, and seemed to have been led into his present position by the Post Office authorities, who had apparently been extraordinarily lax. There was no suggestion of defendant's wishing to communicate with the enemy. The case, however, he went on to say, must be taken as a definite warning that if anything of the kind happened again in that district, which had already been attacked from the sea, excuses of that sort would not be taken into account.

INDEX TO ADVERTISERS.

The Wireless World.

With which is incorporated "The Marconigraph."

An Illustrated Magazine for all interested in WIRELESS TELEGRAPHY, published monthly by THE WIRELESS PRESS LTD., Marconi House, Strand, London, W.C.

Registered for transmission by Magazine Post to Canada.

Telegraphic Address: "Expanse, London." Telephone No.: City 8710 (Ten Lines).

Codes used: Marconi, A.B.C. (4th edition), Western Union.

Advertisement Agents for Belgium, Holland and Colonies: Adr. Koller & Van Os, Rotterdam and Amsterdam.

Subscription Rate... ... ... 5s. per annum, post free.
Single Copies ... ... 3d. each, by post 5d.
Subscription Rate in the United States ... ... $1.25 per annum, post free.
Do. in Canada and Newfoundland ... $1 per annum, post free.
Europe ... ... fr. 6 per annum, post free.

All Editorial communications to be addressed to "The Editor, 'The Wireless World,' Marconi House, Strand, London, W.C."

All communications relating to Subscriptions, Advertisements, and other business matters, to be addressed to "The Publisher, 'The Wireless World,' Marconi House, Strand, London, W.C."

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

CONTENTS.

HARVEYS'

UNIFORM SUIT

BRIDGE COAT

17 London Street
(Facing Fenchurch Street Station)
LONDON, E.C.
TELEPHONE—AVENUE 2200.

Business hours, 8.30—7.30.
Saturdays, 1.30.

Book to Mark Lane or Fenchurch Street Stations.

TAILORS, OUTFITTERS, BOOT & TRUNK MAKERS

SPECIAL PRICES FOR SENIOR OR JUNIOR OPERATORS.

Uniform Serge Suit, complete, gold lace and buttons ...	50/-
Uniform Serge Suit, fine quality complete, gold lace and buttons	60/-
Superfine Cloth Uniform, gold lace and buttons	70/-
Superfine Cloth Mess Suit, gold lace and buttons	65/-
Bridge Coat, gold shoulder straps and buttons, complete ...	55/-
Naval Cloth Cap, Badge and Band	7/-
Senior gold lace Cuffs	7/-
,, ,, Epaulettes ...	4/-
Junior Epaulettes	3/-
Badges	3/-
Crown Badges	4/-
Buttons, large ... per doz.	2/-
,, small ... ,,	1/-
White Suits ... 8/-, 10/6,	12/6

WE HOLD THE LARGEST STOCK OF WHITE SUITS IN LONDON.

A splendid selection of Fancy Suitings, Harris and Donegal Tweeds, Rainproofs and Waterproofs always in stock.

We allow a special discount to Marconi employees on all civilian clothing of 10%

Send for our List and Patterns.
Special Orders in 24 hours.

MESS SUIT

HARVEYS'

PATROL SUIT

NOTE NEW ADDRESS: Facing Fenchurch Street Station.

ACKNOWLEDGED TO BE THE BEST HOUSE FOR THE WIRELESS OPERATOR.

WIRELESS IN THE FUTURE

will not be less attractive and will not offer less scope for ambition than Wireless in the past. You can find your opportunity if you enter the profession fully equipped with the best modern knowledge. A sound, practical correspondence course will so equip you without any excessive claim on your time and without serious interference with your present work.

THE EMPIRE CORRESPONDENCE COLLEGE

offers you such a course—a course of instruction broadly conceived and conscientiously carried out.

Dept. K., 143/9 Great Portland St., London, W.

WIRELESS

The NORTH-EASTERN SCHOOLS OF WIRELESS TELEGRAPHY.

LEEDS 22 Blenheim Ter. **NEWCASTLE-on-TYNE** 18 Eldon Square.

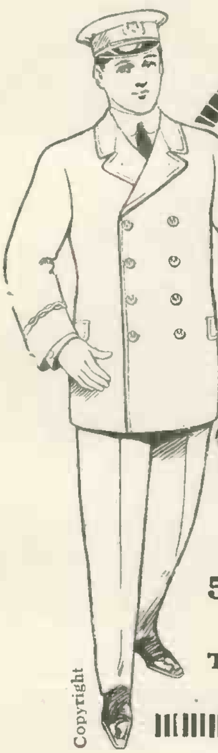
WEST HARTLEPOOL 11 Church Street.

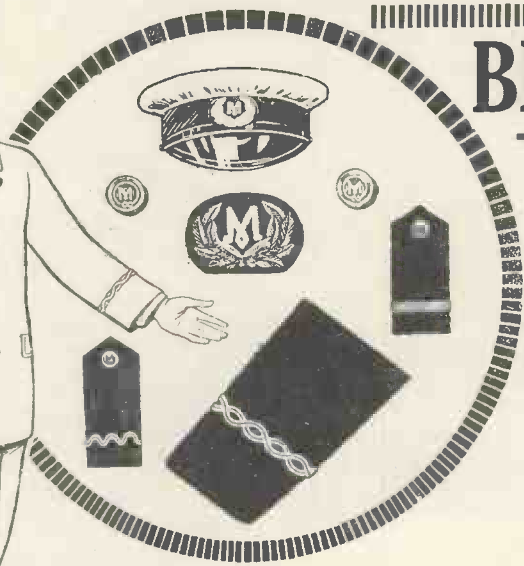
THESE are the only Schools in the British Isles fitted with complete Standard Marconi, Telefunken and Poulsen Installations.

Day and Evening Classes. Complete Course for the Postmaster-General's First Class Certificate. At two recent Examinations 100 per cent. of our Day Students obtained the Postmaster-General's FIRST-CLASS Certificate of Proficiency in various systems.

A Correspondence Course can be taken by those residing too far away from any of the above Schools. This Course is both theoretical and practical, students being taught by experts.

WRITE NOW for Illustrated Booklet. (H.S.)





BRYMAN

SPECIALIST IN MARCONI UNIFORMS

WIRELESS OPERATORS' OUTFITS COMPLETED IN 24 HOURS

Write for Patterns of Serges and Price List, Post Free.

5 STOCKWELL RD., CLAPHAM, S.W.

OPPOSITE STOCKWELL TUBE STATION.

Telephone: Brixton 780. **Hours, 9 to 9.**

Closed Wednesday at 1.

THE
HENLEY WIRING SYSTEM

¶ The Ideal surface wiring system for any type of new or existing building. Easy to install, unobtrusive, economical, and does not entail damage or alteration to decorations or fixtures. ¶ If you contemplate an Electric Lighting Installation in your Office, Factory, or Residence, you should write to us for our new booklet Z83.

W. T. HENLEY'S
TELEGRAPH WORKS CO., LTD.
Blomfield Street
LONDON, E.C.

ACCUMULATORS

FOR WIRELESS & EXPERIMENTAL WORK.
SEND FOR CATALOGUE 85.

THE Chloride ELECTRICAL STORAGE CO LIMITED

London Offices
39 Victoria St., S.W

CLIFTON JUNCTION
MANCHESTER

SPECIALISTS IN

MARCONI UNIFORMS

Every Requisite for the Service.

In Stock or to Order at Short Notice.

SAMPLES AND PRICE LIST POST FREE. • • • TERMS—CASH.

PRICES:

Suits to Measure ...	... from £2	2	0	Gold Badges	... each £0	4	6
White Suits	... „ 0	8	6	„ Shoulder Straps (senr.)	per pair 0	4	6
Gold Cuffs (senr.) ...	per pair 0	7	0	„ „ „ (junr.)	„ „ 0	3	6
„ „ (junr.) ...	„ „ 0	3	11	Caps	... from 0	2	6

SELF & SON, Outfitters, 79 Fenchurch St., London, E.C.
Telephone: 139 Central. Established 1840.
CLOSE ON SATURDAY AT 1.30.

Photographic Acknowledgments.—Battery Park, New York (Photochrom Co.). Lord Mersey and "Lusitania" Enquiry (Photo Press). Sir Henry Jackson (Elliott & Fry). Venice (Sanders, Phillips & Co.). Repairing Wireless at Sea (*Daily Mirror*). Flying Corps entering Marconi House (Alfieri). Italian Airship and "Leon Gambetta" (Giles). Operators' Memorial, New York, and American Cart Station (Marconi Co. of America). Port Said (P. W Harris).

Printed by W. H. SMITH & SON, and published by THE WIRELESS PRESS, LIMITED, Marconi House, Strand, London, W.C.
Sole Agents for Australia and New Zealand, Messrs. GORDON & GOTCH. South Africa, CENTRAL NEWS AGENCY, LTD.