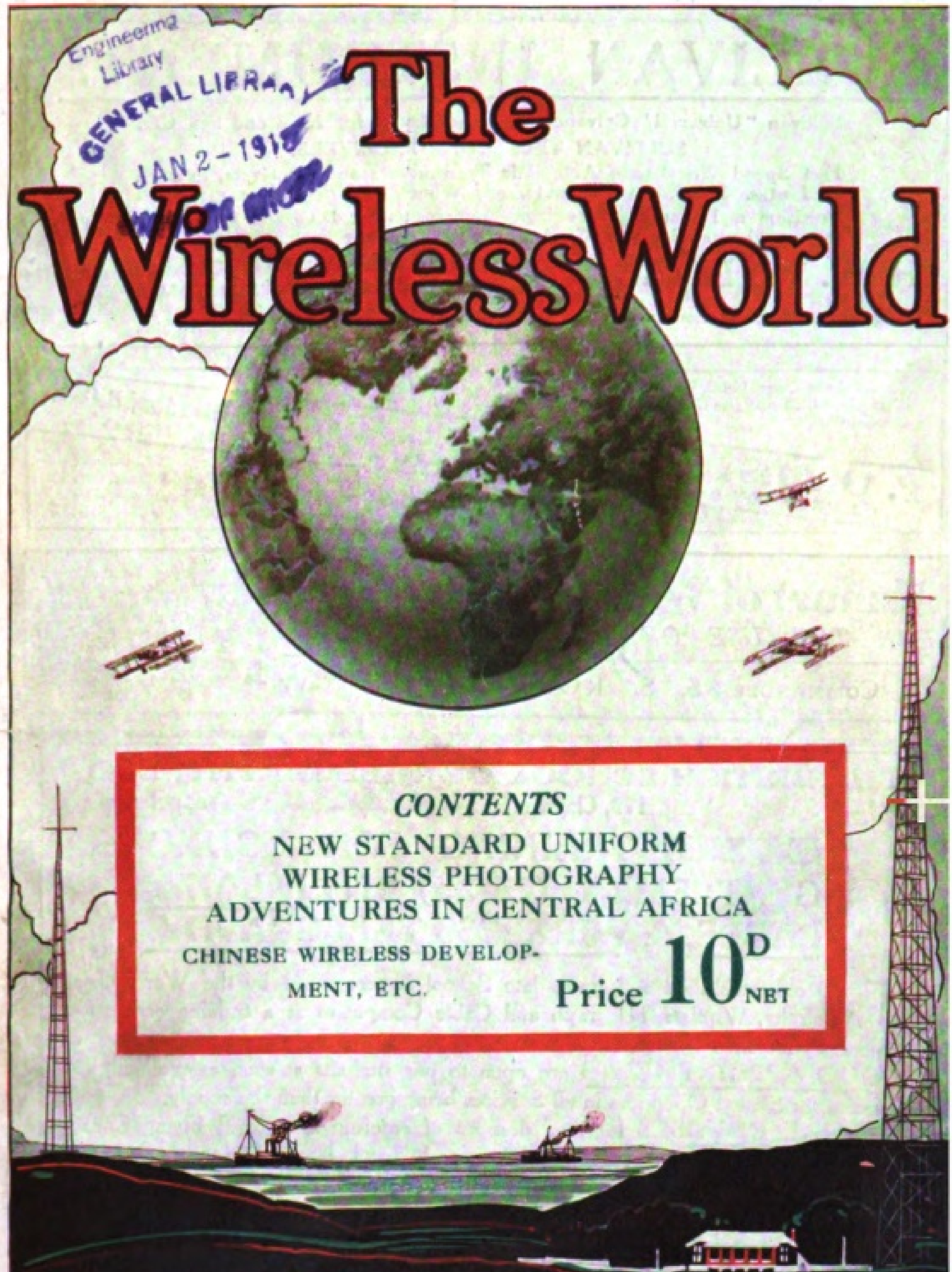
VOL. VI. No. 69. DECEMBER · 1

The Wireless World



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THE WIRELESS WORLD

With which is incorporated "The Marconigraph."

A MAGAZINE DEVOTED TO WIRELESS TELEGRAPHY AND TELEPHONY

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The
WIRELESS
WORLD

Volume VI. No. 69. DECEMBER, 1918.

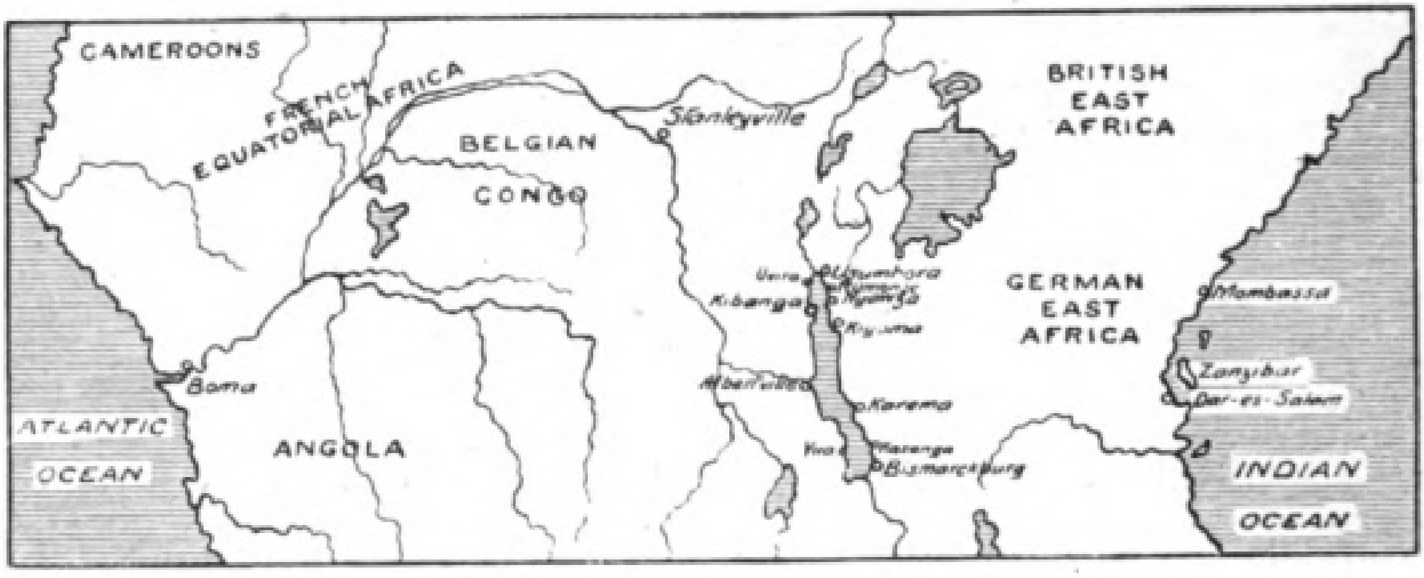
Four Wireless Men in Central Africa

Notes of Our Wanderings in a Tropical Land

By LIEUT. E. F. BOILEAU, R.N.V.R.

We left Falmouth on January 11th, 1916, and on February 2nd reached Boma, a little town which lies where the Congo flows into the Atlantic Ocean, 6° south of the Equator. Here we reported to the Governor-General of the Belgian Congo and set to work to prepare for the long inland journey up that mighty river.

It took us forty-two days to reach Stanleyville, so named after Stanley, the famous explorer, whose black hair was turned to white by his sufferings in the course of opening up these districts to Western civilisation. Here we met Commander Spicer Simson, who was in charge of the expedition, and received instructions that all the material we brought with us should be despatched in charge of the warrant telegraphists on to Lake Tanganyika, whilst we remained behind for eighteen days to supervise the transhipment and facilitate the transport of the war stores then urgently required by the Naval African Expedition. From Stanleyville we proceeded to Kalemio (now been renamed Albertville), which lies at the mouth of the Lukuga River, and at that time constituted the naval and military base for operations on the Lake. During the next fortnight we busied ourselves with overhauling and testing all our wireless gear, and found that the mechanical parts of the sets had suffered considerably on their journey from Stanleyville. This was due to the heavy condensation of moisture caused by the variation in temperature between night and day. It was not until May 15th that we became definitely attached to the Belgian Forces.



Our work consisted of the erection of stations at various points on the Belgian fringe of the Lake in conformity with the advance of the Allied Forces. We had to wrestle with any number of difficulties, mostly owing to the undeveloped state of the country. The loneliness, moreover, of white men—often working alone for long periods in the midst of natives—can only be understood by those who have gone through it. When we were sent, for example, to erect a station at Kibanga we found ourselves dumped upon an absolutely desolate spot on the sandy foreshore of the Lake, with no European neighbour nearer than half-an-hour's bush tramp away. We did not do so badly, under the circumstances, when we got this erection fixed up and wireless connection established within six days after starting.

One of our radiotelegraphic missions involved a journey by Lake steamer to Usumbora, a point the Belgian Forces had just occupied in their southern advance. As before, the soil was sandy, and so close to the Lake that, so soon as we started digging for our masts, we struck water. We did good service here, opening up communication *via* Kibanga with the base of operations 180 miles away.

Thus as the troops advanced they were kept in instantaneous touch with their base through a medium which possesses no wire exposed to the depredation of beasts, whether "wild" or human. The only protection necessary was that of guards of Belgian native soldiers, locally called Askari, in case the Germans might land raiding parties from their side of the Lake.

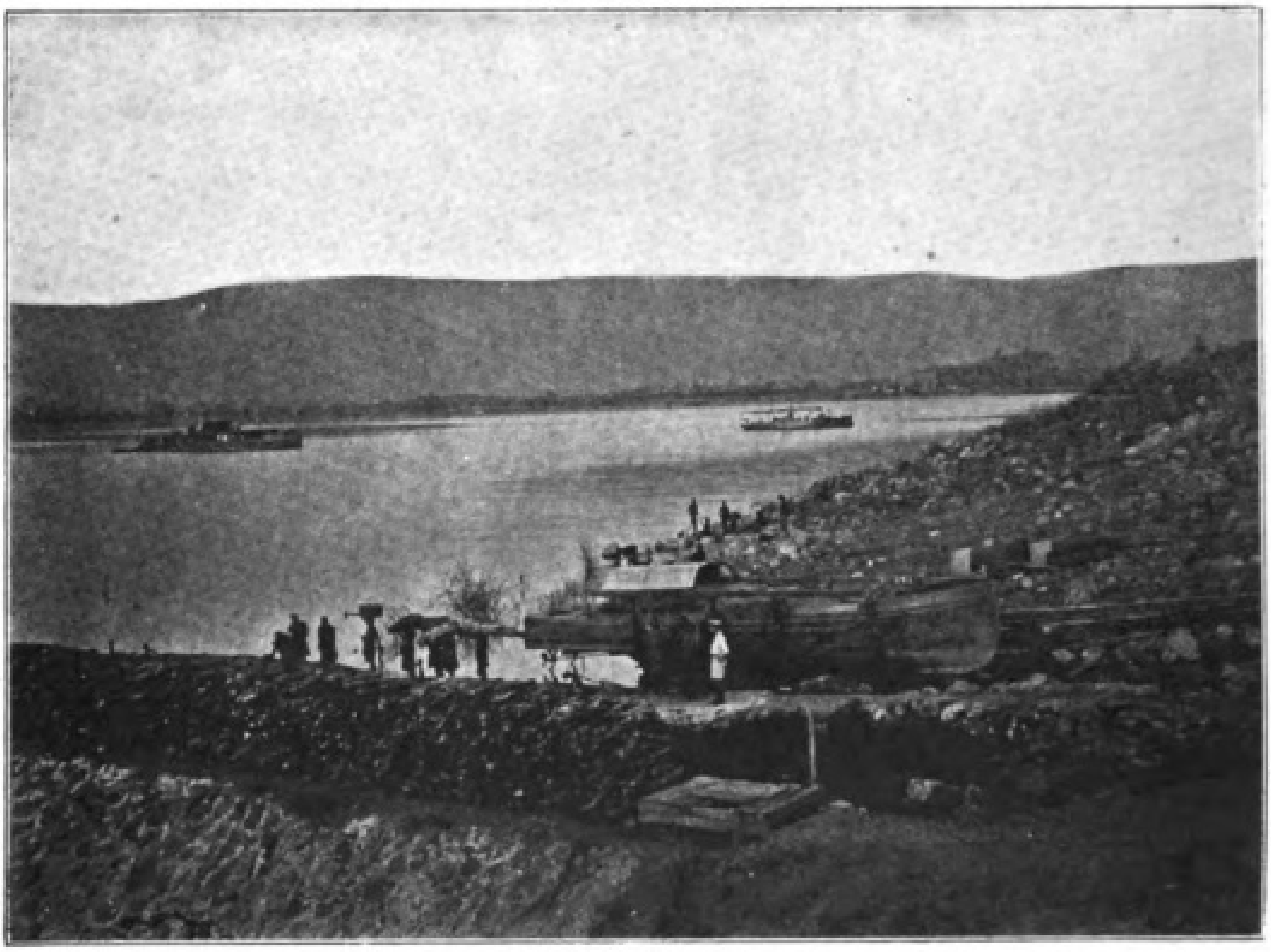
During July the military forces occupied Nyawza and we were ordered to erect at that point a portable set which had just arrived by the north-bound Lake steamer. This involved us in a most uncomfortable trip. Our transport was a long steel barge of the type commonly used for freight on the Congo rivers. Wireless men and gear were crammed on board, together with no fewer than 103 native carriers, all in ill-health, who were being sent back to their villages because they were unfit for further service with the troops. As officers, we lived, ate and slept in a most confined space on the forward part of the deck, and it was a happy day for us when we got quit of it.

The capture of Kigoma, the principal German port on the Lake and the terminus of the German East African Central Railway, created a new situation, and involved us in a sort of double-shuffling of stations. In such a country, where wireless constitutes the only means of rapid communication, and transport of material is so expensive, alike in time, labour, and cost, wireless gear is " worth its weight in gold," and it was of the utmost importance to put such material as was available on the spot to the best possible advantage. Owing to this factor in the situation, we were constantly obliged to dismantle installations only recently erected and shift them temporarily elsewhere, refitting when we were able. Thus, when we had to meet the wireless needs of Kigoma, scarcity of radiotelegraphic gear forced us once again to dismantle the Usumbora set and transfer to the erstwhile German Lake-centre both the 5 kw. set with which I was travelling and the 2 kw. gear which had been fixed at Usumbora. During the interval which elapsed between the dismantling, transference, and re-erection of these stations, the whole task of maintaining communication across the Lake between the General Headquarters of the Belgian Army in the field and the officer in charge of supplies and troops on the Lake, as well as the burden of linking up General Headquarters with the seat of government at Boma, was borne by the two British $1\frac{1}{2}$ kw. sets. This interval lasted for a period of four weeks, at the end of which time the shuffling above referred to had fixed up Kigoma with the permanent installation, and released gear for Usumbora. To that wearisome spot therefore we once more wended our way on the river steamer.

In consequence of the imminent arrival of the rainy season we this time selected a site of fairly high ground, establishing our own quarters in a recently evacuated hospital. We had by this time become past masters in rapid erection! That set was therefore fixed up and put in operation between night and morning, and communication re-established with Kigoma, 100 miles away.

Now we made acquaintance with the troubles of working in the rainy season. During this period, traffic with the Belgian 2 kw. station at Kigoma was at times unreliable and always difficult owing to the prevalence of atmospheric disturbances,

BELGIAN WIRELESS STATION ON THE LUKUGA RIVER, THE ONLY STREAM THAT FLOWS OUT OF LAKE TANGANYIKA TO THE SEA.



AT KASANGA ON LAKE TANGANYIKA: ONE OF OUR GUNBOATS PREPARING TO START.

These generally made their presence felt by obstructing signals at about 10 or 11 a.m. and putting a stoppage altogether on reliable working after midday. We therefore had to establish a relay station half way between the two.

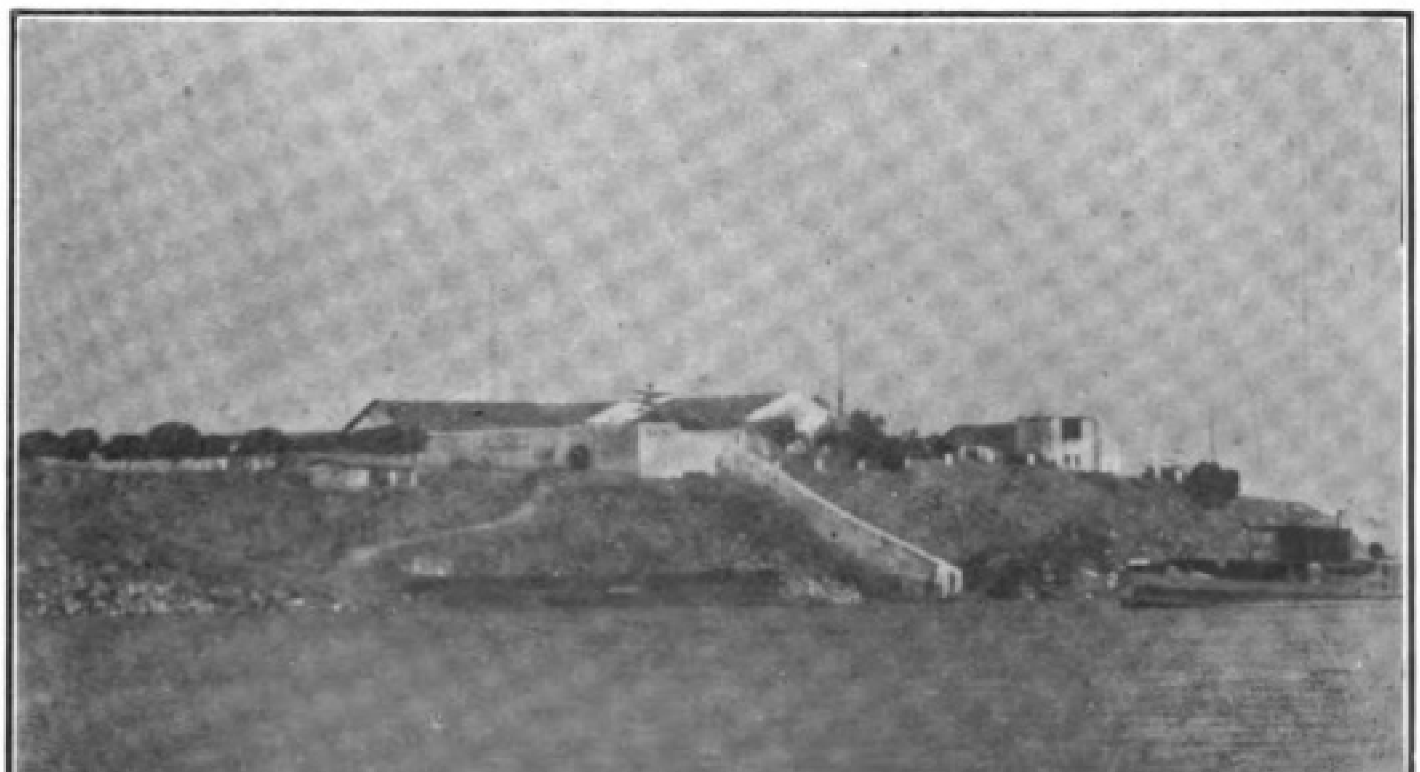
I have already referred to the difficulties of wireless work in this part of the world; let me illustrate what we had to endure from delays in transport alone. Early in November the motor at Usumbora suffered from a bad "big-end" seizure, which bent the crank-shaft and the left-hand cylinder connecting rod. There were no spare parts available; those that I had cabled for in the previous May had not arrived, so we had to suspend *sending* altogether, only maintaining a receiving watch, and despatching messages by a fast runner, a distance of over 44 miles, to Rumonge (our half way station) for wireless transmission thence to Kigoma. It was not until December 9th that the long-expected spare parts, ordered seven months before, arrived. Even then I had to take the bent connecting rod down by river steamer to Kigoma and get it straightened; so that, what with one thing and another, it took me two months to put straight what could have been remedied at home in a day or two.

In March, 1917, during some fresh operations, the Belgian troops got down as far as Karema and, of course, "wireless" had to follow in their track. We came in here for a further period of hardship. The wet season was not yet over, and we were living in tents. When rain fell, which it did pretty profusely every day, we could get no food cooked because our "boys" had no kitchen, and could not keep the rain off their fire. We were, moreover, very short of food just then, the presence of a large number of troops having placed a severe strain on the supply of fresh food. The moisture in the atmosphere was so abundant that at night time you could squeeze it out of your mosquito net; whilst, to crown it all, the mosquitoes were conducting a very effective campaign of their own. At times like these, it is none too easy to keep yourself fit and cheerful.

Still further south, we followed the victorious forces to Kasanga, then serving as a naval base for the British Tanganyika Flotilla. Here we set up a fresh station and soon established communication with the Belgian post of Vua, and with another 5 kw. set located at Kilope in the Belgian Congo. I was decidedly struck all through my wanderings with the high efficiency of the 5 kw. set in this part of Africa. The distance between Kasanga and Kilope was 112 miles, yet signals were quite good enough for traffic, although when we tried to extend our range as far as Karema, over a distance of 130 miles, we found our signals to be not sufficiently reliable, and were obliged to relay *via* Vua. One highly satisfactory feature of this Kasanga station consisted of an extraordinary absence of disturbance in the ether.

Soon after this Mr. Moore had to retire to the Kigoma Hospital through persistent attacks of fever; and a little later (at the end of June to be more exact), there being no longer any fear of the Germans returning to the Lake, I received orders to dismantle the stations both at Kasanga and Karema, and proceed to Dodoma on the German East African Central Railway, whither by that time the base of the Belgian Colonial Army had been transferred.

This completed our Tanganyika service. We had worked on the shore of that Lake for fourteen months on end, enjoying a very moderate climate considering that we were but 3° south of the Equator, and experiencing very little sickness. The only illness of any importance was Mr. Moore's attack of fever referred to above. Of course, experience taught us many lessons; but these lessons had to be bought often at the expense of severe labour and discomfort. We found the cart sets with which we had been supplied to be by no means the most convenient form of portable wireless that could be desired for this work. We constantly had to convey them across the Lake, and every time our installations were put on board it meant that the wheels had to be removed and each cart lifted by as many native labourers as could put their hands to it, into a steel lifeboat, well ballasted with mast gear. Then these lifeboats had to be paddled out to the steamer and the cart again lifted aboard from the small boats. This procedure was extremely awkward and sometimes risky.



KASANGA—THE NAVAL BASE FOR THE BRITISH TANGANYIKA FLOTILLA.

PERSONALITIES IN THE WIRELESS WORLD

[Photo, Elliott & Fry.

DR. E. W. MARCHANT

ELECTRICAL engineering has for over fifteen years figured prominently in the curriculum of the Liverpool University, and to Dr. E. W. Marchant must be assigned a full measure of the credit due. The late Mr. David Jardine bequeathed a gift of £10,000 to found a professorship, and Dr. Marchant was in 1903 elected to be the first occupant of the chair. The new laboratories were erected and equipped under his able supervision at a total cost of over £14,000. During recent years the generosity of Sir Wm. Hartley, J.P., has added a very complete installation for research work in wireless telegraphy.

Dr. Marchant was born in Kent during 1876, and educated first at University School, Hastings, and afterwards at the Central Technical College, Finsbury. At the latter establishment he won the Siemens Medal, and the Salomons Scholarship maintained by the Institution of Electrical Engineers. He graduated as B.Sc. at London University with honours in physics and mathematics, afterwards proceeding to acquire the degree of D.Sc. at the same university, together with a Granville Scholarship. After his apprenticeship he was (in 1897) appointed superintendent of Lord Blythswood's laboratories and workshops at Renfrew, N.B. At this time Mr. Marconi was demonstrating the value of his new discoveries, and fired the enthusiasm of our young electrical engineer, who set to work to investigate wireless on his own account. In 1900 he became Chief Assistant at the Finsbury Technical College, under the late Professor Silvanus P. Thompson, and in 1901 migrated to the University College, Liverpool, acting first as Lecturer in Electro-Technics, and subsequently accepting the post which he at present occupies. In the early stages of his career he became closely associated with the late Mr. Duddell in the development of the oscillograph, and was joint author of a paper read before the I.E.E. on the "Study of the Electric Arc by the Aid of Oscillographs." He has written many papers on wireless subjects, the more recent being contributions on the strength of wireless signals, read before the I.E.E. and the Wireless Society of London. He attended the International Wireless Commission at Brussels in 1914 as a British delegate, is a Vice-President of the Wireless Society of London, and Past President of the Liverpool Engineering Society. He is a Member of the Council of the Institution of Electrical Engineers, and Past Chairman of their Manchester Section.

Some Aspects of Radio Telephony in Japan

By EITARO YOKOYAMA

(Engineer of the Ministry of Communication, Tokio, Japan)

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(Continued from page 435 of our November issue.)

INFLUENCE OF GAP CLEARANCE UPON DISCHARGE.

DESCRIPTIONS have been given of the discharge phenomena, and the range of best pressure for the production of steady oscillations has been considered, but only in the case of a certain definite gap clearance—namely, 0·5 mm. To investigate the relation between the gap clearance and the corresponding most desirable pressure a series of tests were made, the gap clearance being varied from

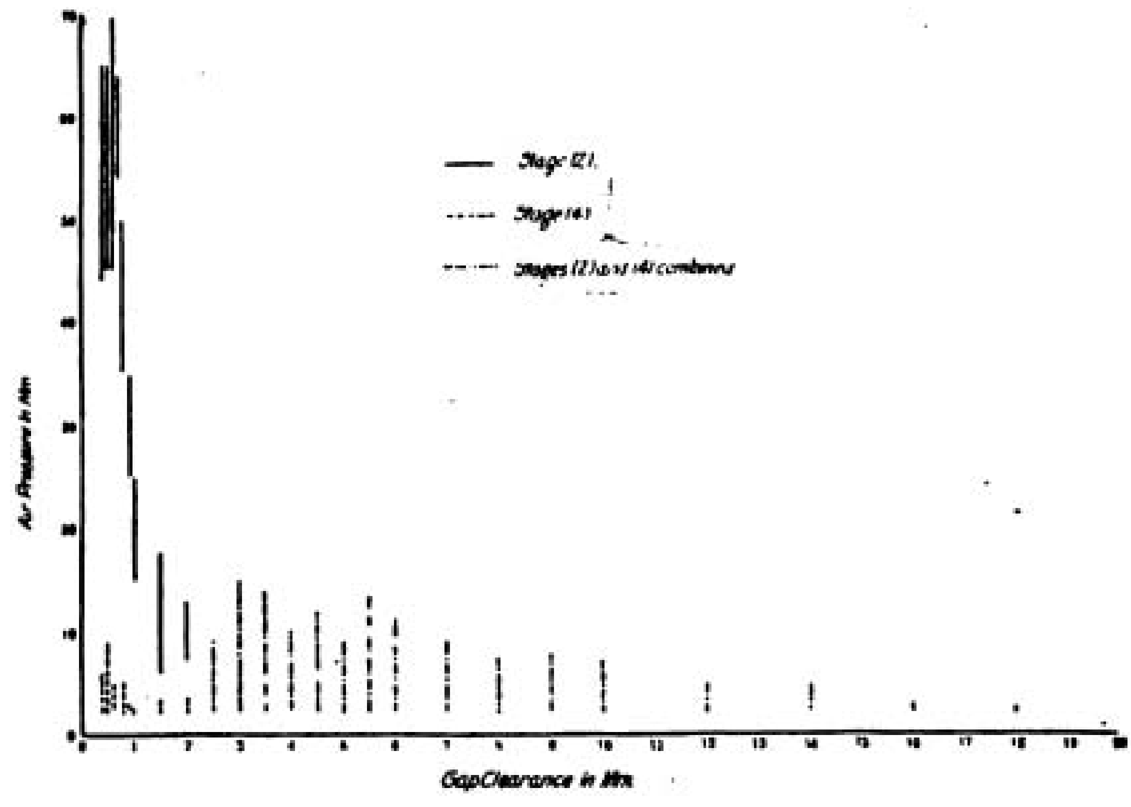


FIG. 9. RELATION BETWEEN GAP CLEARANCE AND MOST SUITABLE PRESSURE.

2 cm. (0·8 inch) down to 0·1 mm. (0·04 inch). The results of these tests are shown in Fig. 9. This figure shows that, in the case of short gap clearances, the useful range of air pressure is rather wide and extends to low vacua, while for longer gap clearances it is closely limited to higher vacua. Furthermore, there is no abrupt change between stages (2) and (4) for clearances longer than about 2 mm. (0·08 inch), stage (3) disappearing entirely.

To obtain data on the best operating conditions, the primary supply current, the terminal voltage at the gap, and the secondary oscillation current were simultaneously measured for various gap clearances with the corresponding most suitable air pressure, the supply voltage being kept constant. The results of the tests in stages (2) and (4) are shown respectively in Figs. 10 and 11. The data of the measurements for gap clearances longer than about 2 mm. (0·08 inch), (where the stages (2) and (4) cannot be differentiated), are all included in the curves of Fig. 11. These two series of curves show that the increase in gap clearance decreases both the primary supply current and the secondary oscillation current, and increases the gap terminal voltage. The conclusion is, therefore, that it is most advantageous to use as short as possible a gap clearance. However, it must be remembered that

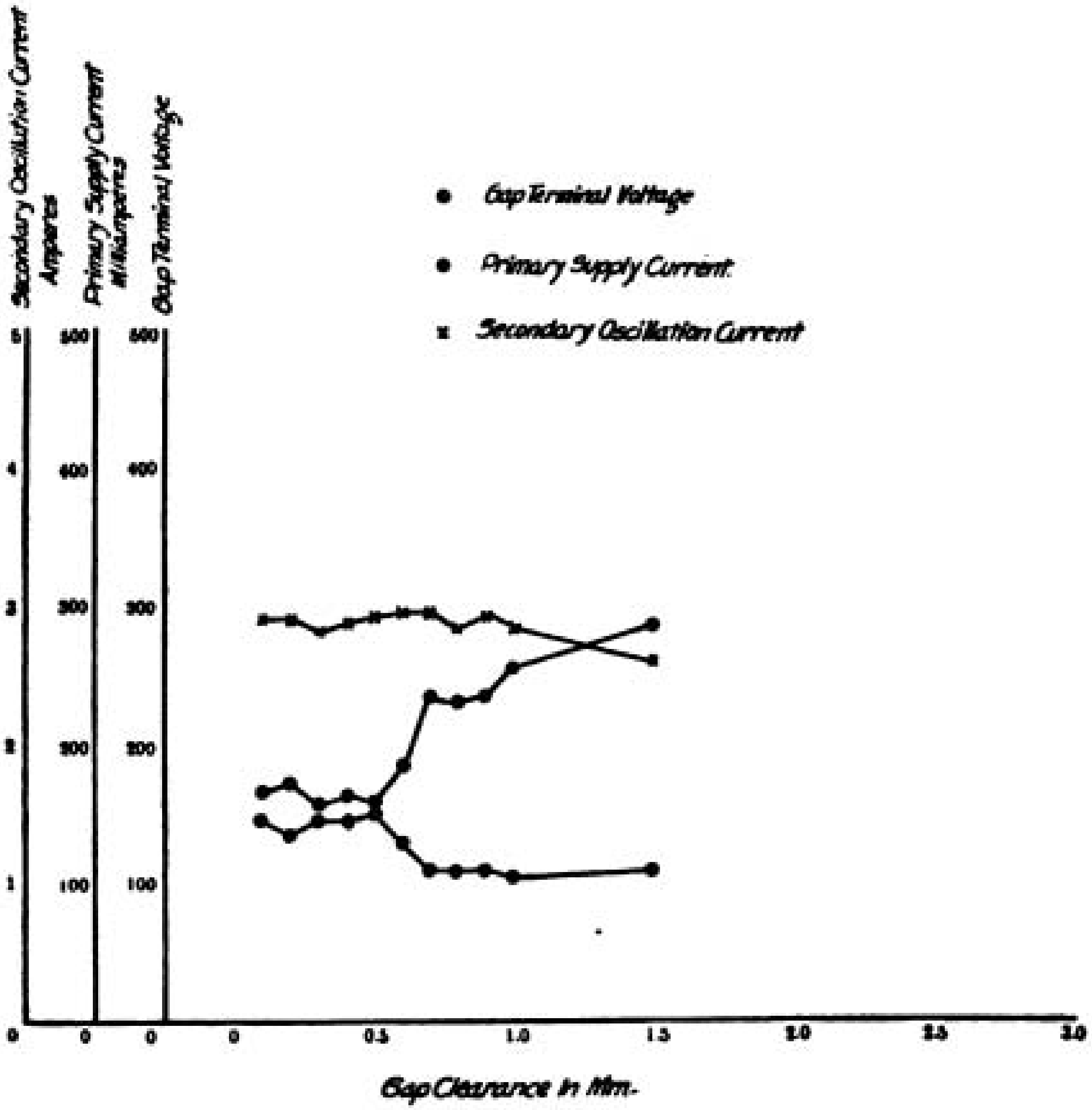


FIG. 10. RELATION BETWEEN GAP CLEARANCE AND SUPPLY CURRENT, GAP TERMINAL VOLTAGE, AND SECONDARY OSCILLATION CURRENT. STAGE 2.

there will be a lower limit to the shortest practical gap clearance because of other causes, such as heating of the electrodes which may melt them together in a very short gap.

INFLUENCE OF DIMENSIONS OF ELECTRODES ON DISCHARGE.

As stated, the time of continuance of discharge in the gap (and accordingly the duration of the secondary oscillation current) depends largely on the dimensions of the discharger electrodes. The dischargers of Figs. 2, 4, and 5 were compared in this connection, and the results are shown in Fig. 12.

With the discharger of Fig. 2 the discharge conditions in the gap became highly unfavourable and the secondary oscillations remarkably feeble after only some thirty seconds of operation. Using the discharger of Fig. 4 the time of continuance

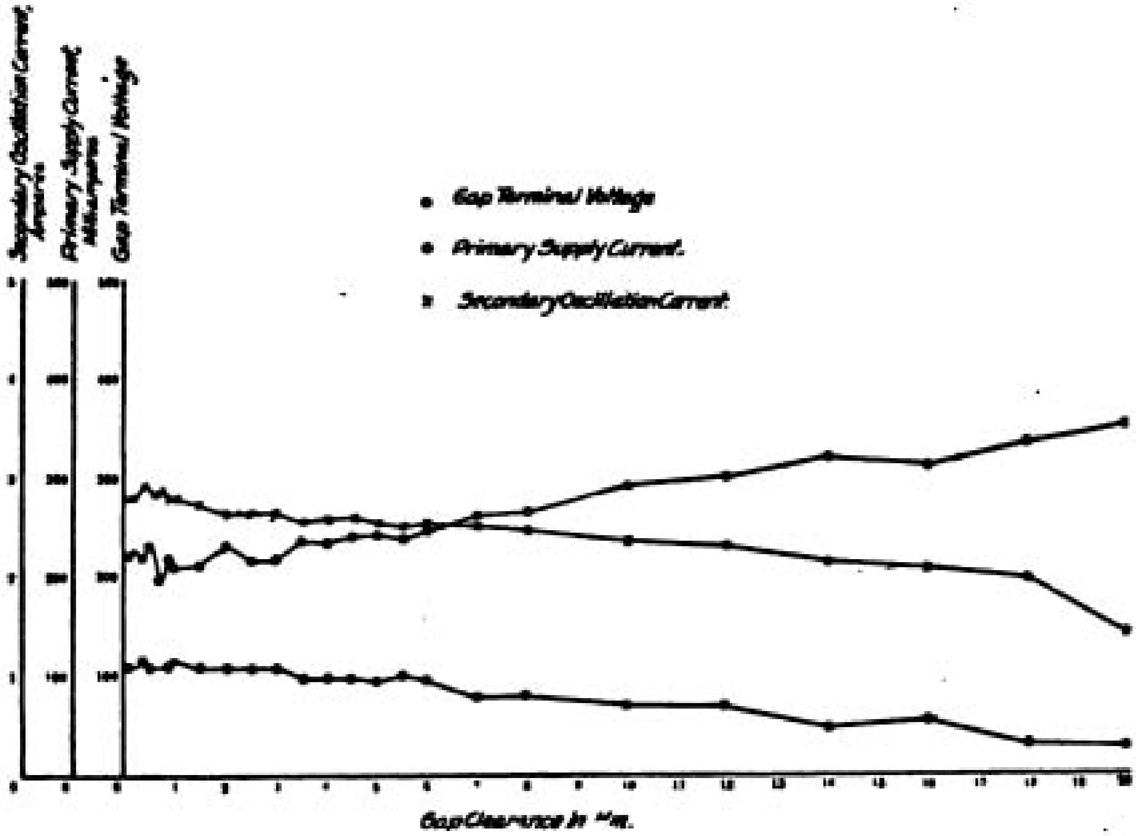


FIG. 11. RELATION BETWEEN GAP CLEARANCE AND SUPPLY CURRENT, GAP TERMINAL VOLTAGE, AND SECONDARY OSCILLATION CURRENT. STAGE 4.

of the discharge and of the secondary oscillations was, on the contrary, prolonged as long as some thirty minutes. With the discharge tube in Fig. 5 the operating condition of the discharger was still very good after two hours' continuous use.

As the supply voltage, the supply current, and the capacity of condensers, etc., were not exactly the same in each case shown by the curves of Fig. 12, the magnitude of the secondary oscillation current cannot be fairly compared from these curves. In addition, since sufficient precautions were not taken as regards the perfect sealing of the dischargers (these being made for temporary experimental use), the air pressure within probably changed in the course of the test. Otherwise the tube of Fig. 5 should have lasted far longer.

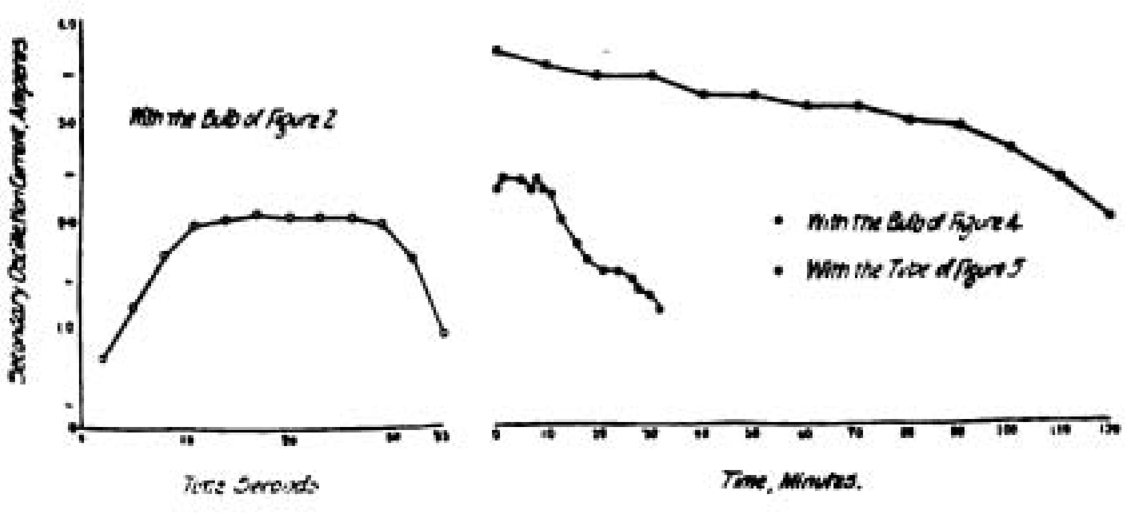


FIG. 12. EFFECT OF DIMENSIONS OF ELECTRODES ON TIME OF CONTINUANCE OF DISCHARGE.

Influence of Shape of Electrodes on Discharge.

At first there were used electrodes of the form of Fig. 13 (*a*). It was found that the discharge was not very regular, and accordingly the oscillation produced not very steady. On attempting to use the electrodes having the form of Fig. 13 (*b*), which were exactly the same except with a pin-hole at the centre of their respective discharging surface, it was noticed that discharge and oscillation were remarkably improved. Comparing these two kinds of dischargers as the oscillation generator for radiophone work, the latter was found very satisfactory, while the former gave objectionable noise in the receiving telephone because of the irregularity of the discharge. It being evident that the shape of the electrodes had some influence on the nature and duration of the discharge, it was attempted to make a comparison using the four shapes of electrodes shown in Fig. 13, all possible combinations of the four kinds being tried. In the test, copper was used as anode and aluminium as cathode, the clearance between the electrodes being kept constant at 0·5 mm. (0·02 inch).

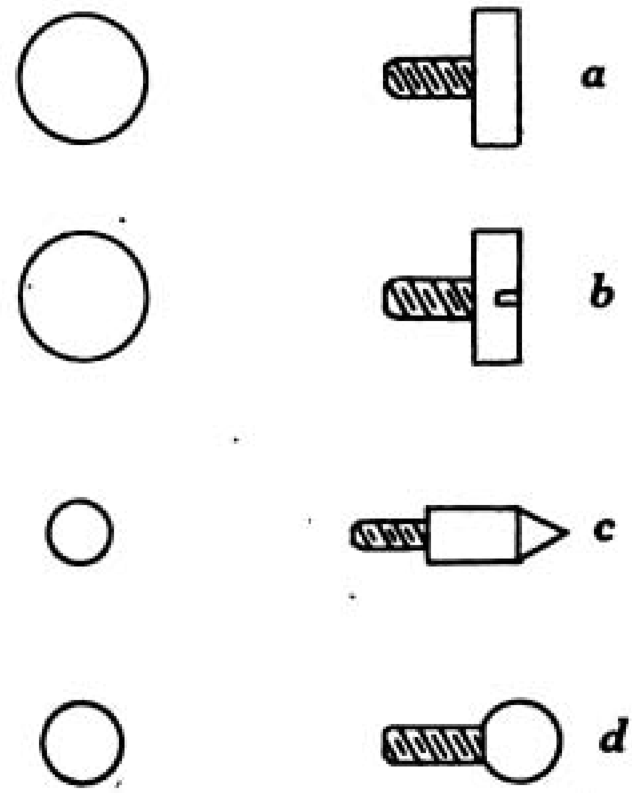


FIG. 13. VARIOUS FORMS OF ELECTRODES TESTED.

The best result was obtained by using the electrodes shown in Fig. 13 (*b*) for both terminals. The discharge was irregular with the electrodes Figs. 13 (*a*) or (*d*) as either one of the electrodes, this being due to the wandering of the discharge over the electrode surfaces. A discharger with (*c*) as either one of the electrodes also gave bad results in the long run, probably owing to excessive heating of the points.

(*To be continued.*)

Administrative Notes

The International Bureau of the Telegraphic Union at Berne notifies, under date of September 18th, 1918, in Circular Letter No. 71, as follows: "By letter "of July 12th, 1918, the Argentine Administration informs us that the coast station "Punta Delgada, Chubut, particulars of which station appear in the official list of "radiotelegraph stations with the endorsement, 'Under construction,' has now been "opened for general public correspondence."

The New Zealand Government recently opened a new wireless station at Rarotonga, in the Cook Islands. The whole of the apparatus therein installed was designed and manufactured by the Amalgamated Wireless (Australasia), Ltd., at their Sydney works. We hope to be able shortly to print views of this new development of wireless activity in the Pacific Ocean.

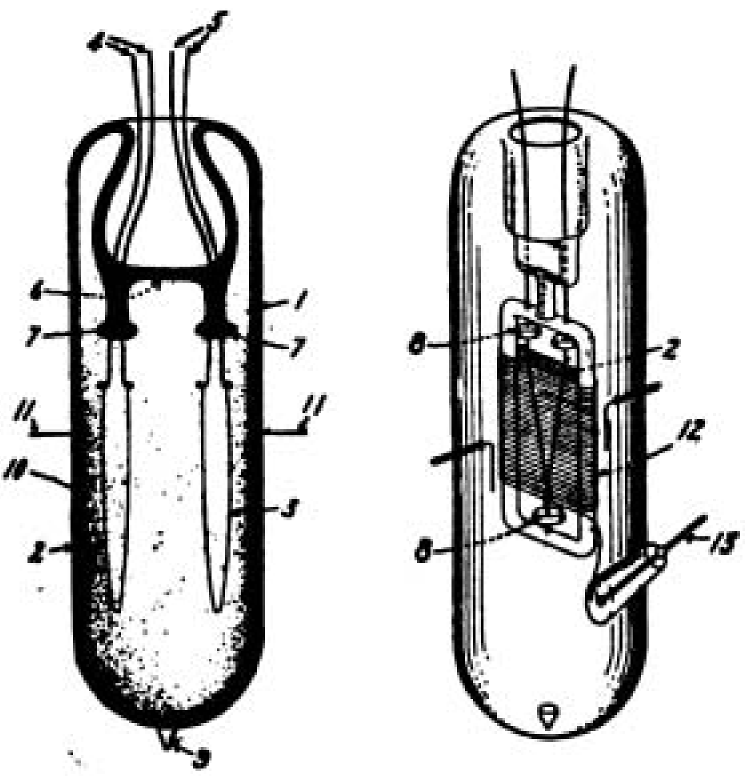
We learn from the Amalgamated Wireless (Australasia), Ltd., that they have recently opened a branch office at 422–424, Little Collins Street. The whole of the building has been taken over and the major part assigned as premises to the Marconi School. Mr. Horace Firth, who has been selected to direct the company's business in the colony of Victoria generally, has been appointed as superintendent of the Melbourne school.

Digest of Wireless Literature

A Method of Constructing Gas-Free Electrodes.

In order to obtain the exceedingly high vacuum so essential in connection with the operation of the vacuum tubes, it is necessary that the metallic elements inserted in the envelope be gas-free.

Dr. Langmuir has recently shown a method whereby the anode of the vacuum tube consists of a coating of metal sprayed on the inside of the bulb by incandescing a refractory metallic conductor such as tungsten in a partial vacuum. To accomplish this the temperature must be sufficiently high to actively vapori e the refractory metal. This vaporised metal is deposited on the walls of the vacuum bulb as a hard, strongly adherent film, which even when so thin as to be transparent is a good electrical conductor, and capable of carrying relatively heavy currents. In fact, Langmuir has described a three-electrode vacuum tube in which an anode made in the foregoing manner was capable of receiving plate current of 100 milliamperes or more.



FIGS. 1 AND 2.

In the tube shown in Fig. 1 one of the filaments can be employed as the cathode of a two-electrode vacuum tube, and the other to supply the vaporised metal for casting the interior of the tube. The device then becomes a two-electrode valve, and can be employed as an oscillation detector or as an ordinary rectifier.

The tube shown in Fig. 2 is essentially a three-electrode vacuum tube. Dr. Langmuir mentions that it is not necessary to supply an extra filament to be vaporised, but that the main filament 2 can be made large enough so that part of its metal can be deposited on the inside of the bulb to act as the anode; in other words, the grid and filament of the vacuum tube are inserted during the original construction, but the metallic coating for the anode or plate is deposited by bringing the temperature of the filament up to a high degree of incandescence.

The process of manufacture is as follows:

Referring to Fig. 1, the envelope 1, consisting of glass quartz or similar non-conducting material, is provided with two vaporisable conductors 2, 3, consisting of tungsten tantalum or molybdenum, and provided respectively with leading-in conductors 4, 5, sealed into a stem 6 in the usual manner. One of these filaments 2, 3 may be used for the cathode of the completed apparatus and the other may be vaporised by heating it to incandescence by passage of current. The particles of vaporised metal travel outward in all directions in straight lines. In order to avoid the formation of a continuance conducting film over the entire inner surface of the container and in electrical contact with the cathode, provision should be made for intercepting the vaporised metal near the cathode so as to "cast shadows" on the envelope wall which will be free from deposited metal. This may be done by shaping the stem 6 so that it will in part bulge outwardly, also by providing knobs or rings on the leading-in wires as shown at 7, Fig. 1, or 8, Fig. 2.—(*Wireless Age.*)

THE REVOLVING MIRROR AND SPARK DISCHARGES.

Professor Lindley Pyle, Professor of Physics at Washington University, contributed to a recent issue of the *Electrical Experimenter* an article describing the revolving mirror method of observing and photographing the oscillatory nature of the "wireless" spark. Fig. 3 shows, diagrammatically, the apparatus used. A small transformer, *T*, is used to charge the capacity, *C*, which is so arranged that it will discharge through the inductance, *L*, and across the spark gap, *S*. This discharger consists of two zinc rods thrust through poles bored in the side of a wooden box, the box completely enclosing the spark except at one side, where a hole is cut. The box may be about 6 in. long and the gap about ⅛ in. Light from the spark passes out through the hole in the box, thence through the lens, *L*, to the mirror, *M*, whence it is reflected back through the lens to a focus at *P*, which is either a photographic plate or a piece of white card. The mirror is fastened upon the projecting shaft of a small high speed motor and, being silvered on both sides, is really equivalent to two mirrors.

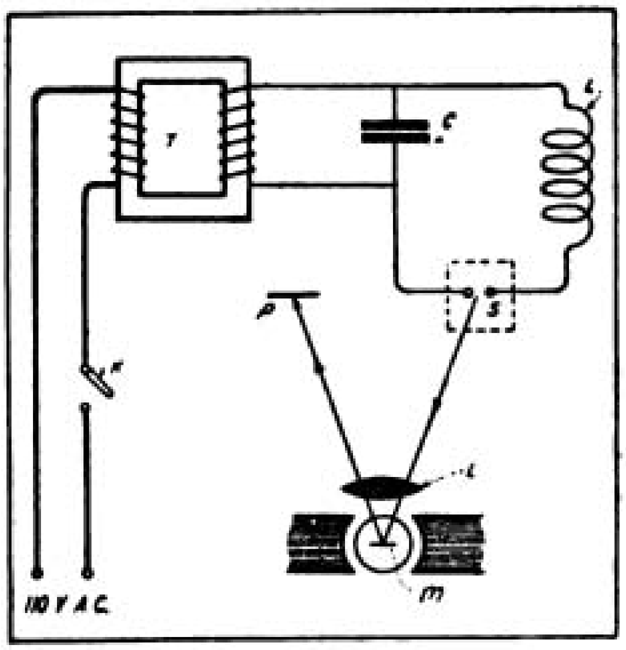


FIG. 3.

With the spark discharge in action and the motor at rest, a bright and sharp image of the spark will be seen upon *P*, provided, of course, that the mirror is set at the correct angle. If now the shaft of the motor is rotated slowly, while the spark is occurring, a number of separate images of spark discharges will appear upon the white card or plate. Each separate image corresponds to a complete spark of the discharge. The faster the mirror is rotated the wider will be the separation between these bright images.

Let us now switch on the current in the motor circuit. As the motor attains a high speed the spark images will be very widely separated and soon a point will be reached when there will be only one image on the card at a time. This image will then be seen to be "dragged out" and will itself resolve into a number of separate images, one for each passage of current across the gap, or two for each complete oscillation. The first of the series will be the brightest, and each subsequent image will be diminished in intensity, the total number of images in the complete train being, of course, dependent upon the damping of the circuit. It is obviously a simple matter to calculate the oscillation frequency of the circuit from the separation between the images and the speed of the motor.

The article describes in detail how the apparatus used may be manufactured, and a photographic reproduction is given of an oscillatory spark discharge taken with the apparatus described. Although it is not mentioned by Professor Pyle, the spark-gap, *S*, in Fig. 2 should be so arranged that the electrodes are above one another, and not side by side as shown.

WIRELESS ON TRAINS.

The paper is a *résumé* of research work carried out by the writer from 1906-1916 for the Union Pacific Railroad Company.

It was at first attempted to actuate signals in the cab of a locomotive by using a coherer, but it was found that the reliability was insufficient. It was therefore decided to experiment as to the best means of obtaining communication with moving trains, either by wireless telegraphy or by wireless telephony. The various types of antennæ tried both on the trains and for the land stations alongside the line are described, explaining the difficulties incidental to railway work. It was found that a flat-topped antenna with ground counterpoise gave the best results. Considerable work was done with radio-telephones, which is illustrated and described. There are diagrams of the connections and a plan of a train, showing some particulars of the wireless installation.

A dining-car was converted into a wireless laboratory and there are photographs showing the wireless apparatus installed.—(Dr. Frederick H. Millener, *Proceedings of the Institute of Radio Engineers*, August, 1918.)

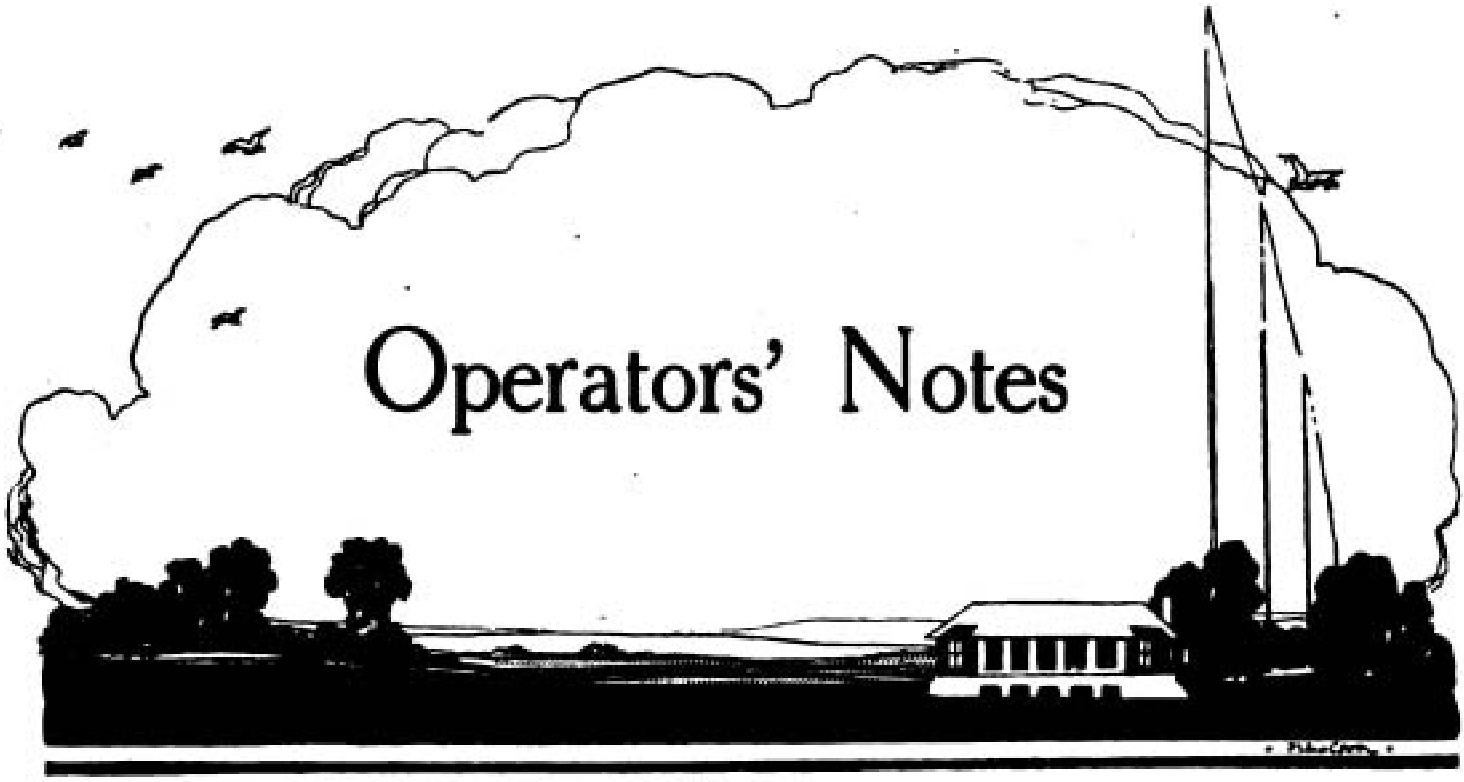
WIRELESS COMMUNICATION BETWEEN HOLLAND AND THE DUTCH EAST INDIES.

The *Allgemeen Handelsblad* is informed by an Apeldoorn correspondent that it is proposed to erect the Dutch station for wireless communication with the Dutch East Indies at Hoog-Buurloo, near Apeldoorn. A railway a few miles long will have to be constructed from that place to Kootwijk for the transport of construction materials and to provide easy access to the wireless station when it has been erected. There will be four receiving towers, with an electric plant having an immense capacity, greater than that of any other in the country. Extensive buildings will be erected, including dwellings for workmen. The wireless station will be placed upon the Koelberg (between Hoog-Buurloo and the railway line), which is 86 metres high, one of the highest points in Holland.

The Telefunken Company of Berlin has been asked to send an engineer to inspect the ground selected. The wireless station will be of about the same extent as the immense wireless station at Nauen and direct communication will be guaranteed with the similar station to be erected in the Dutch East Indies.—(*Allgemeen Handelsblad*, August 11th and 18th, 1918.)

IMPROVEMENT IN DIRECTIVE WIRELESS TELEGRAPHY.

French Patent No. 485,632 of A. Artom is concerned with the use of multiple directive antennæ for sending or receiving. The antenna consists of several aerial wires connected to different plates of a condenser situated in the oscillating circuit or to different tappings of an inductance situated in the oscillating circuit. Each aerial wire consists of a pair of conductors so placed as to facilitate the radiation or reception in one direction. The entire system may be tuned to a single frequency, or each pair of conductors may be tuned to a different frequency.—(*Revue Générale de l'Electricité*, September 28th, 1918.)



Operators' Notes

The New Standard Uniform for the Mercantile Marine.

In our October issue (page 400) we made a preliminary announcement regarding the new standard uniform in the British Mercantile Marine, which has now been approved by His Majesty the King. Although the Order-in-Council containing particulars of the new uniform was issued in September, detailed particulars of the exact manner in which the wireless operator's braid was to be worn have only just been received from the Board of Trade.

The regulations for the standard uniform are lengthy and detailed and many of them, of course, do not apply to wireless men. The following extracts, however, contain the whole of the regulations which actually apply to wireless operators:

"(1) The uniform of the British Mercantile Marine shall be such as is set forth "in the Schedule to this Order: Provided that where at the date when this Order "comes into operation the Masters and Officers of the ships belonging to any company "or firm are accustomed to use a cap with a distinctive badge, that badge may, if "the company or firm so desire, be substituted, in the case of persons whilst serving "on board or employed on the business of ships belonging to that company or firm, "for the cap badge prescribed in the said Schedule.

"(2) The persons entitled to wear the uniform so prescribed shall be Masters "and Officers of the Mercantile Marine holding certificates from the Board of Trade. "Uncertificated Junior Officers of the Mercantile Marine qualifying for their first "certificate, and Surgeons, Pursers, Wireless Operators, Cadets and Apprentices of "the Mercantile Marine, and Petty Officers and other ratings of the Mercantile "Marine specifically mentioned in the said Schedule, but no other person whatsoever.

"(3) The uniform to be worn by any person whilst employed in any position or "rank on board any ship shall be the uniform appropriate to that position or rank, "without reference to the class of certificate which he may hold.

"(4) A member of the Mercantile Marine employed ashore, or temporarily "unemployed, shall be entitled to wear the uniform appropriate to the highest rank "in which he has at any time been previously employed.

"(5) No person entitled to wear the uniform shall, when on board ship, in port "or on shore, be dressed partly in uniform and partly not in uniform.

"(6) This Order shall apply only as respects persons who are or who have been "employed on British ships registered at ports in the British Islands.

" (7) This Order shall come into operation on the day of the promulgation " thereof.

" (8) This Order may be cited as 'The Mercantile Marine (Uniform) Order, " '1918.'

" EXTRACT FROM SCHEDULE.

" 1. DISTINCTION LACE OR RANK STRIPES.

" *First Wireless Operator.*

" 2 waved lines, with diamond, of ¼ in. gold Russia braid (or black braid).

" The space between each row of braid is to be 1½ in.

" First Wireless Operators (will wear) one diamond of ¼ in. gold Russia " braid (or black braid), with open centre, and an outside measurement (angle to " angle) of 1½ in. imposed on the distinction lace (see illustration, page 494).

" *Second Wireless Operator.*

" 2 waved lines of ¼ in. gold Russia braid (or black braid).

" *Third Wireless Operator.*

" 1 waved line of ¼ in. gold Russia braid (or black braid).

" 2. GREAT COAT.

" For all Officers, but not Cadets or Apprentices. Blue cloth. Length to come " to 14 in. from the ground. Double breasted. Six buttons on each side, to button " four buttons, the bottom button not to come below the level of hips. A plait " down the back, with an opening at the bottom 18 in. long with a fly and three " small plain buttons. A cloth strap behind with a buttonhole at each end and " two corresponding uniform buttons to confine the waist to required size. Stand " and fall collar with hook and eye in collar seam. Edges of coat to be double " stitched, the shoulders fitted with straps for rank stripes.

" 3. FROCK COAT.

" For all Officers, but not Cadets or Apprentices. Blue cloth, double breasted, " with padded turn-down collar. Cut for six buttons, but to have five buttons on " each breast, to button four buttons, the width of lapel to be 3 in. at fourth button, " tapering to 2½ in. at waist seam; two buttons on the hips, with side edges in " plait of skirt extending halfway down the skirt, with a button at bottom of each " side edge. For Officers, 5 ft. 9 in. in height, length of coat 38 in., with a propor- " tionate variation for difference in height. The proportionate variation in length " of skirt for each inch of difference in height is ½ in. Lining, black material. " Round cuffs, and rank stripes on the sleeves. A black morocco leather belt, 1½ in. " wide, with gilt buckles of same design as standard cap badge can be worn optionally.

" 4. UNDRESS COAT.

" For all Officers, Cadets and Apprentices. Blue cloth, with padded turn-down " collar, the length to be sufficient to cover the hips; double breasted, with five " buttons at equal distance on each side, to button four buttons. Pockets without " flaps at the sides, in line with the lower button, and one outside left breast pocket. " An opening 5 in. long at the bottom of each side seam. Round cuffs, rank stripes " on the sleeves.

" 5. WORKING UNDRESS JACKET.

" Blue serge, single breasted, stand collar, with hook and eye at neck, five " buttons at the front, and opening at bottom of each side seam 5 in. long. A " patched pocket on each breast without flaps. Shoulder straps for rank stripes " in black mohair.

"6. WHITE UNDRESS COAT.

"White drill, single breasted, stand collar, with hook and eye at neck, five "buttons at the front, and an opening at bottom of each side seam 5 in. long. A "patched pocket on each breast, without flaps. Shoulder straps for rank stripes.

"7. MESS JACKET.

"Blue cloth, double breasted, six buttonholes in each row, four on the turn "and two below, padded turn-down collar; slightly roached over the hips with a "rounded peak behind; two pockets with welts at the sides. Round cuffs, with rank "stripes.

"8. WHITE MESS JACKET.

"White linen, of the same shape as the blue jacket but with a roll collar, two "buttons in each row, and two buttonholes on either side to correspond with the "buttons, to be worn linked with two No. 2 size buttons connected by a ring. "Shoulders fitted with straps for rank stripes.

"9. SHOULDER STRAPS.

"For all Officers, but not Cadets or Apprentices. Blue cloth with rank stripes "and coloured cloth, according to rank or branch. Straps to be 5 in. long, 2¼ in. "wide, and to have a No. 3 button on top.

"10. TROUSERS.

"Blue cloth, but no gold lace, for frock or undress coat. Blue serge for working "jacket, and white duck or drill material for white undress coat.

"11. WAISTCOAT.

"Blue cloth, single breasted, with six buttons. For wear with blue mess "jacket: Blue cloth, single breasted, cut low, with roll collar and four buttons. 'For wear with white jacket: White marcella, the same pattern as the blue waist- "coat.

"12. BUTTONS.

"A gilt-raised round button, with a plain rim encircling a rope rim, surrounding "an anchor without cable rove through a naval crown. (Registered Design "No. 664,376.)

"(1) Eight-tenths of an inch in diameter (or, in button-maker's measure, "35 lines, relief 7 lines).

"(2) Fifteen-twentieths of an inch in diameter (or, in button-maker's measure, "30 lines, relief 6 lines).

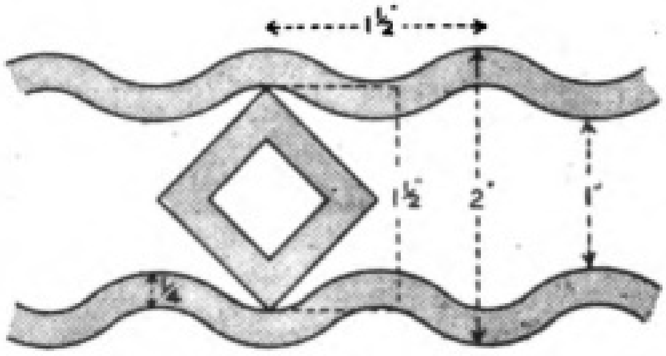
"(3) Thirteen-twentieths of an inch in diameter (or, in button-maker's measure, "25 lines, relief 5½ lines).

"They are to be worn as follows:—

"Size No. 1 on all coats. Size No. 2 on jackets. Size No. 3 on waistcoat and "shoulder straps.

"13. CAP AND COVER.

"For all Officers, Cadets and Apprentices. Cap: Blue cloth, with three blue "cloth welts, 3¼ in. total depth, diameter across the top 8¼ in., for a cap fitting "21⅞ in. in circumference, the top to be ⅛ in. larger or smaller in diameter for every "¼ in. the cap may vary in size of head above or below the before-mentioned standard "—*i.e.*, a cap 22¼ in. in circumference, diameter across the top 8½ in.; cap 21 in. "in circumference, diameter 7⅞ in. The sides to be made in four pieces and to be "1½ in. deep between the welts; a black mohair braid band, 1¾ in. wide, placed "between the two lower welts, the join of the band to be in front so as to be covered



RANK STRIPES: FIRST WIRELESS OPERATOR.

"by the badge, the upper side of the "mohair band to be left unsewn to admit "of bottom edge of white cover being "slipped under when required.

"The cap set up on a band of stiff "leather or other material 1¾ in. deep.

"The use of steel cap stretchers is "prohibited.

"Cover: The cap cover to be of "white ribbed marcella.

"Peak—For Masters: Covered with "blue cloth and bound with patent "leather, and embroidered on the front "edge with laurel leaves in gold ½ in. wide.

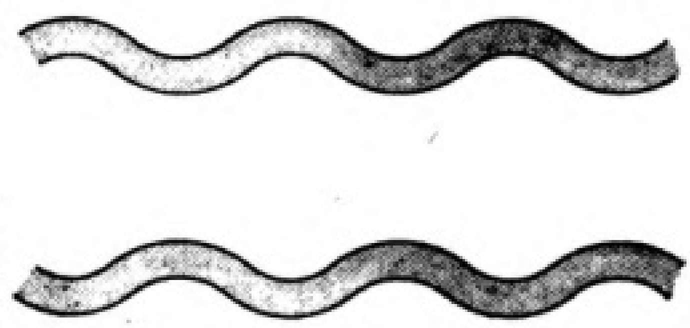
"For all other Officers, Cadets and Apprentices: Patent leather without "embroidery.

"The peak to drop at an angle of 45 degrees and to be 2 in. deep in the middle "when worn with embroidery, and 1¾ in. when plain.

"Chin stay for all Officers, Cadets and Apprentices: Black patent leather, ⅜ in. "wide, buttoned on to two black cloth "buttons placed immediately behind the "corners of the peak.

"14. CAP BADGE.

"Gold naval crown over silver anchor "(without cable), the anchor on red oval "cushion with gold rope rim, surrounded "below and at the sides by gold oak-"leaves and acorns. The whole on a "backing of navy blue cloth (Registered "Design No. 664,377).



RANK STRIPES: SECOND WIRELESS OPERATOR.

"15. FOUL WEATHER COAT AND HAT.

"A black oilskin and sou'-wester of the usual pattern.

"16. NECKTIES AND COMFORTERS.

"Neckties: With frock-coats or undress, a plain black silk or satin tie, 1½ to "2 in. wide.

"With mess undress, a plain black silk or satin tie, 1 in. wide.

"Comforter: To be white.

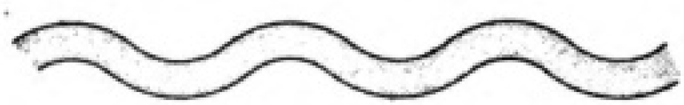
"17. GLOVES.

"Plain, brown dogskin, or brown buckskin, with greatcoat, undress coat and "working undress jacket.

"Plain, white, with frock-coat and mess jacket.

"18. BOOTS.

"Black boots or shoes with all uniforms other than white undress, with which "white shoes may be worn."



RANK STRIPE: THIRD WIRELESS OPERATOR.

As soon as the Order was issued the Board of Trade was approached and asked to state:

(1) Whether the crests of the waves in the upper row of lace were to come

immediately above the crests of the lower row, or whether the crests of the upper row were to be above the troughs of the waves of the lower row.

(2) If the latter, whether the space of $1\frac{1}{2}$ in. was to be measured at the maximum or minimum separation.

(3) Whether the diamond was to be placed at a point of maximum or of minimum separation.

(4) What was to be the measurement from crest to crest of the waves.

The Marconi Company has now received from the Board of Trade a drawing giving an explanation of the points above and with the correct measurements marked thereon. This drawing is reproduced herewith.

It should be particularly noted that it is a punishable offence for any unauthorised person to wear this standard uniform. Students, whether attached to Marconi or private schools, who have not been to sea as wireless operators are not entitled to wear this uniform and are liable to incur serious penalties by so doing. The present Marconi uniform, with the "M" badge and buttons and crossed wave braid, thus becomes obsolete, although, of course, those members of the staff who already possess such a uniform will be able to effect the change at a cost considerably less than that of a complete uniform by changing the badge, buttons and braid. This should be done as soon as possible.

[Official photograph

A GERMAN METHOD OF GENERATING POWER FOR TRENCH WIRELESS.

Telegraphy, Aeronautics and War

In the book now before us* Mr. Bright has collected together a large number of his addresses, papers and memoranda on the three subjects of telegraphy, aeronautics and the war, the first of these subjects preponderating. Several of the author's contributions are of great value as presenting to the general reader the importance of inter-Imperial telegraphy in a clear and interesting manner. In many parts of the book a comparison is made between the cable method of communication and its younger sister radiotelegraphy. Almost invariably Mr. Bright arrives at the conclusion that the cable method is considerably the better.

We, for our part, would be the last to claim that wireless telegraphy has yet reached perfection, or that there do not exist a number of problems which cry for solution. At the same time it is quite wrong to imply that cable telegraphy is a perfect means of communication, and an impartial enquirer will find that cable telegraphy is faced with a number of problems every whit as difficult as those which at present face the newer art, besides possessing certain insuperable objections unknown to wireless telegraphy.

As a Fellow of the Institute of Radio Engineers, and a Delegate at the International Radio Telegraphic Conference of 1912, Mr. Bright is singularly ill-informed in his radiotelegraphic facts. Indeed, many of his conclusions rest upon erroneous assumptions and totally unsubstantiated statements. Not that the author sets out to be an open opponent of wireless telegraphy—indeed he goes so far as to point out its many advantages for certain classes of work.

One of the earliest statements which will cause surprise among those acquainted with practical radiotelegraphy occurs in the introduction, where the author is speaking of transatlantic wireless. "A very good route in some ways for a transatlantic "wireless system would be by the Faröe Islands, Iceland, Greenland and Labrador, "with a terminus at each extremity in more or less close proximity to the trans-"atlantic cable terminus. One advantage of such a route would be that, on account "of its distance from the shipping route, it is less likely to be a source of disturbance "to ordinary marine 'wireless' work. Again, owing to the series of comparatively "short subdivided sections herein provided, the power required would be far less, "and therefore free from the objection of disturbing the multitudinous 'wireless' "that goes on between ships in ordinary transatlantic routes." Quite apart from the fact that it can be definitely stated that the Marconi transatlantic stations *cannot be heard* by ordinary ship installations, even at close quarters, unless special apparatus is provided—a fact which any seagoing operators would have given to Mr. Bright on request—such a duplication of stations would mean four repetitions for any one message which crosses the Atlantic. Every wireless station which keeps up a constant service needs to have power in excess of that required to cover the distance to which it communicates in favourable circumstances, and if such long wave stations interfere with ship working—which they do not—then we fail to see how matters would be remedied by four or five times the amount of signalling for the same traffic. This paragraph, however, is typical of many based upon erroneous assumptions.

A few lines farther down we come upon a statement that the German wireless station at Nauen has "A constant station transmitting power of 6,000 miles occa-"sionally raised to 7,200." The Nauen Station, even since its power has been considerably augmented, has never had a constant range of anything approaching this, and frequently has great difficulty in covering half that distance.

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* *Telegraphy, Aeronautics and War*, by Charles Bright, F.R.S.E. London: Constable & Co., Ltd. 16s. net.

When the European War broke out, very few days elapsed before the world at large became acquainted with the extreme vulnerability of the cable, the British Forces severing every one of the German lines to America. It is rather amusing, therefore, to find Mr. Bright speaking of the vulnerability of wireless antennæ. The footnote on page 54 states: "The range of an up-to-date naval gun is often "greater than the distance at which a wireless station can be readily accommodated "inshore." Surely Mr. Bright cannot have forgotten the case of Nauen, which he mentions a few pages before; of the Eiffel Tower, to which he makes frequent reference; not to mention Arlington (now called Washington), Hanover, Lyons, and Madrid, all of which are referred to in the book.

In fairness to Mr. Bright, it should be mentioned that many of the papers reprinted in this volume were published before the outbreak of war. One statement, however, is repeated so extensively, in papers delivered before and after the war, that we feel we cannot omit reference to it. It is to the effect that the wireless system does not lend itself to code to the same extent that prevails with cables. This statement is completely disproved by the war experiences of all belligerent nations—most dramatically, perhaps, by the machinations of Count Bernstorff, as evidenced in the Sayville wireless disclosures.

In an address delivered by Mr. Bright at the end of 1911 he made the statement that "An untuned radio system, like that on the Eiffel Tower, is capable of com- "pletely demoralising all other radiotelegraphy that is proceeding within, say, a "range of 1,000 miles." A similar statement was repeated in the *Empire Review* about the same time. This statement appears in several places, being modified at a later date into "such as that *at one time* on the Eiffel Tower." The italics are ours. Although the earlier installation on the Eiffel Tower was a slow spark highly damped system, impossible to be tuned out *sharply*, yet at its worst it never interfered with ordinary ships' traffic, seeing that its wavelength (2,500 metres) was more than four times that used for ship and shore communication. It is necessary to emphasise this point, as the impression is given throughout Mr. Bright's volume that high power stations, *whatever their wavelength*, interfere with ordinary ship and shore communication.

On page 112, where a rather laborious attempt is being made to belittle long distance work by wireless, and to eulogise the cable working, the author says, "The "difference between the two is akin to that between an express and a suburban "train whose constant stops correspond to the retransmission necessary with "radiotelegraphy, but overcome, in the modern cable service, by an automatic "relay. Thus the whole world can be encompassed by cable in a quarter of an hour. "How long would that take by wireless?" The answer to this difficult question is, about a quarter of a minute—as Mr. Bright will find, if he refers to recent newspaper reports of direct wireless communication between Great Britain and Australia, where the messages despatched by wireless and cable at the same time arrived by wireless very much in advance.

On page 257, in a reprint of a memorandum supplied to the Dominions Royal Commission as late as July 29th, 1914, Mr. Bright says, speaking of errors in cable and wireless work respectively, "I consider on the contrary that as 'wireless' "usually involves in practice the reception of Morse signals on a telephone, the "wonder is that more errors are not made by the operators, having regard to the "slight difference between a dot and dash—between, say, the signification for the "letter 'A' and the letter 'M.'" It should not be necessary to point out the fallacious reasoning contained in this paragraph. We would remind the author that the difference between a dot and a dash is exactly the same in the telephone as on the telegraph sounder. Reception is aural in each case, and seeing that the "sounder" is largely used by cable companies between their sub-offices and the cable station, this argument must prove to be a two-edged weapon.

Wireless Telegraphy In the War

The Victory Message.

THE war, and therefore "Wireless in the War," is over. Our heading made its first appearance in September, 1914, and we print it here for the last time. Wireless has "done its bit" in the struggle and shares in the triumph. We have endeavoured to record in the pages devoted to this section such of the achievements of radiotelegraphy, and the incidents connected therewith, as censorship has permitted. Over and over again we have been obliged, in the public interests, to be silent; and just as the world must learn in the coming peace-time the most brilliant of the feats of their fighting men, so must it await the abolition of censorship before it can be told the most striking achievements of wireless.

We just now used the phrase in connection with radiotelegraphy that it "had "done its bit," and did so advisedly, in view of the fact that this expression has become honoured amongst us through what it typifies. But we should be fully justified were we to revert to the more full-mouthed declaration, put by Virgil in the mouth of Æneas—"*Quorum pars magna fui*" ("Wherein I played a mighty part").

The wireless message of the German Government to their merchant ships bidding them fly to the protection of the nearest port, for fear of the British Fleet, marked the initiation of the world struggle. This message was despatched before the actual declaration of war by England.

A wireless announcement of the signing of the armistice—that acknowledgment of utter defeat by the Powers of Evil as embodied in German militarism—consummated its close.

The following brief *résumé* will indicate how that armistice was, from start to finish, shepherded by wireless telegraphy:

On Thursday, November 7th, the German authorities sent out from their wireless stations an acknowledgment of President Wilson's pronouncement that Marshal Foch was "empowered to receive accredited representatives of the German "Government and to communicate the armistice conditions to them." The same message included the list of the German representatives, and asked that the plenipotentiaries should "be informed by wireless where they can meet Marshal Foch," adding, with their characteristic effrontery, a petition for provisional cessation of fighting "in the interests of humanity." French wireless took up the tale, and Marshal Foch instructed the enemy delegates what route they must follow, in order to reach him and learn the offer he was prepared to make. On Friday, November 8th, the German plenipotentiaries radiated through French Government stations the message that they had "received the conditions of the armistice as well as the "formal demand that they should be accepted or refused within seventy-two hours," adding that all their attempts to shuffle were unavailing, and there was no need to send fresh delegates. Through the same medium the enemy emissaries advised their Government of the departure and route of the envoys who bore the historic document to its *destinataires*.

On Monday morning, November 11th, came the "Crowning Mercy" in this solemn series of wireless inter-communications. It fell to the lot of operators, as they maintained their listening watch during the chill small hours, to receive the momentous message from the French Marshal announcing that the armistice had been signed. The phrase "A message of Fate" has often been employed; surely never before has its employment been so completely justified. The whole world was waiting expectant. And ether waves placed the whole world in a position to learn the news at once and simultaneously. The armistice was signed at 5 a.m. Wireless brought the intelligence to London at 5.40 a.m., and—seeing that these waves travelled with a speed of light—we may take it that its reception everywhere occurred practically at the same moment. What a drama! And what a *dénouement!*

AND ITS PRICE.

The old phrase "No Cross, no Crown" has been true throughout the world's history, and it is true to-day. Heavily has the Cross weighed upon us during the four years and three months of the war's duration. Too many of those who have had to bear it are no longer with us to wear the Crown. The memory of the men who have made the supreme sacrifice deepens the solemnity of the hour, and sobers

WIRELESS INSTALLATION IN A LOFT ON THE WESTERN FRONT.
From a drawing in colour by Lieut. F. Leist, R.O.I., official artist to the Australian Forces.

our elation at victory. Many a wireless operator still at sea who received the Victory Message has survived the ordeal of being torpedoed by the pirates whose chiefs were forced at last to make a tardy surrender. A large number of their comrades, cut off in their prime through the same infernal agency, will never again manipulate a key or "listen in" to the messages of the ether waves. Being dead, they yet live; and cannot have been far away from their comrades at the great moment. Their heroism and their devotion to duty are handed on to their successors as a "Marconi Tradition," and we may be quite sure that no rejoicing can be deeper than theirs, that wireless has passed in triumph through the trials of the Great War to achieve the mighty destiny which awaits it in the Great Peace.

A "Surprise" Radio Appeal.

On October 31st last an Italian naval operator was "listening in" at Venice when a Marconigram dropped, as it were, "out of the blue." This message was addressed "To the Commander of the Fleet of the Entente." Its purport ran as follows:—

"The Committee of Public Safety of Trieste, in view of the grave state of the "city, wish to treat with the Entente Fleet. Come and meet us off Point Coarle. "Answer if you have received. We are waiting."

Dramatic indeed was the situation which had given rise to this wireless message. Two days previously the principal personages of all parties in this, Austria's principal seaport upon the Adriatic, had decided that the lack of order resulting from the disintegration of Austria demanded action upon their part. On the afternoon of October 29th they waited upon Baron von Fries Skene, the Lieutenant-Governor of the city, and demanded that he should hand over to their Committee of Public Safety the administration he was plainly powerless to conduct. After telegraphic communication with Vienna, the Governor complied, and asked for a safe conduct for himself and the naval commander of the port. His request was granted in both cases; and one of the delegates, Signor Pasigli, as he left the palace, stood up in his motor-car and proclaimed to the crowds waiting outside, "Trieste is no longer "Austrian—you are free."

It was from this committee, then, that the message emanated which dropped on Venice "all unawares." At the despatching end, members of the committee stood round the solitary wireless operator in Trieste as he discharged his functions. What would be the reply? The response came almost immediately. "All right, "quite all right." The anxious administrators heaved a sigh of relief, and asked whether, seeing they had only one operator, the Italian naval commander would wireless them his instructions at the fixed time of 9 p.m. Accordingly, punctually to the hour, Venice radiated a short message, instructing them that their representatives would be received on the following morning.

Three delegates boarded an ex-Austrian torpedo-boat and proceeded to Venice. They satisfied Admiral Marzolo of the great need of their city, and, before daybreak on the following day, twenty-four Italian units, strung in a long line over the sea, proceeded on their historic voyage. The procession was led by a destroyer conveying General Pettiti di Roreto, and, as the Italians landed, the surging crowd of citizens at Trieste broke all cordons in their struggle to approach the ships. Immediately the general placed his foot upon the ground, he proclaimed in stern and solemn tones, "In the name of His Majesty the King of Italy I take possession of the City "of Trieste." Thus was brought to a happy consummation the long-continued struggle of Italy to free her citizens on the eastern side of the Adriatic, handed over to Austrian tyranny by the iniquitous treaty of Campo Formio.

Through Tribulation to Glory.

Amidst the succession of thrilling incidents which have marked the last few weeks, the part played by that gallant general and most capable soldier, Sir Charles Townshend, in the closing scenes of the Turkish *débâcle* has been too generally overlooked. I am glad to notice that Colonel Repington has called attention to this omission in the *Morning Post*.

How the heart of the hero of Kut, kept though he was in honourable captivity, must have burned within him, when he realised that the work for which he had done and suffered so much was being accomplished by those he left behind him. Though in durance, his intercourse with the Osmanlis showed him plainly that Turkey was trembling upon the brink of surrender, and needed but a gentle push to urge her on the way. Man of action that he was, he disdained to sit in idleness, obedient to the doctrine of "wait and see." What steps could he take? Obviously his first task consisted of getting in touch with the Turkish Administration; his second to communicate with the British. He lost no time over it. On October 17th he interviewed Izzet Pasha, the Turkish Grand Vizier, and opened his eyes to the reality of the situation, learning from him on the other hand, the difficulties which stood in the path to peace.

Obtaining leave, he set out to accomplish the second item of his programme. Radiotelegraphy furnished him with the means. Once across the straits, General Townshend secured a special train to take him to Smyrna. Here he found himself in the midst of a population who lined the streets and cheered for peace as he drove through the town. So far secrecy had been maintained, but now—removed from Germany's sinister influence—his mission was openly avowed. In a tug he passed over the Turkish minefield at night, and before daybreak on October 20th reached Mitylene. Here wireless placed him in touch with England and he was able to report the situation to London. From Mitylene he proceeded to Mudros, accompanied by a Turkish naval officer, who was sent back with the least possible delay to fetch the duly accredited Turkish delegates.

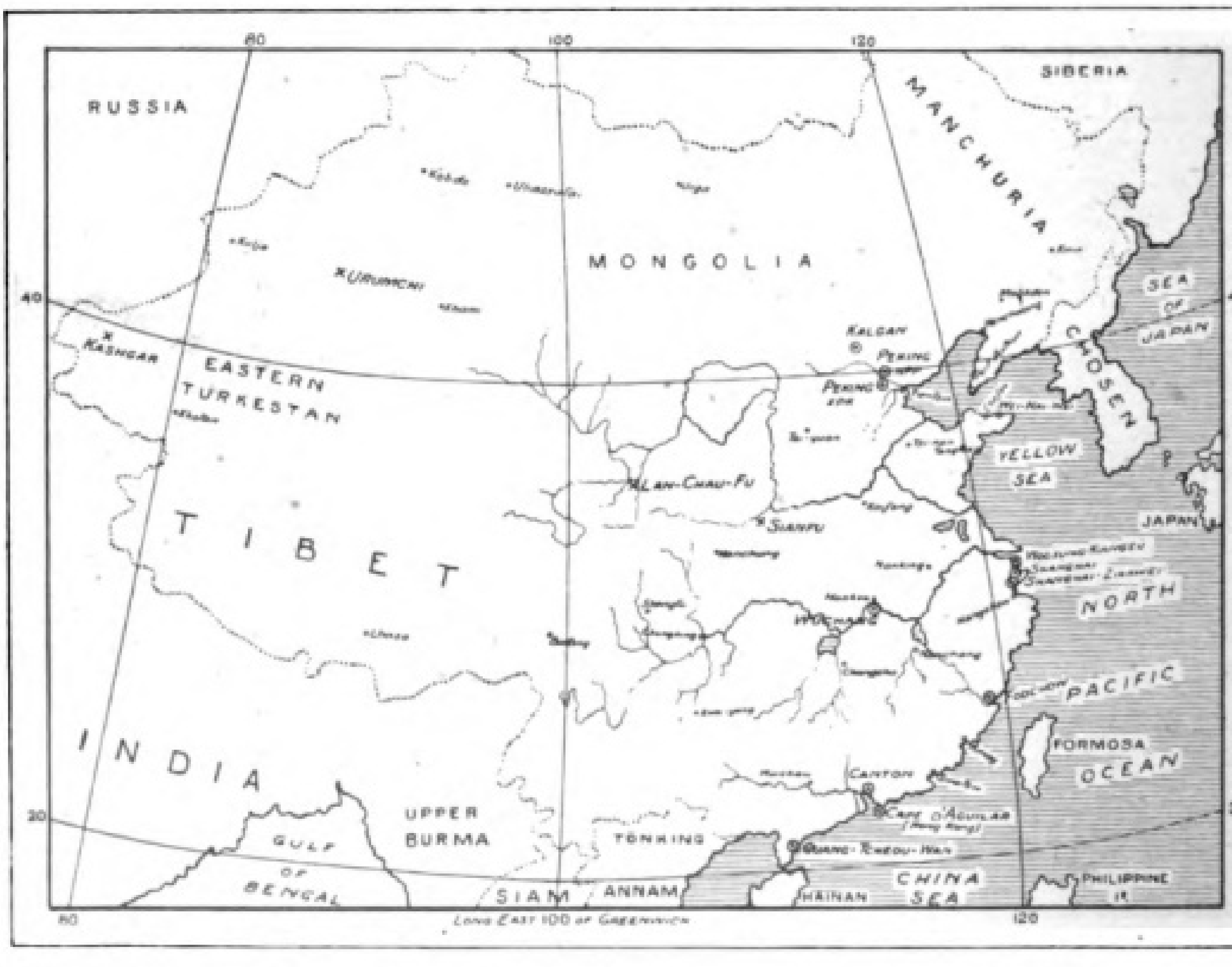
A PANORAMIC VIEW SHOWING THE HARBOUR AT TRIESTE.

Chinese Wireless Enterprise

Rapid transit of intelligence and speedy means of communication rank high amongst the more important needs of every country.

Judged by modern standards, China is sadly deficient in both respects, for, although it is traversed in all directions by numerous routes, none of them are paved or metalled and all are badly kept; the vast internal trade being mainly water-borne. Think of it! We have here an area (in many parts of extreme fertility) possessing a grand total of just under four million square miles, with a population estimated at three hundred and twenty millions. Yet this vast expanse and teeming population has to content itself with less than six thousand miles of railway and thirty-six thousand miles of telegraph wires! Small wonder that everyone who knows the facts dwells upon the possibilities here opened for development and expansion.

The benefits which could be bestowed upon such a community by wireless telegraphy are enormous. Up to the present its development has been almost entirely confined to the coastal fringe. China is intensely conservative and slow to move, but the people are intelligent and industrious. The lessons of the Great War, now at an unlamented end, have been by no means thrown away upon her.



THE EXISTING WIRELESS STATIONS ARE MARKED ◯, THOSE PROJECTED UNDER THE NEW SCHEME ARE MARKED X.

Prominent amongst these lessons stands out the importance of possessing a well-developed system of radio-telegraphy, and we have accordingly within the last few months seen a "stirring of the waters" and the conclusion of two important contracts relating thereto.

The Chinese realise their need of wireless, but are also sensible of a lack of "worldly gear." They have supplied the former need by contracting with the Marconi Company for two hundred wireless telephony sets, whilst they have arranged to meet the financial difficulty by borrowing £600,000 from the British Company, on the strength of Treasury Bonds bearing an interest of 8 per cent., repayable over a period of five years, the first instalment of liquidation to start after five years' time. These bonds have been placed upon the market by the Marconi Company and were immediately over-subscribed.

A second contract followed close on the heels of that above referred to, and—under its provisions—China will be furnished with a chain of stations spanning her vast territory, and giving the immense stimulus to trade which instantaneous communication inevitably brings in its train. On our sketch map will be found, marked with a cross, the position of the installations at present arranged for, at Kashgar, Urumchi, Langchowfu and Sianfu. The reasons for this selection of centres will be best gathered from the particulars which follow.

Kashgar, at one time the capital of an independent Mohammedan kingdom, lies in Eastern Turkestan. It stands in a rich oasis at the confluence of highways leading eastward to Pekin, southward to British India, and north to Russia. Urumchi, the Tihwa-Chou of the Chinese, constitutes the headquarters of the Chinese Government in Turkestan. It is surrounded by double walls and commands the only practicable defile for troops into the Eastern Provinces. Langchowfu, in Western China, was mentioned by the great Italian explorer, Marco Polo, in the thirteenth century and still remains the capital city of the Province of Kansu. It is situated amidst commanding heights and in a district containing coal mines. Sianfu (otherwise Singanfu), in the Hwang-ho Valley, is another of China's historic cities, standing at the centre of a vast wheat-field, and forming the point where a number of important trade routes converge.

[*Underwood & Underwood.*

CHINESE GIRLS MAKING EMBROIDERY.

The new stations will exceed in power and range of transmission any others in the Republic, and as a purely commercial overland telegraph circuit the scheme will constitute a world record. It is a source of no small satisfaction to reflect that this new departure in China is due to the enterprise of a British company, and that supervision of the construction will be conducted by a British engineer.

Wireless in Many Lands

Now that Belgium is being rapidly cleared of the enemy who has oppressed her so long, it would appear a fitting opportunity to turn our thoughts towards what Germany was doing when she invaded King Albert's territories. The British Press has repeatedly pointed out that she thereby violated international agreement to which she herself was party. This, however, conveys to the average newspaper reader simply that Germany broke faith; it does not emphasise the fact that it meant the levelling of a blow against the world's polity. Belgium was not only national, but international. That characteristic it owes to its history.

In the break-up of the Roman Empire the Franks over-ran the country and settled there. During feudal times the petty local rulers grouped themselves under the over-lordship of the Dukes of Burgundy. When Burgundy's most powerful ruler, Charles the Bold, met a violent death in 1477 this part of his dominions passed into the hands of the Austrian House of Hapsburg, and through them fell under Spanish dominion, remaining Catholic after the Netherlands had succeeded in forming a Protestant republic. The peace of Utrecht (which closed Marlborough's wars) transferred the Low Countries from the Spanish to the Austrian Hapsburgs, and under their dominion they rested until the French liberated them therefrom. When the European Powers re-arranged the map of Europe after the fall of Napoleon Bonaparte, Belgium was united with Holland. This experiment in statesmanship failed, and the London Congress of December 20th, 1830, recognised Belgian independence, placing it under international protection.

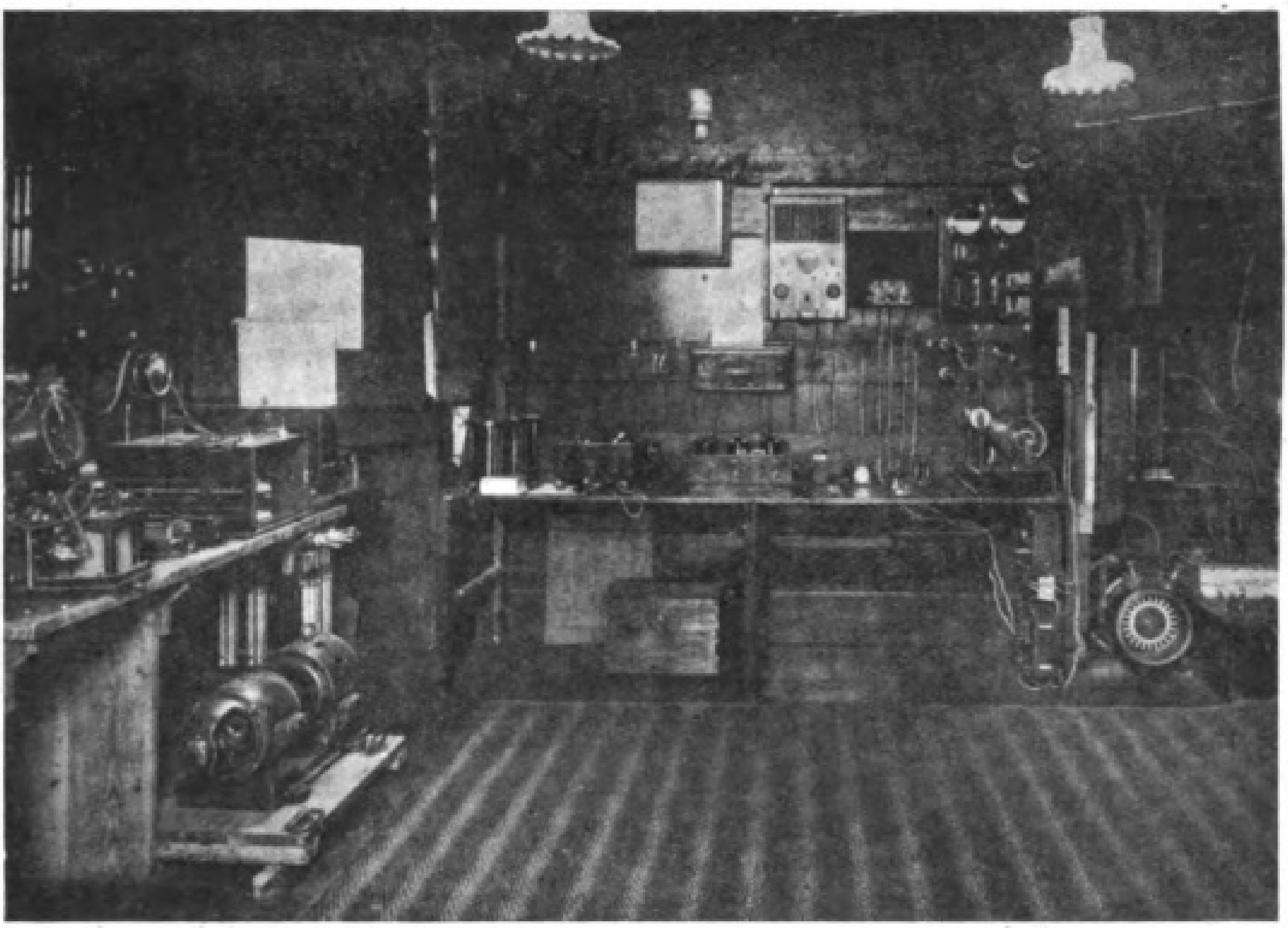
OUTSIDE THE SCHOOL IN ROTTERDAM.

It will thus be seen that Belgium has been subjected for a thousand years or so to a whole series of foreign rulers, and that the cohesive power of national feeling has enjoyed a chance of development of less than a century. When we remember that her population of mixed Germanic and Celtic origin are still classified by language into two fairly equal divisions, it is obvious that Belgian feeling lent itself in pre-war days naturally to international activities. The devotion to patriotism which her population has displayed all through this war has been, therefore, all the more a source of admiring wonder to us all.

Internationalism in pre-war days manifested itself in many directions. The colonies of the Belgian Congo were originally the private property of King Leopold, and next an internationally recognised "free State." Only since 1907–8 has it assumed the status of a colonial possession.

Radiotelegraphic organisation displays a similar trend. The Belgian company has embodied this fact in its title, that of the Société Anonyme Internationale de Télégraphie Sans Fil, and carries it out in actual working. It exploits wireless telegraphy on vessels of the mercantile marine of all European countries with the exception of our own, Italy, France, Germany and Austria.

When (under the title of Compagnie de Télégraphie Sans Fil) they first started business the young men engaged by them for service in the capacity of radio-telegraphists on board ship used to be sent to the school of the Marconi International Marine Communication Company at Liverpool, in order to undergo the customary course of training which sufficed to meet the requirements of those early days (1903).



THE INSTRUMENT ROOM IN THE ROTTERDAM SCHOOL.

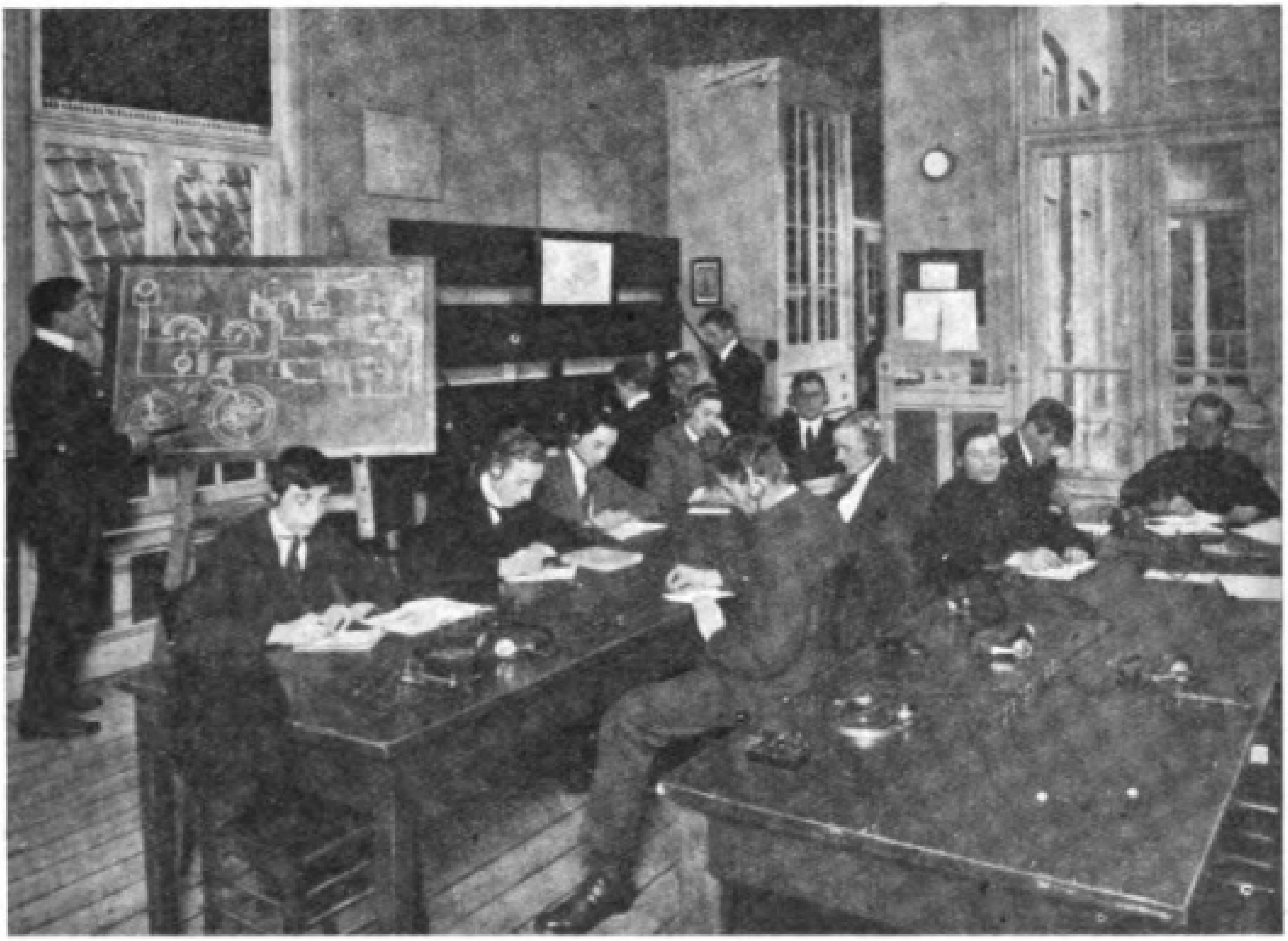
After receiving initial training in Liverpool, the students were placed on board ship as junior operators, there to complete their tuition. This method prevailed until 1909, when the fitting of Dutch merchant vessels began to expand very rapidly, with the result that the Belgian company fitted installations in a very large number of vessels registered in the Netherlands and in the Dutch East Indies. It was this development which was responsible for the establishment of a school, in February, 1910, at Rotterdam, where the first home of the school was located in the Tivoli Building. Here learners were trained in telephonic reception, in the theory of electricity and magnetism, and in the rules and regulations of the service. For opportunities of imparting practical tuition in the tracing of faults, as well as in the maintenance and manipulation of wireless gear, the company was indebted to the courteous permission of the Holland-America Line managers, who lent the wireless cabin of the s.s. *Rotterdam*, when in port, for that purpose. It was obvious that this arrangement could only serve as a makeshift, and the large number of pupils, belonging not only to Dutch but Danish, Norwegian, Swedish and Belgian nationality, who were attracted by the opportunities afforded caused larger premises to be taken. These were located in 1911 at 16 Boompjes, and early in 1914 the larger and more suitable building at 23a Boompjes was acquired for that purpose. The accompanying photographs of exterior and interior views will show the character of the present school. Later on the Belgian company established an inspectorate at Amsterdam, and took the opportunity at the same time of relieving the pressure upon their establishment in Rotterdam by opening a fresh school in the former city. The photograph which we reproduce on this page gives a very fair presentment of its handsome building, and the continued prosperity of these two radiotelegraphic training establishments in Holland speaks volumes for the rapid expansion of wireless and for the enterprise of the S.A.I.T. An arrangement has, moreover, been entered into with the Director of the School of Navigation at Amsterdam, providing that opportunities shall be given for enabling future officers of the Dutch mercantile marine to obtain the wireless instruction necessary for fitting them to qualify for the Netherlands Government's radiotelegraphic licence.

But the activities of the Belgian company, as we have seen, are far from being confined to the Low Countries, and circumstances have necessitated the provision of training centres for radiotelegraphists at Athens, Christiania, Lisbon, Barcelona, Bilbao and Cadiz, some of which we illustrate here.

THE BARCELONA SCHOOL FOR WIRELESS STUDENTS.

THE AMSTERDAM BUILDINGS.

In earlier days the S.A.I.T. made a rule to engage as telegraphic students only such applicants as were already able to receive Morse signals by sound at a minimum rate of fifteen words per minute. The rapid increase in the number of continental ships fitted with wireless which has come about during the past few years has caused this source of supply of students with some preliminary knowledge to be completely exhausted. Steps had therefore to be taken for starting with the absolute



PUPILS AT WORK IN THE SCHOOL AT AMSTERDAM.

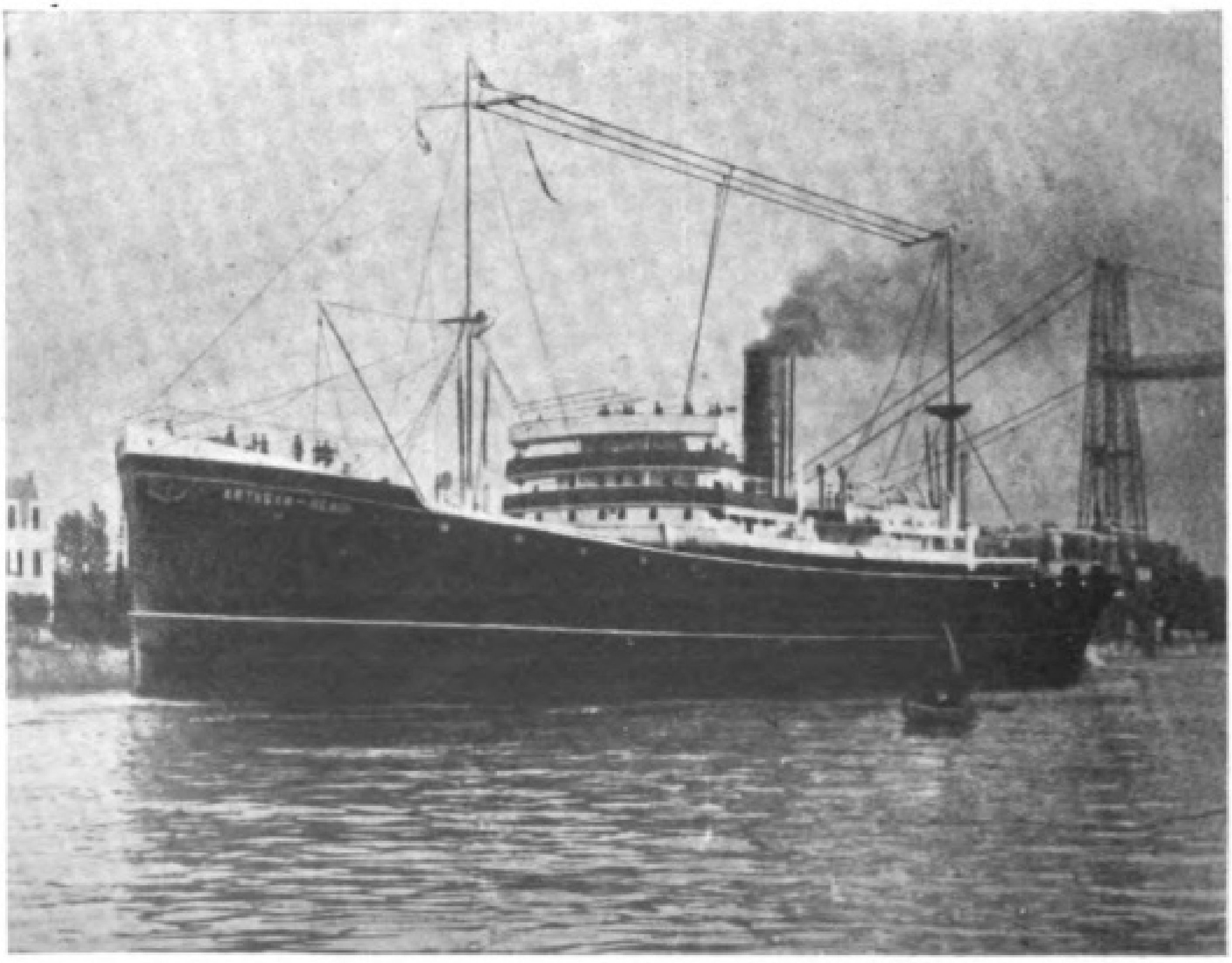
"Raw Material," and the curriculum was enlarged so as to give complete training to suitable applicants with no specialised knowledge whatsoever in telegraphy. Both day and evening classes to cater for this need have been opened at the various centres enumerated above, where for a small monthly fee pupils can be taken and trained *ab initio*. These extended classes have been placed at the disposal of ships' officers desirous of acquiring an insight into the practice of radiotelegraphy. In the course of last year a Royal Decree, promulgated by the King of Spain, rendered it compulsory for all Spanish ships of 500 tons and over to be equipped with wireless installations. This naturally gave a great impetus to the study of the science in Spain, and the existing school of the Belgian company, located at 5 Gran Via Layetana, in Barcelona, was organised to meet the demand thus created. A large number of students are receiving instruction at this school whilst other establishments have been opened, one at No. 5 Calle Zorilla, Cadiz, and another at 13 Calle Buenos Aires, Bilbao.

However, the good work done in this connection by the Belgian company, with the object of enabling the decree of the Spanish Government to be carried out, is further supplemented by the public spirited action of Messrs. Sota y Aznar, the well-known shipowners of Bilbao, who have arranged for tuition to be given in wireless to Spanish cadets on board their steamer the *Artagan-Mendi*, a fine specimen of marine architecture, which, built originally as a cadet ship at the Euskalduna Works, at Bilbao, has been pressed into the service of carrying cargo and constitutes perhaps the largest Spanish cargo vessel afloat. Our illustration depicts this new steamer lying at Bilbao; she started her maiden voyage on October 16th last year, and carries a wireless instructor in addition to the telegraphist. This instructor is supplied by the Belgian company, and his class is composed of sixteen pupils entered as cadets on board.

The Greek Government, in the course of 1917, enacted the compulsory establishment of wireless on all Government vessels of 300 tons dead weight and over, as well as for all vessels of 1,000 tons up. This enactment naturally brought in its train a fresh demand for wireless operators, and the Hellenic Government took in hand the task of establishing schools for the purpose of instructing young men to fill the vacancies. The Belgian company had been affording every assistance in their power, and their assistant inspector at Athens has been lent to the Greek Ministry of Marine for the purpose of instructing their pupils.

The few particulars which we have been able to enumerate above will serve to give an indication of the widespread nature of Belgian radiotelegraphic enterprise as exemplified in some of the many lands which form its field of operation, as well as to illustrate the point which we made in starting, with regard to the international character of Belgian activities. But, in justice to the company, we must ask that our examples shall not be taken as exhaustive. We have not referred, for instance, to the arrangement made with the Netherlands shipowners, whereby ships' officers can be given sufficient training at the Amsterdam and Rotterdam schools to equip them with sufficient knowledge successfully to undergo the Dutch Government's Second-Class Licence Examination. Nor have we made any allusion to the training which has been given in the S.A.I.T. Netherlands schools to Belgian soldiers interned in Holland during the course of the war, with the object of enabling them to acquire knowledge suitable for securing civil employment after the cessation of hostilities.

As a matter of fact, additions and developments have been going on even in war-time, and the immediate future is likely to witness a considerable expansion of radiotelegraphic activities in Belgium, so soon as peace conditions enable men's energies to be turned in fresh directions.



THE SPANISH STEAMER S.S. "ARTAGAN-MENDI," USED AS A TRAINING SCHOOL FOR WIRELESS CADETS.

The Design and Construction of Apparatus for the Wireless Transmission of Photographs

By MARCUS J. MARTIN

Article I.

ON pages 74 to 98 of the small handbook on *The Wireless Transmission of Photographs* a brief description is given of a system of radio-photography known as the "Telephograph," and this system, the outcome of several years' research work, is one that up to the present has given, from an experimental point of view, the most satisfactory results.

As far as the writer is aware very few articles, other than those which have appeared from time to time in THE WIRELESS WORLD, have been published on the telegraphic transmission of photographs either by wireless or other methods, and none whatever have appeared on the construction of photo-telegraphic apparatus.

The present series of articles, which deal exclusively with the design and construction of the apparatus used in the telephograph system of radio-photography, have been submitted with the purpose of supplying sufficient data to enable anyone who so desires to construct a similar experimental set of their own, but it must not be taken for granted that the methods and apparatus employed are the best to use for the purpose under discussion. It is a long step from the laboratory to commercial practicability, and as at the present time all radio-photographic systems are in a

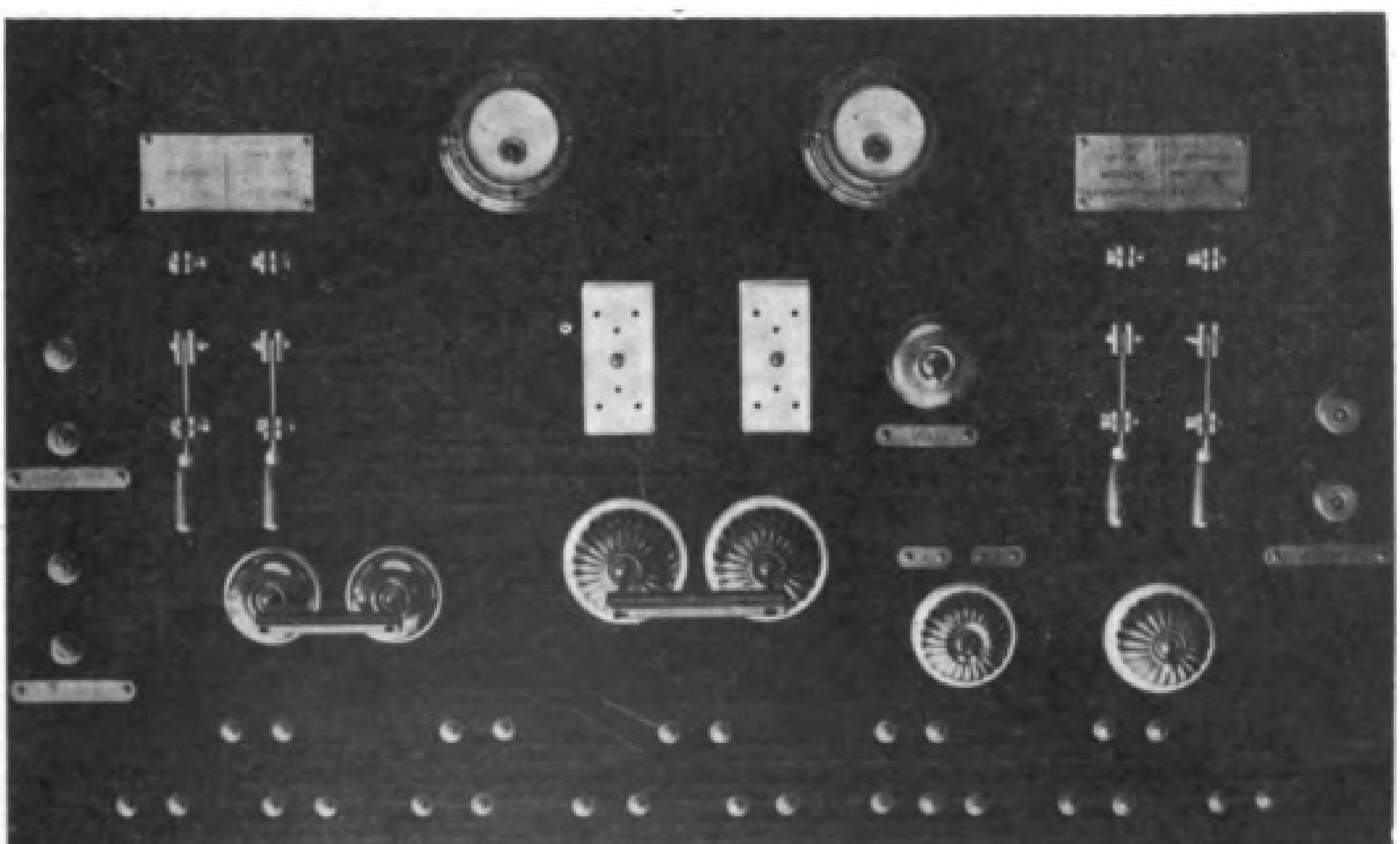


FIG. 1.

more or less experimental stage, there is a vast amount of original work to be undertaken before any wireless system can compete with the systems of photo-telegraphy at present in use for working over metallic conductors.

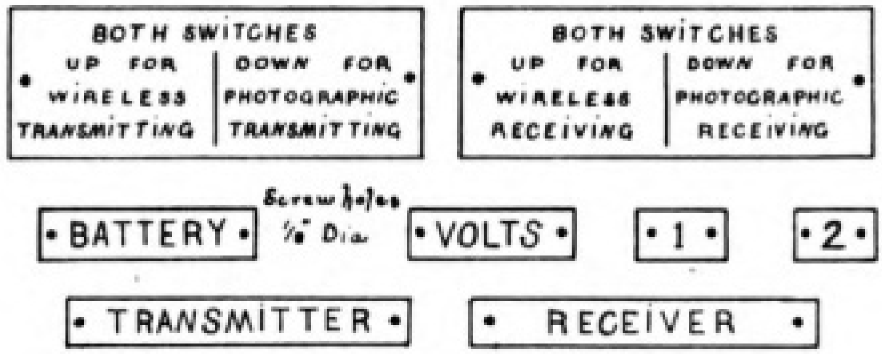


FIG. 2.—SWITCHBOARD NAME-PLATES.

While the information given in these articles is such as would enable a complete experimental station to be built, the main idea is to provide, for really serious workers, a practical groundwork from which improvements can be made that will eventually culminate in a really practical commercial system.

It should be noted, however, that under no conditions whatever can wireless apparatus of any description be constructed while the present restrictions are in force; therefore these articles will be confined entirely to the photo-telegraphic side of the subject, and only those pieces of apparatus described that in no way infringe the regulations.

From a study of the description and diagrams given in the volume already referred to it will be seen that numerous pieces of apparatus are employed worked

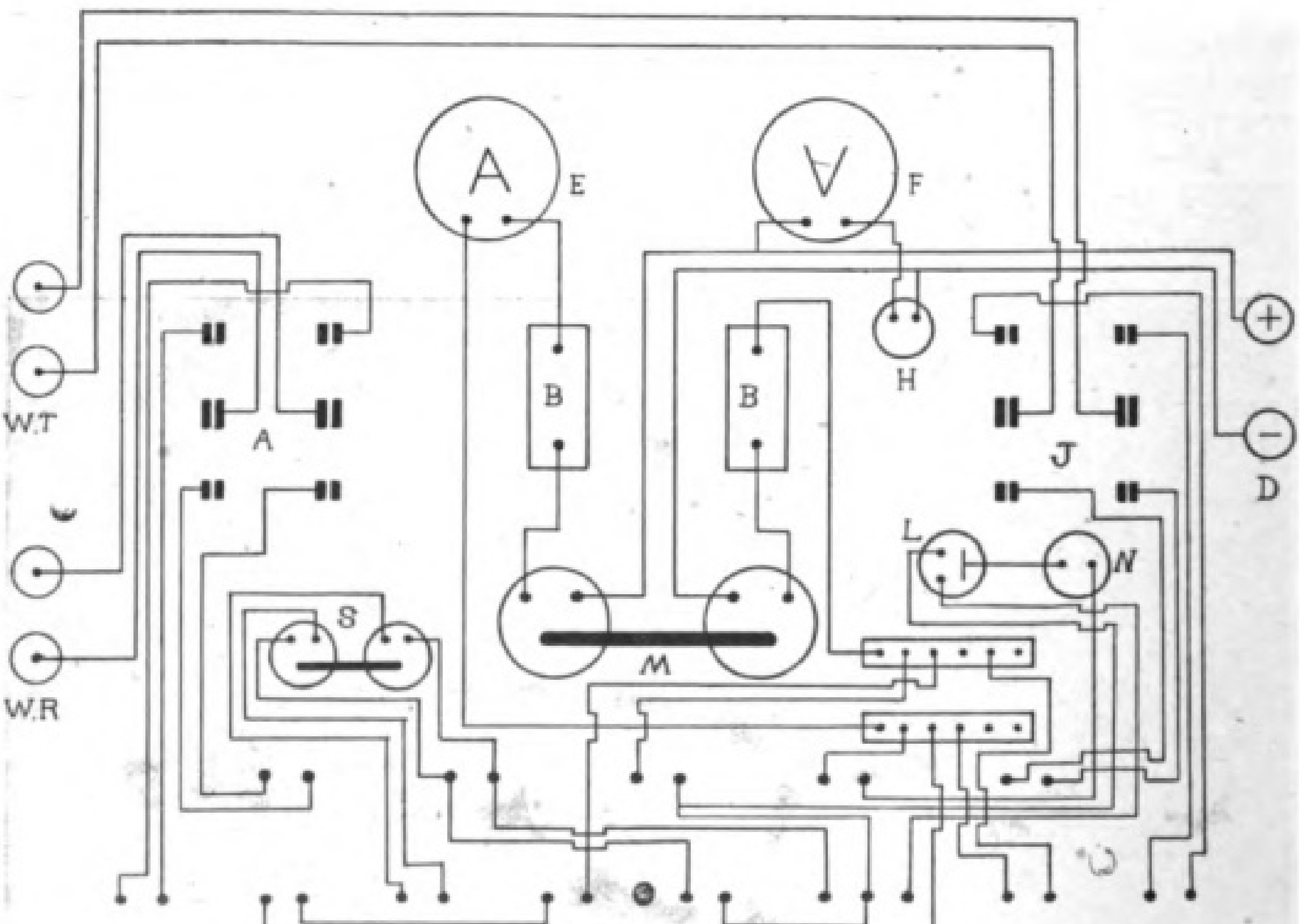


FIG. 3.—F, VOLTMETER; E, AMMETER; A, WIRELESS RECEIVING C.O. SWITCHES; J, WIRELESS TRANSMITTING C.O. SWITCHES; H, VOLTMETER SWITCH; D, BATTERY TERMINALS; M, MAIN SWITCH; B, FUSES; L, 5-AMP. LAMP SWITCH; N, TWO-WAY SWITCH; S, 5-AMP. D.P. SWITCH; W.T., WIRELESS TRANSMITTING TERMINALS; W.R., WIRELESS RECEIVING TERMINALS.

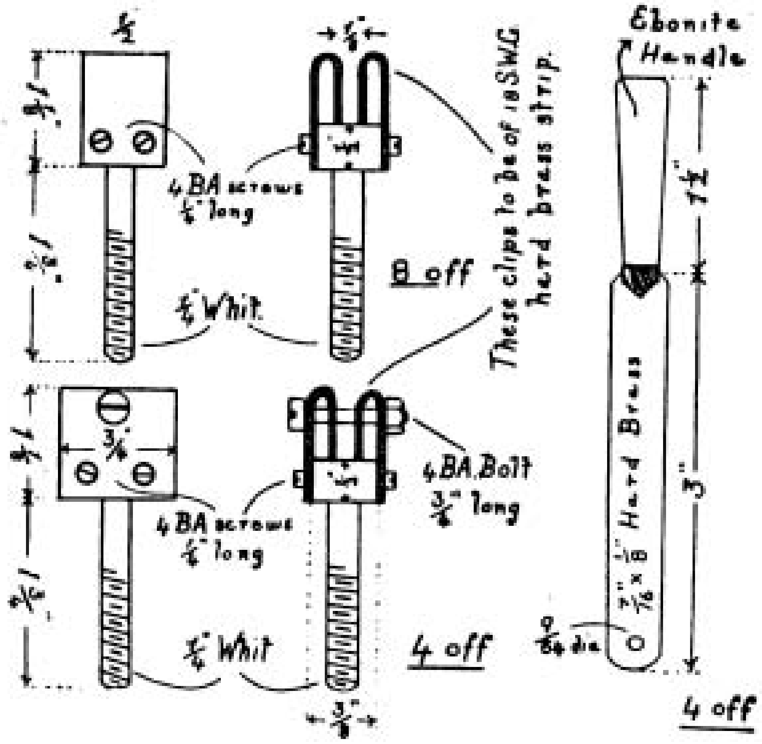


FIG. 4.—DETAILS OF CONSTRUCTION OF S. P. C. O. KNIFE SWITCHES.

from several independent sets of batteries, the various operations being controlled through a number of switches. For ease in connecting up and operating and for the quick tracing of faults the switchboard about to be described was designed, the idea being to dispense with the several sets of batteries and to work the instruments from a main source of supply, and to include the major portion of the wiring on the board and so render it only necessary to run leads from the different instruments to their respective terminals on the board.

The disposition of the meters, switches, etc., will readily be seen by reference to Figs. 1 and 2, and the wiring and other arrangements from Figs. 3, 4, 5, 6 and 7.

The board, of polished mahogany, measures 48 in. long by 30 in. wide by 1 in. thick, a recess 1½ in. deep being provided at the back for the protection of the connections. The fittings on the board consist of the following: 1 volt and ammeter of the spring-controlled type, reading 0-20; 1 voltmeter switch; 1 10-ampere double-pole main switch; 1 5-ampere single-pole tumbler switch; 4 single-pole change-over knife switches; 1 5-ampere single-pole two-way tumbler switch; 1 5-ampere double-pole tumbler switch; 2 10-ampere cut-outs; 2 terminal blocks, instruction plates and terminals. A drawing of the S.P. change-over knife switches *J* and *A* is given in Fig. 4; but these can, if desired, be replaced by D.P. change-over tumbler switches. The position of the terminal blocks, and also the connections at the back of the board, is given in the wiring diagram, Fig. 3.

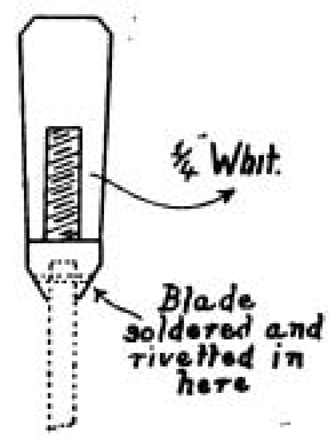


FIG. 4A.—METHOD OF SECURING BLADE AND HANDLE.

The wiring from the terminals at the bottom of the board, numbered 1 to 13, to the various instruments is given in the diagram Fig. 7. Leads run from terminals marked 1 on the board to the local terminals on the relay *S*; from terminals 2 to wireless sending key; from terminals 3 one lead runs to contact spring on the shaft of machine, and the other lead to one terminal of coil winding of relay *S*; from terminals 4 to coil windings of relay *K*; from terminals 5 to circuit breaker on machine; from terminals 6 to clutch; from terminals 7 to contact breaker *L*; from terminals 8 to local contacts of telephone relay *U*; from terminals 9 to photographic receiver; from terminals 10 to telephone relay windings; from terminals 11 to telephones; from terminals 12 to coil windings of contact breaker *L*; from terminals 13 to local contacts of relay *K*.

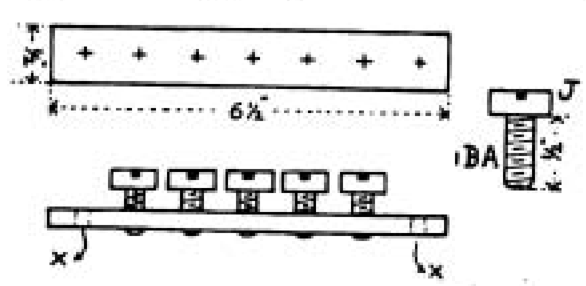


FIG. 5.

The various circuits can easily be traced by reference to Figs. 3 and 7 accompanying this article, and Figs. 35 and 51 in the volume already referred to. The terminal blocks, which are situated in a convenient position at the back of the board, are given in detail in Fig. 5. They consist of two pieces of brass bar, $6\frac{3}{4}$ in. by $\frac{1}{2}$ in. by $\frac{1}{4}$ in., the $\frac{3}{16}$ in. diameter holes X to take the holding down screws being drilled $\frac{3}{8}$ in. from the end. The remaining holes are spaced 1 in. apart and drilled and tapped 2BA to take the screws J, ten of which will be required, together with ten 2BA plain brass washers. The two rows of terminals at the bottom of the board are made from 3BA cheese-headed brass screws, $1\frac{3}{4}$ in. long, 27 of which will be necessary, together with 54 brass hexagon nuts (standard size) and 27 plain brass washers. Their arrangement is given in Fig. 6. The instrument leads are composed of fairly heavy silk-covered flexible cord, the ends being provided with thimbles for attaching to terminals. Their length will, of course, depend upon the distance of the board from the various instruments. The terminals should be numbered at the back of the board to facilitate wiring up. The instruction plates are cut from 18 gauge sheet brass and engraved with wording as shown in Fig. 2, the engraving being afterwards filled with black wax.

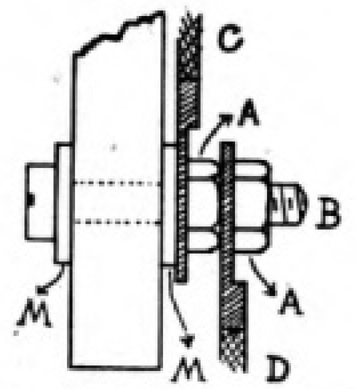


FIG. 6.—M, WASHERS; A, HEXAGON NUTS; C, PERMANENT CONNECTION; D, INSTRUMENT LEAD; B, SCREW.

The method of working with this switchboard is somewhat similar to that given on page 95 of the volume mentioned, and is as follows: At the transmitting station, everything being ready for work, the change-over switches J are placed in the position for photographic transmitting (switches down). The switch L is closed and the two-way switch N is placed on No. 1 contact, and the closing of these switches brings the clutch F into action and the machine begins to revolve. As soon as the whole of the line print has been transmitted the end of the machine shaft D, Fig. 36, engages with the spring m, breaking the clutch circuit and allowing the motor to run free. As soon as the machine stops, the switches L and N are opened and the machine drum run back to the starting position by hand.

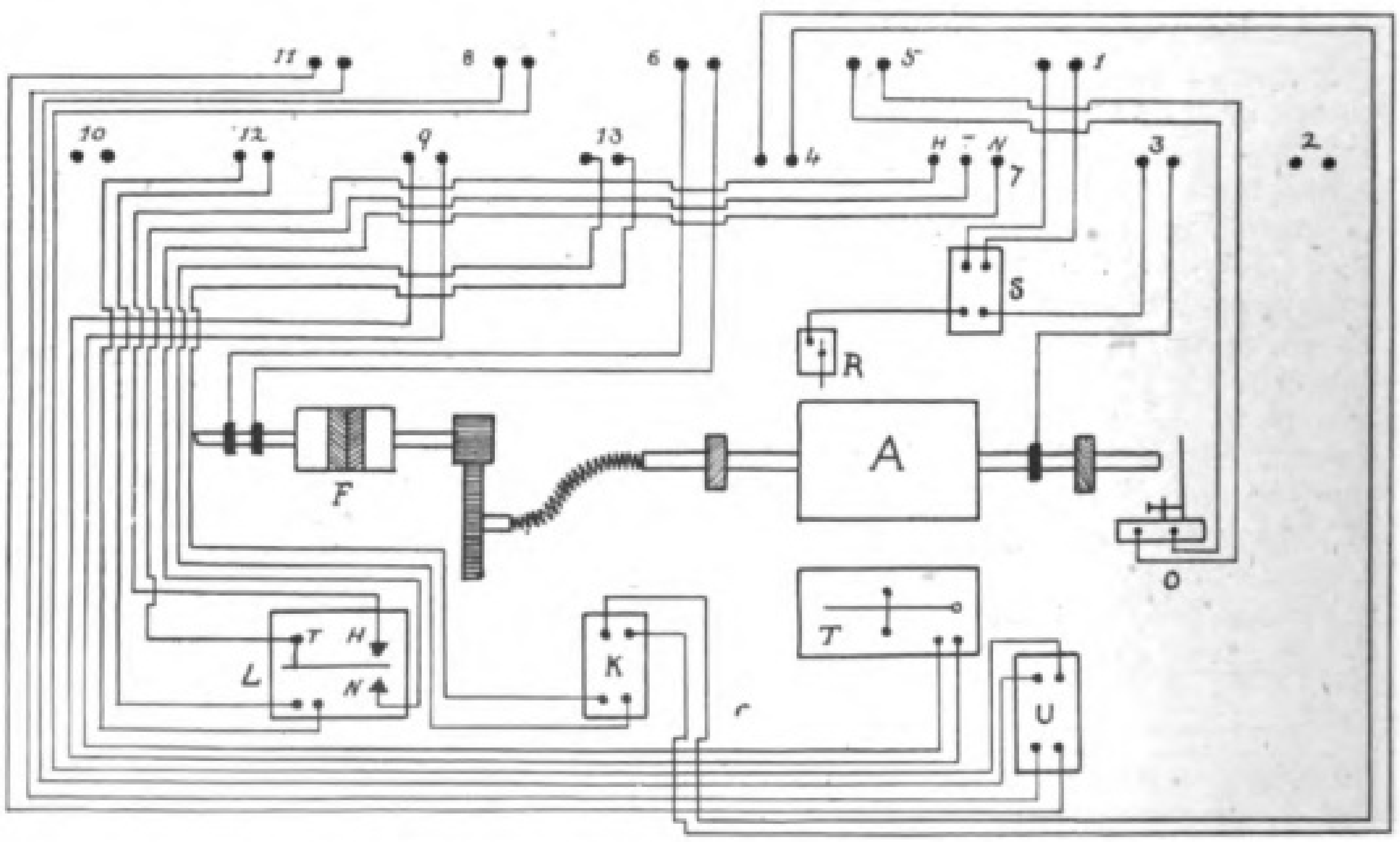


FIG. 7.—S, RELAY; R, STYLUS; T, RECEIVING INSTRUMENT; A, MACHINE; F, CLUTCH; O, CIRCUIT BREAKER; U, TELEPHONE RELAY; K, POLARISED RELAY; L, CONTACT BREAKER.

At the receiving station the change-over switches *A* are placed in the position for photographic receiving (switches down), the switch *S* being open. The switch *L* is closed and the two-way switch *N* is placed on No. 2 contact. The closing of these switches does not bring the clutch *F* into operation until current from the telephone relay *U*, connected to the wireless receiving apparatus, operates the polarised relay *K*, which in turn completes the circuit of the circuit breaker *L*. When the armature of *L* is attracted, the circuit of the relay *K* is broken, the circuit of the clutch *F* is completed and the machine starts revolving. By keeping the switch *S* open the whole of the minute current from the telephone relay *U* is used to actuate the relay *K*. As soon as the clutch comes into operation and the machine starts revolving, the switch *S* is closed, the current from the telephone relay then passing into the photographic receiver as the circuit of the relay *K* is automatically broken by the circuit breaker *L*. As soon as the whole of the picture has been received and the machine breaks the clutch circuit, the switches *L* and *N* are opened and the machine drum run back to its starting position by hand.

(*To be continued.*)

Viva l'Italia!

We offer our heartiest congratulations to the Fatherland of Marconi on the completeness with which the valour of the sons of Italy has attained her national aspirations. The special difficulties under which she has laboured all through this mighty struggle have been stupendous. Right richly has she deserved her success. May the bonds which have all through history united the countries which share the glory of being Senatore Marconi's birthplace and the locale of his strenuous radiotelegraphic activities knit the two nations even closer in the future than they have done in the past.

[*Official Photo—Associated Illustrations.*

WITH THE ALLIED FORCES ON THE ITALIAN FRONT. SENATORE MARCONI IN COMPANY WITH THREE BRITISH WIRELESS EXPERTS.

In Memoriam

We chronicle with deep regret the passing, within a short period of each other, of Messrs. William Rushbrooke Dale-James, Frank Gray, and Clarence Campbell Armstrong, highly esteemed members of the staff of the Marconi International Marine Communication Co., Ltd., doing duty on shore. Well known to most seniors, and to many juniors in the Company's employ, they possessed the respect and goodwill of all with whom they were associated during their several years of service on sea and land, and who now offer condolence with the families of the departed.

W. R. DALE-JAMES.

The Marconi Company, and the staffs to which the deceased were attached, were represented at the obsequies, floral tributes from each being sent as a last mark of regard.

Mr. Dale-James was born at Sheffield, and at the time of his death on October 20th was in his thirty-sixth year. He was educated at St. Olave's Grammar School, Southwark, and, on leaving, entered the metallurgical laboratories of a Sheffield firm of steel manufacturers. After three years' experience of this work, Mr. Dale-James took a course in wireless telegraphy at the London Telegraph Training College, and joined the Seaforth School of the Marconi Company on April 10th, 1908. On qualifying he was appointed to the land station at Rosslare, subsequently being transferred to Crookhaven. After a considerable experience of handling wireless traffic from ship to shore Mr. Dale-James was transferred to the sea-going staff, and sailed in various ships of the Cunard, White Star, and C.P.R. Lines. In 1911 he was transferred to the Belgian Company, and sailed in several Spanish liners. On returning to England in 1913, he was appointed to the *Marmora* and made Travelling Inspector. Whilst attached to this vessel Mr. Dale-James served through her first commission as an auxiliary, subsequently transferring to the s.s. *Saxon*, from which he retransferred to the P. & O. Line.

F. GRAY.

At the end of 1916 Mr. Dale-James took up instruction work in the London School, and represented the Company's interest in the free training scheme at Newcastle-on-Tyne, and, later, at Portsmouth. More recently he acted as holiday relief to the Superintendent at Southampton, and at the time of his death was temporarily in charge of the East Ham Depot.

Mr. Gray, who died on September 23rd, was only twenty-five years of age, and was engaged in instruction work in the London Marconi School. He was educated at the Wesleyan School, Kentish Town, and was the first member of the Evening Classes, comprising about 100 students, to gain the First Class P.M.G. Certificate and graduate to the Day Classes. On appointment to the staff on May 11th, 1913, he joined the s.s. *Uranium*, subsequently serving on the s.s. *Denbighshire*, *Kestalia*, and, among others, the s.s. *Tuscania*, *City of Paris*, *Obuasi*, and *Themistocles*.

C. C. ARMSTRONG.

Mr. Armstrong was a native of Melbourne, Australia, and was educated in that city at Fitzroy Grammar School. He received his training at the Warrington Wireless School, and joined the Marconi Company with a first-class certificate. On appointment to the staff, on September 22nd, 1912, he took duty on the s.s. *Armenian*, and, amongst other vessels, served on the s.s. *Oropesa*, *Runic*, and the Dublin-Holyhead mail boats. In March, 1916, he was attached to the Southampton depot for inspection work, where he died on October 21st, in his thirty-third year.

Among the Operators

It is still our sad duty to record the death of the brave operators who have lost their lives at sea, by enemy action, in the wireless service of their country. Unfortunately, the list is not yet exhausted, but now that peace is upon us, we sincerely trust that the names yet remaining to be published next month will mark the end of it. The lives of the operators mentioned this month have been sacrificed as the result of hostile activities. Both on our own part, and on that of our numerous readers, we extend to the parents and relatives of these young men, who so nobly uphold the "wireless tradition," the deepest sympathy in their sad bereavement.

MR. WILFRED FRANK FREEMAN, formerly employed as chemist's assistant at Birmingham University, and at Messrs. Philip Harris and Company, Ltd., was born at King's Norton on December 22nd, 1899, and educated at Dennis Road Council School, and the Central Secondary School, Birmingham. He was trained at the City School of Wireless Telegraphy, Ltd., Manchester, and after gaining the P.M.G. Certificate appointed to the operating staff in April, 1917.

Born at Claines, near Droitwich, on March 24th, 1899, MR. THOMAS OWEN PRICE was educated at the Elementary School and the Grammar School, Bromyard, Worcester, and trained at the North British Wireless Schools, Ltd., Edinburgh. He received the P.M.G. Certificate, and was given an appointment by the Marconi Company in May, 1916.

MR. WILLIAM CHEETHAM was born at Oldham on August 19th, 1900, and went to the Waterloo Council School for his education. Commencing his career as a solicitor's clerk with Messrs. Ascroft, Maw, and Shimeld, he subsequently attended the City School of Wireless Telegraphy, Ltd., Manchester, and obtained the P.M.G. Certificate. Mr. Cheetham's service with the Marconi Company dated from March of this year.

Of Scottish birth, MR. DAVID MCGREGOR BRYCE, aged eighteen and a few months, was born at Irvine, Ayrshire. He received his education at Carluke Higher Grade School. Starting life as a mechanic at Messrs. Apthorpe's Motor Supplies, Glasgow, he turned his ambition to wireless telegraphy, and was trained at the North British Wireless Schools, Ltd., Glasgow, where he gained the P.M.G. Certificate. Mr. Bryce was appointed to the Marconi Company's staff in August last.

MR. CECIL BRICKELL was born at Petersfield on January 19th, 1901. He was educated at Alton National School, Eggars Grammar School, and Aldershot and County Secondary School. His training in radiotelegraphy was received at Marconi House School, and on qualifying for the P.M.G. Certificate Mr. Brickell was placed on the staff of the Marconi Company on September 30th, 1917.

Bedminster, near Bristol, was the birthplace of MR. EDWARD JAMES PHILLIPS, on January 26th, 1900. After receiving his education at the Boys' Holyrood Council School, and the Boys' Grammar School, Ilminster, he was employed in the office of the Clerk to the Guardians and Rural Council of Chard, subsequently being trained in wireless telegraphy at Marconi House School. He won the P.M.G. Certificate, and on May 6th last joined the operating staff of the Marconi Company.

MR. ARTHUR BYATT, born at Harrogate on June 3rd, 1900, was educated at the Municipal Secondary Day School there, and started his career as a chemist's apprentice. His wireless training was received from the Marconi instructors at the Central Technical School, Leeds, and on receipt of the P.M.G. Certificate he proceeded to sea in the Marconi Company's service in May of this year.

ROLL OF HONOUR.

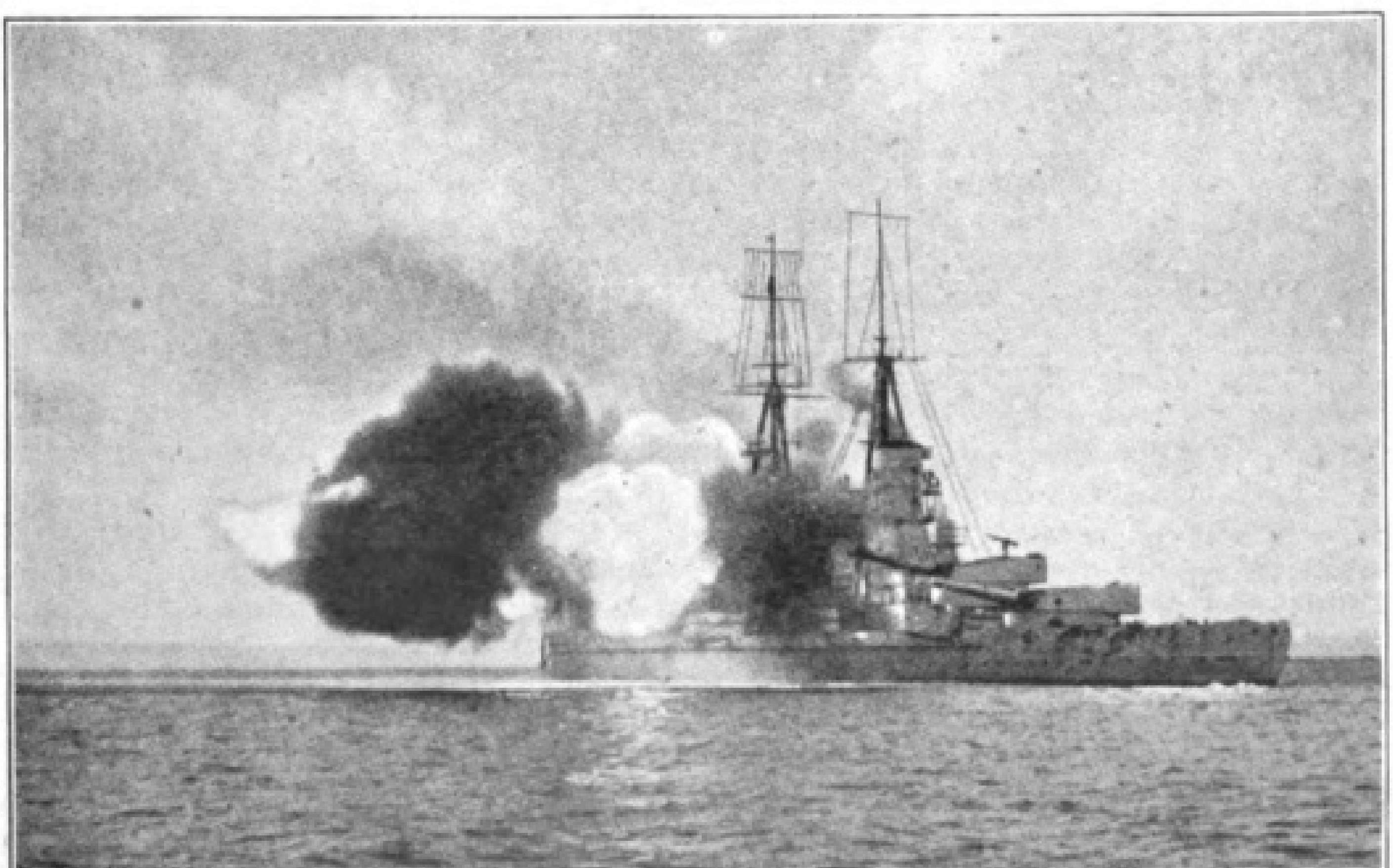
MR. JOHN DICKSON was born on June 15th, 1901, at Edinburgh, and received his education at Flora Stevenson's Board School. He was in the employ of Messrs. Lamb, Reid, Ltd., Fruit Salesmen, Edinburgh, and left that firm to take up wireless telegraphy. Trained at the North British Wireless Schools, Ltd., Edinburgh, Mr. Dickson qualified for the P.M.G. Certificate, and entered the service of the Marconi Company in July, 1917.

Born on May 9th, 1899, at Airdrie, Lanarkshire, MR. JOHN TAGUE was educated at St. Margaret's School, Airdrie, and afterwards was employed as a miner. Trained in wireless telegraphy at the North British Wireless Schools, Ltd., Glasgow, he obtained the P.M.G. Certificate, and joined the Marconi Company's staff on January 2nd this year.

Formerly a clerk, MR. ALFRED GEORGE BATES was born at Regent's Park on July 19th, 1899, and educated at the L.C.C. Schools at Mina Road, Camberwell; Eglinton Road, Plumstead; and Alexis Street, Bermondsey. He was admitted to the course of training at Marconi House School, and received the P.M.G. Certificate. Mr. Bates entered the Marconi service in August, 1917.

MR. STUART HAY MURRAY was born on August 14th, 1901, at Kilmadock, and attended Deanston Public School, Doune; the High School, Stirling; and the Royal Technical College Navigation School, Glasgow. His training in radiotelegraphy, under Marconi instructors, was received at the latter college. On gaining the P.M.G. Certificate, Mr. Murray was placed on the Marconi Company's operating staff last April.

MR. THOMAS NORMAN TELFORD LEACH first saw the light at Redhill, Surrey, on October 20th, 1900, and pursued his studies at Abingdon Grammar School. He was a student at Marconi House School, and successfully passed the P.M.G. Examination. On receipt of the Certificate, Mr. Leach was appointed a seagoing operator in April last.



[*Italian Naval Official.*

AN ITALIAN DREADNOUGHT FIRING BROADSIDES.

Instructional Article

NEW SERIES (No. 9).

EDITORIAL NOTE:—Below we give the ninth of a new series of twelve Instructional Articles devoted to PHYSICS FOR WIRELESS STUDENTS. *Although at first sight the subject of physics would not seem to have a very intimate connection with wireless telegraphy, yet a sound knowledge of this subject will be found of the greatest use in understanding many of the phenomena met with in everyday radiotelegraphy. As in previous series, the articles are being prepared by a wireless man for wireless men, and will therefore be found of the greatest practical value.*

CONDITIONS NECESSARY FOR CHEMICAL ACTION (continued).

Light.—In the last article it was explained that in many cases the mere contact of two substances is not sufficient to cause chemical action to take place between them and that therefore energy has to be supplied to the atomic systems from an external source ; instances were given in which this added energy is supplied in the form of heat. The energy of light is another potent agent in many chemical actions.

Examples.—(1) Hydrogen and chlorine when mixed will not combine in the dark. On the exposure of the mixture to sunlight chemical action occurs and hydrochloric acid is formed.

(2) A very familiar example of chemical action by the energy of light is that which takes place when a photographic plate is " exposed," or when sensitised paper is left in the light. Briefly, if silver chloride, silver iodide, or silver bromide is exposed to light, coloured compounds, the exact composition of which is not precisely known, are formed. On these phenomena the photographic art mainly rests. Salts of other elements may be employed, but there can be no photography without light, and however complicated the process may be it depends upon chemical action induced by light.

(3) The reader may have noticed that, as a rule, green foliage is absent from places where the sunlight does not penetrate. In woods where the ground is in perpetual shadow green plant life does not flourish. Green plants quickly become blanched if kept in darkness, and every gardener knows that to produce good *white* celery he must earth it up well. The compound which is responsible for the green colour of vegetable life is chlorophyll and its production depends, so biologists believe, upon conditions of light and heat, its function being to nourish plants by absorbing carbon dioxide from the air. The point to note is that radiant energy from the sunlight produces vital chemical action within the tissues of plants.

Sound.—There are certain cases of chemical action known to occur through the agency of sound. If contact is insufficient we have to swing the atoms of different substances nearer to each other, or, in the case of a single substance to cause the atoms to swing so far apart that they remain so. (*See* the case of mercuric oxide, WIRELESS WORLD, November.) Heat is generally capable of performing the part of disturber but in the case of acetylene gas sound fulfils this part. A molecule of acetylene is composed of two atoms of carbon in combination with two atoms of hydrogen, and if exposed to the detonation of mercury fulminate it will break up. The carbon atoms are deposited on the sides of the vessel and the hydrogen is freed.

Carbon bisulphide also can be decomposed by this method.

Electricity.—If a current of electricity is passed through acidulated water the latter is decomposed into hydrogen and oxygen—a typical example of chemical action taking place through the agency of electricity. Very many instances of **chemical decomposition** by **electrolysis** could be given. A case of **chemical combination** by electrical means has already been mentioned, that of the production of ozone, the allotrope of oxygen, by the passage of an electric spark through air. This is referred to again in order to make it clear that electricity can act as a system-builder as well as a system-breaker.

Pressure.—Chemical action will sometimes occur under the stimulus of pressure. Thus, if finely powdered lead is mixed with sulphur the two substances will combine if subjected to great mechanical pressure, forming lead sulphide.

If potassium chlorate mixed with sulphur is given a sharp blow with a hammer chemical action ensues accompanied by an explosion. If the reader is tempted to try this let him exercise great care whilst making the mixture, and then use only a pinch at a time. Potassium chlorate is liable to explode whilst being powdered by itself in a mortar and when mixed with red phosphorus it will decompose very violently if merely rubbed. On account of its strongly marked pyrotechnic qualities potassium chlorate is largely used in the manufacture of matches, flares and fireworks.

THERMAL EFFECTS OF CHEMICAL ACTION.

We have not yet completely exhausted the list of agents which will induce chemical action, but those mentioned are the most important. If the reader will refer back he will notice that with the exception of the essential condition of contact in cases where two or more substances are employed, each of the agents imparts energy to the system of molecules or atoms to which it is applied. So that whether the agent be heat or electricity or light the result is to alter the motions or positions of the material particles and to disturb their original grouping, causing decomposition, combination or some other form of chemical action. The amount of energy we have to supply depends, as has been explained, upon the degree of attraction existing between the atoms of the original molecules. As chlorine has a strong affinity for hydrogen, chloride of hydrogen is a very stable compound and in order to decompose it we have to bring in a large amount of energy; on the contrary, trichloride of nitrogen is so unstable that its atoms fly apart if it is submitted to a slight mechanical shock. It is desirable that we should be quite clear about the meaning of stability and instability because we are now going to think about what relation these qualities bear to the heat effects of chemical action.

Exothermic Chemical Action.—We have constantly tried to keep the student's mind fixed on the all-important question of energy and he may have been struck by the fact that a number of cases have been given in which chemical action occurs accompanied by the evolution of heat or of heat, light, and sound, such as an explosion—accompanied, that is to say, by the transformation of energy into a form in which it is generally of little or no use. Every chemical action has a heat effect. Sometimes heat is evolved and lost; sometimes heat is absorbed, and sometimes it is evolved but at once transformed into another form of energy.

A chemical action which results in **an output of heat** is called an **exothermic action.** We have seen that the stable compounds require more energy to bring about their decomposition than do the unstable ones because their atoms are harder to swing apart on account of their strong mutual attraction. It may, therefore, be concluded that if the decomposition of a molecule demands a large addition of energy to the system, *this must be the reverse of what happened when the molecule was formed—i.e.*, a large *output* of energy. In other words, if during a chemical action much heat is evolved—that is, if the action is exothermic—we may be sure that to *reverse* the action that heat or its equivalent of some other form of energy will have to be given back.

It also follows, generally, that exothermic actions tend towards the production of stable molecular systems. A molecule composed of two kinds of atoms, each of which kind has a marked affinity for the other, is generally the result of vigorous chemical action characterised by the transformation of much energy and may be regarded as stable because much energy would be necessary to undo the result of that action. It must be understood, however, that a compound molecule resulting from an exothermic action may not *necessarily* undergo decomposition by the mere application of heat; chemical actions are not in all cases so easily reversed.

Example.—Exothermic Action.—If hydrogen is mixed with chlorine and a lighted taper is applied to the mixture the two gases combine with violence, the action being highly exothermic. As might be expected, hydrochloric acid, the resultant compound, is extremely stable and in order to decompose it great heat—upwards of 1,500 deg. C.—has to be employed. This particular example happens to be that of an exothermic action which is reversible by the application of heat.

It must not be thought that the *whole* amount of heat evolved during an exothermic action is due to chemical action. Every chemical change gives rise to a physical change, and as a physical change results in an energy-transformation it is obvious that some of the energy given out when an exothermic chemical action occurs is due to the physical change which takes place at the same time.

Endothermic Chemical Action.—In some instances chemical action results in the **absorption of heat.** This class of action is called endothermic, and as it is the reverse of exothermic we may say that when a chemical action produces an absorption of heat, that heat must be given up when the action is reversed.

Generally speaking, if the formation of an atomic system requires the addition of much energy the component atoms have not a strong affinity for each other, and, therefore, for the decomposition of the molecule only a small impulse is needed. In other words, compounds formed as a result of endothermic action are in many cases unstable and during their decomposition—*i.e.*, the reverse of the said endothermic action—they evolve a large amount of heat.

Example.—Endothermic Action.—The production of carbon bisulphide, which is brought about by the direct union of sulphur and carbon, involves the absorption of heat. As might be expected carbon bisulphide is not particularly stable and when it decomposes heat is evolved.

HEAT AND TEMPERATURE.

Heat is the energy of molecular motion and as such it is, of course, without weight. Hence a body weighs the same whether it is hot or cold, provided that when it is heated no chemical action occurs which would alter the amount of matter in it. The difference between heat and temperature, not always clearly understood, may be explained as follows. Heat is energy which is manifested to a sense akin to that of touch by a certain effect; *the intensity of this effect* is temperature. The nature of the effect is too familiar to need description; we perceive it by means of our sense of heat or cold. Heat must be regarded as a physical *thing*, but temperature as that state of a body which decides whether it will receive heat from, or impart heat to, another body; for if two bodies are brought into contact with each other the one with the higher temperature will deliver heat to the other until each has the same temperature. A small piece of red-hot metal will give up heat to a much larger piece which, though not having reached a condition of red-heat, may have much more heat than the smaller one.

The amount of heat received by a kettle of water whilst being brought to boiling-point is quite considerable yet the temperature the water attains (100 deg. C.) is not great. Conversely, if a small piece of iron wire is held in a flame it quickly reaches a high temperature (1,500 deg. C. – 1,600 deg. C.) but the amount of heat it acquires during the process is not large.

The determination of the amount of heat evolved or absorbed during a chemical action is a very important branch of physics and the practical value of such work is obvious when, for instance, one remembers that the price of fuel (coal, coke, oil, etc.) depends to a great extent upon its calorific or heat-producing value. The technical chemist when examining a sample of coal always performs what is known as the " heat test," because the *intrinsic* value of a fuel is measured in units of heat.

Units of Heat.—In the **C.G.S. system** the heat unit is called the **calorie**, and is that quantity of heat which will raise one gramme of water through one Centigrade degree of temperature. One thousand calories equal one **major-calorie.**

The **Centigrade unit of heat** is the amount of heat required to raise 1 lb. of water through 1 deg. C., and is written lb.-deg.-Cent.

The **Fahrenheit unit of heat**, written lb.-deg.-Fahr., is the amount of heat necessary to raise 1 lb. of water through 1 deg. Fahr. This is the B.Th.U., or British thermal unit.

* * * * *

Before leaving the subject of chemical action it will be well to sum up as follows. *All chemical actions are characterised by* (1) *the formation of new substances which may be either elementary or compound, or the formation of new substances, some elementary and some compound;* (2) *physical change;* (3) *a heat effect; absorption or evolution of heat.*

THERMO-CHEMISTRY OF THE SIMPLE VOLTAIC CELL.

In what follows we examine the action of a voltaic cell in the light of our knowledge of chemical action and its three characteristics. As a typical simple cell we will select that which consists of a plate of zinc and a strip of platinum foil, both immersed in a jar of dilute sulphuric acid. (Fig. 36.*) The student knows that such an apparatus is a source of electrical energy and that if the positive and negative terminals are joined by a conductor a current will flow through the cell (from the zinc to the platinum) and through the external circuit (from the platinum to the zinc). Remembering the law of the conservation of energy we recognise that this energy does not spring into existence the moment the circuit is closed; clearly it is not *new* energy originating within the cell just because the zinc, platinum, acid, and wire are brought together in the manner described. No, this energy actually *exists somewhere before we build up the cell, but not in the form of electricity.* Where is it and in what form does it exist? To find the answers to these questions we will study the chemistry of the cell.

* As most people are familiar with the appearance of a simple voltaic cell we have in this diagram left the usual glass jar, acid, and hydrogen bubbles to the reader's imagination; he has simply to follow the text and consider the plates as immersed in acid to the extent indicated by the shaded portions.

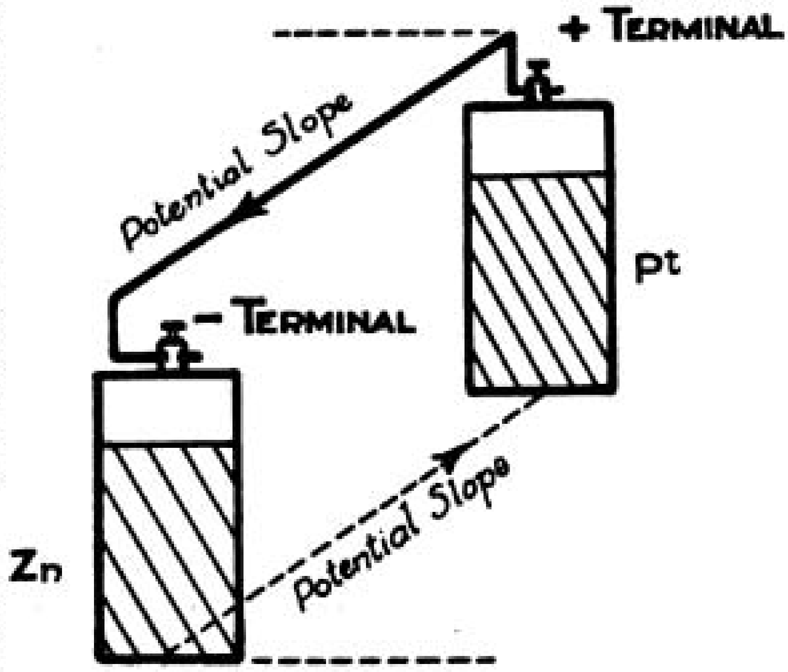


FIG. 36.

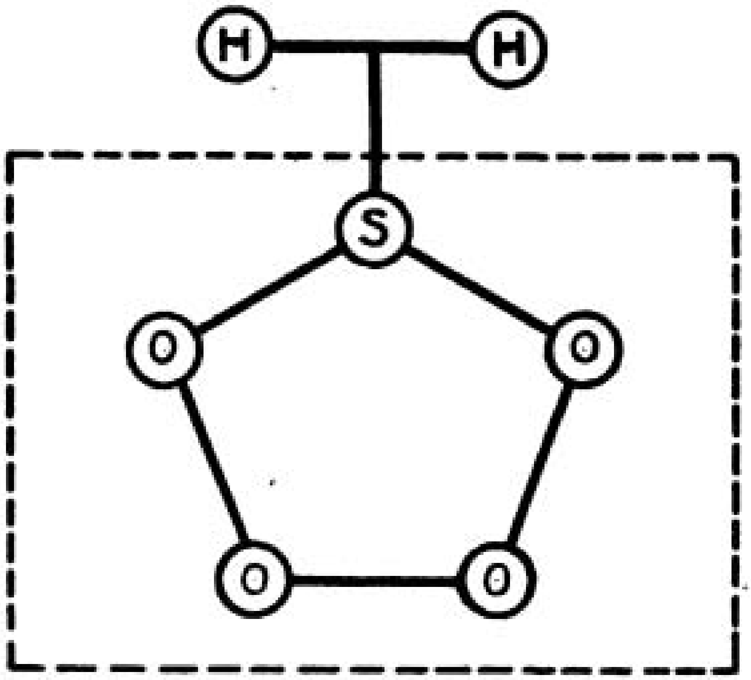


FIG. 37.

When the external circuit is completed as shown in the diagram :

(*a*) A current of electricity flows through the cell and external circuit.

(*b*) The external circuit becomes hotter.

(*c*) Bubbles of hydrogen are evolved at the platinum foil.

(*d*) The zinc plate commences to be dissolved.

(*e*) Zinc sulphate is formed and remains in solution in the electrolyte, which becomes weaker.

(*f*) The acid commences to decompose.

(*g*) The temperature of the cell, or what may be termed the internal circuit, rises.

Nothing chemical happens to the platinum, so that we have simply to consider a chemical action between zinc and sulphuric acid. Now, sulphuric acid is composed of hydrogen, sulphur, and oxygen, and a molecule of the acid contains seven atoms forming a system which may be represented by Fig. 37. That part of the system which is shown enclosed by a dotted line has, when considered as a group by itself, a strong affinity for zinc, with which it will combine readily ; zinc and the system (SO_4) may be thought of as straining to combine with each other. By this it is not meant that the (SO_4) system in a bottle of sulphuric acid is necessarily tending to make its way through the glass in order to reach the zinc tray on which the bottle may stand. The "straining" referred to is a word used to describe the power, held in leash, of zinc and (SO_4) to combine with each other. This tendency is inherent in the two materials and does not alter in degree with the quantity of material considered, nor does it depend upon the proximity of the one kind of material to the other ; it is as fundamental as inertia, and in degree as invariable as the velocity of light. Just as a stretched catapult has potential energy and needs only to be released for that energy to change into the kinetic form, so zinc and (SO_4) have potential energy and need only to be brought into contact in a certain way for that energy to change into a kinetic form.

Here we have the answers to the questions we propounded. The energy of our voltaic cell resides in the zinc and the acid in the form of potential energy.

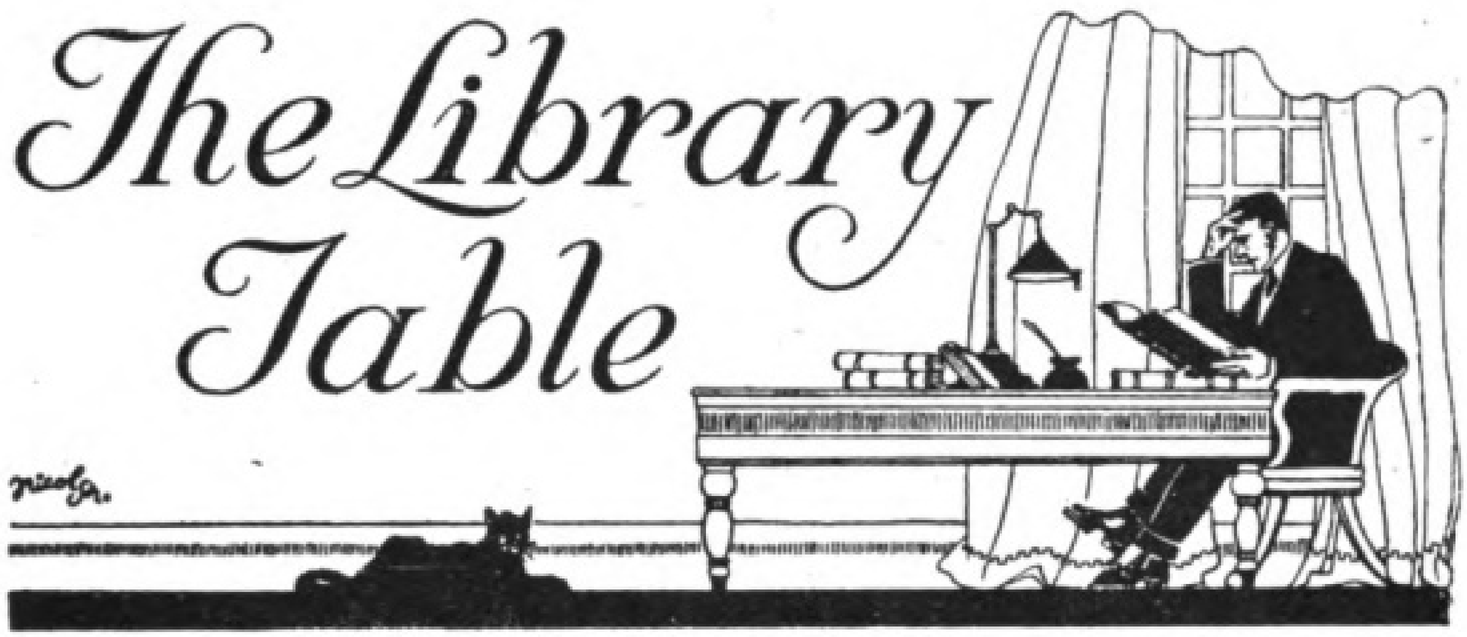
(*To be continued.*)

Share Market Report

LONDON, *November 14th*, 1918.

DEALINGS have been very active in the shares of the Marconi group during the the past month. All classes of shares have recently shown a marked improvement which is generally maintained. Marconi Ordinary, £4 12s. 6d. ; Marconi Preference, £3 16s. 3d. ; Marconi International Marine, £3 11s. 3d. ; Canadian Marconi, 14s. 6d. ; American Marconi, £1 12s. ; Spanish and General, 14s.

The Library Table



PRINCIPIOS ELEMENTALES DE TELEGRAFIA SIN HILOS. Por R. D. Bangay. Partes 1 y 2. London: The Wireless Press, Ltd., Marconi House, Strand. España: Compañía Nacional de Telegrafia Sin Hilos, Alcala 43, Madrid. Precio: España; 10 pesetas, Franqueo 1 peseta extra. America Latina, $2·25 neto; Franqueo 25 cents extra.

The progress of wireless telegraphy in Spanish-speaking countries has created an insistent demand for a textbook which shall put into the hands of students a volume introducing them to the theory of the subject. The test of years of experience has proved that no treatise more completely fulfils such requirements than Bangay's "Principles" in English, which has been the means of instructing thousands of English-speaking students to radiotelegraphy.

The volume which lies before us consists of the latest edition of the English treatise translated into Spanish, and possesses the clear and attractive format which we have learned to expect in the publications of the Wireless Press. We can assure our Spanish friends that it would be impossible for them to find any volume more fully suited to fulfil their requirements.

DARING DEEDS OF MERCHANT SEAMEN. By Harold F. B. Wheeler, F.R.Hist.S. London: George G. Happar & Co., 3, Portsmouth Street, Kingsway. 5s. net.

Mr. Wheeler believes in the "personal narrative" style of conveying history, and has published a number of historical volumes, taking a great figure-head as a centre round which to group his facts. This is a plan well suited to his style of narration, lending itself as it does to proportionate and well-balanced effect. In the present instance his subject necessarily involves the relinquishment of this method, with the result that the volume before us is one to keep by our side and enjoy piecemeal, rather than one to read through without a break to the finish. We hail the appearance of the book as peculiarly opportune at this present moment, when our foe is endeavouring to escape by fair words from the penalties which attach to his foul deeds.

WIRELESS WORLD readers are familiar with some of the deeds of gallantry narrated here. We may instance the torpedoing of the *Falaba* on March 28th, 1915. At that time (three and a half years ago) the civilised world was unprepared to witness, even in times of war, the callous and premeditated murder of innocent civilian passengers, largely women and children, on the high seas. For centuries such procedure had been left to the basest of outlaws and pirates, and the picture of torpedoes cutting a pathway for themselves through a mass of humanity struggling in the water, in order to reap a further harvest of death from non-combatant victims on board, sent a thrill of horror through every land.

A whole chapter is devoted to the torpedoing of hospital ships, a subject which Mr. Wheeler treats under the title of "The Crowning Infamy." This section of the subject is particularly skilfully handled. The author first explains the general rule that when a man has "done his bit" and been rendered *hors de combat*, civilisation considers him as—for the time being at all events—neutral and immune. He then proceeds to examine the Teutonic excuses for its infraction, proving the hypocrisy of each plea point by point, and illustrating his contentions by specific instances.

Wireless telegraphy naturally looms large all through the volume. In earlier days, before the arming of merchantmen was systematically carried out, radio-telegraphic gear constituted the victims' only method of defence, and formed for that reason the primary object of enemy attack. Count von Dohna-Schlodien, commanding the *Moewe*, expressly told one of his victims "had you used your wireless or touched your gun I should have given you a broadside."

Over and above a number of references scattered all through the volume we find a long chapter devoted specially to "Wizards of the Wireless," the keynote of which we cannot do better than summarise in the author's own words:

> The admiration of the Service for the operators is unbounded. They are known as red-blooded men. Not one of them has failed at the critical moment, a point borne out by officers of the ships chiefly concerned. Their personal messages to headquarters are usually couched in terms such as these: "Ship torpedoed, all effects lost, awaiting instructions." One operator sent a message of this kind three times in as many months, each occasion marking the torpedoing of the vessel he was on. He never flinched, and no word came from him suggesting a transfer to a station on shore. His assistant had been wrecked twice.

We have no space to do more than inform such readers as may have a taste for deeds of gallantry that they will find a rich store between the covers of this book. The subjects range from the heroism of the "Diehards," lined up on the torpedoed *Tyndareus*, under the command of Colonel John Ward, expecting at any moment to be precipitated into a watery grave, to the *sang-froid* with which the 25 Englishmen on board the *Borulas* saved the larger proportion of the 300 Greek half-caste and Egyptian passengers, simply through their national capacity for "keeping one's "head."

ELECTRICAL EXPERIMENTS. By A. Risdon Palmer, B.Sc., B.A. London.: Thomas Murby & Company. 1s. 6d. net.

This volume, by the author of *Magnetic Measurements and Experiments*, which we recently reviewed in these pages, is designed to cover a course in elementary electricity for the younger class of student. The aim is to provide instruction by a series of elementary laboratory experiments, the apparatus used being inexpensive and, in some cases, easily built up by the pupils themselves. In general, the line of instruction is good, but there are several matters which we think might be altered with considerable advantage to the student.

In view of the fact that practically all electrical students come into contact sooner or later with high frequency phenomena in radiotelegraphy, we think it unwise to suggest to students that "the pieces of insulated copper wire which are so arranged to connect the various pieces of apparatus to one another can, with advantage, be wound round a pencil although taking the form of a helix or spiral." In practice the advantages of flexibility and "give" so provided are largely negligible, and in addition the wire becomes a very effective choke for high-frequency currents. In our own experience we have known of experiments becoming complete failures by reason of the fact that the student has adopted this old-fashioned method on connecting the parts of the high-frequency circuit. In extreme cases where a certain amount of give is required two or three turns round the pencil should be ample, thus avoiding the totally unwarranted waste of expensive material caused by using two or three feet of copper wire when a few inches will do.

A praiseworthy feature of the book is the section of simple technical experiments connecting the instruction already given with practical apparatus with which the student comes into contact every day. Thus, we find the construction of a multiple push electric bell with its accompanying indicator carefully described; some experiments with a simple microphone and the commercial telephone, as well as a description of how to set up a simple Morse telegraph. We must, however, take exception to one statement made by the author in describing the single needle instrument, the construction of which has been shown. "The telegraph," says the writer, "used on some railway systems is very similar to that described above, "but for general purposes an instrument called a 'Morse Sounder' is employed, "because it is much quicker in its action, and can be used where messages have "to be sent over long distances, for which the needle arrangement would not be "sensitive enough." In cases where the sounder is substituted for the single needle instrument, neither speed nor distance have had any relation to the causes for the change. Any experienced telegraphist, accustomed to use both a single needle instrument and a sounder, knows quite well that the former is the faster instrument. Apart, however, from a few errors of this nature the book should be useful to those who require guidance for an elementary laboratory course for young students.

A SMALL BOOK ON ELECTRIC MOTORS, C.C. & A.C. By W. Perren Maycock, M.I.E.E. London: Sir Isaac Pitman & Sons, Ltd. 5s. net.

This little volume is well up to the usual standard of Mr. Maycock's works. In a breezy preface the author states that "this book will be of little use to electrical "engineering students, except those making their very first acquaintance with the "subject, for it is entirely free from technical and mathematical complications. "It will be of even less use to the electrical engineer, unless he desires a work for "recommending to his non-technical clients. Other kinds of engineers and engineer-"ing students, on the other hand, as well as all sorts of 'outside' people who are "concerned with or interested in electrical motors, should find this small book "of service." From this the reader will gather that the book is essentially a practical description of modern motors and their application, although as a matter of fact the technical side of the subject is dealt with more fully than one would expect from such an opening.

The first chapter deals with the advantages of electric power, many of which are not realised by the average non-technical man. Particularly interesting are the diagrams showing the comparative sizes of cables and shafts for transmitting a given power. Chapter 2 deals with direct current motors; chapter 3 with controls and control gear; chapters 4 and 5 with alternating current motors and their control, whilst chapter 6 is devoted to explanations of various technical matters and terms. A valuable feature of this and other books by the same author is the profusion of photographic illustrations of modern commercial apparatus, as well as the numerous diagrammatic illustrations which are particularly well drawn.

In these times, when those in charge of factories are no longer content to accept recommendation for electrical installations without at least making themselves acquainted with the rudiments of the subject, this little book should have a wide and ready sale. Incidentally, it is among the best propaganda for the electrical industry that we have seen, and it will be good policy on the part of many electrical manufacturers to make a present of this work to possible and actual clients.

A CORRECTION.—We regret that the price of *The Aeroplane Speaks*, by H. Barber, A.F.Ae.S., reviewed in our October issue, was inadvertently given as 6s. 8d. net. The price of this work is 8s. 6d. net.

Personal Notes

SENATORE GUGLIELMO MARCONI, G.C.V.O., LL.D., D.Sc., has been elected by the Council as honorary fellow of the Society of Engineers.

OBITUARY.

We learn with profound regret of the sudden demise of MR. ERNEST THOMAS EDWARDS, late superintendent of the Eastern Division of the Marconi Wireless Telegraph Company of America. Born at Birmingham in 1883, he was educated at Bridge Street Technical School, and later entered the service of the Post Office as telegraphist. When nineteen he joined the Marconi International Marine Communication Company's service, performing duty at the Lizard, Niton and Liverpool Coast Stations, and aboard the s.s. *Minnehaha* and s.s. *Campania*. In 1904 he was engaged by the Marconi Wireless Telegraph Company of America, and, being an expert telegraphist, was on several occasions selected to demonstrate, both on land and at sea, the superiority and efficiency of Marconi apparatus over that of competitors. On one notable voyage from Buenos Ayres to Europe, testing was done side by side with the operator of the competing company, Mr. Edwards's skilful manipulation resulting in the adoption of the Marconi system. He was then placed in charge of Siasconset, an important station handling exceedingly heavy traffic, from and to ships inward and outward bound, under adverse and difficult conditions of working, which to-day are practically eliminated. From there he was promoted to the Sea Gate, L. I. Station, where he remained until June 1912, when he received the superintendency which he filled with ability until his death. He was well liked by his associates, and his genial personality is remembered by those in England who had the pleasure of his acquaintance. He leaves a widow and two young daughters.

MR. E. T. EDWARDS.

The funeral service was largely attended. A delegation of about twenty-five operators was present, and the Marconi Company was represented by Messrs. De Sousa, Sarnoff, Duffy, Chadwick and Pillsbury.

MR. THOMAS R. TALTAVALL, editor of the *Telegraph and Telephone Age*, New York, and the inventor of many useful electrical devices, died on September 2nd, aged 63 years. Mr. Taltavall was one of the most expert telegraphists of his day. He learned telegraphy in 1867, and eventually rose to the position of superintendent of the leased wire system of the Associated Press.

In 1890 he became editor of the *Electrical Age*, and in 1894 associated editor of the *Electrical World*, until he accepted the editorship of the *Telegraph and Telephone Age* in 1911.

MR. E. R. TIMBERLAKE, junior operator at the Fenchurch Street office of Marconi's Wireless Telegraph Company, Ltd., died on October 30th at his home at Catford. The internment took place at Hither Green cemetery, the coffin being covered with floral tokens of respect, including a beautiful cross from his colleagues. The City superintendent represented the Company at the funeral.

PROMOTION.

H. STANLEY ROBINSON, of Chorlton-cum-Hardy, is the R.N.V.R. wireless operator referred to in connection with "A Fisherman's Fight," mentioned on page 456 of our last issue, under "Maritime Wireless Telegraphy." He has now been promoted to a commission as sub-lieutenant, R.N.V.R.

LIFE-SAVING.

The following spontaneous appreciation of the vital assistance rendered by JUNIOR OPERATOR ROBERT WILLIAMS, of Kirkton, Dumfries, has been received by the Marconi International Marine Communication Company, Limited, from a senior engineer of the vessel :—

"Being a member of the crew of H.M.T. —— when she was torpedoed, I should " like to recommend to you the conduct of Wireless Operator Williams, who assisted " the third engineer to a hatch board in the water when the latter was seized with " cramp, and also rendered aid to the donkeyman, who had a disabled arm. Had " it not been for the timely assistance of Mr. Williams, these two men would in all " probability have been drowned."

The parchment of the Royal Humane Society for saving life has been awarded to WIRELESS OPERATOR FREDERICK OGDEN at Aberdeen. Whilst bathing, Miss Jeanette Melvin was seized with cramp, became unconscious, and was being carried out to sea, when Mr. Ogden swam out and rescued her.

The Lord Provost of Aberdeen, in making the presentation, warmly eulogised Mr. Ogden's conduct.

MATRICULATION.

MR. ALEXANDER PETTY, of Marconi's Wireless Telegraph Company, Ltd., has passed 33rd in the second division of the University of London Matriculation Examination, held at the South Western Polytechnic Institute in September last.

AWARDS.

The Military Cross has been conferred on TEMP. SEC. LIEUT. F. L. S. FITZGEORGE, South African Engineers, for conspicuous gallantry and devotion to duty in establishing a wireless station under heavy fire 300 yards from the front line. His station was twice wrecked, but he kept up communication with artillery brigade headquarters. After continuous shelling he withdrew his personnel, but remained himself with the wireless installation, and, though severely wounded in the arm, would not leave until taken away on a stretcher.

CHIEF PETTY OFFICER WIRELESS OPERATOR ABRAHAM OATES has been decorated with the D.S.M. for meritorious conduct. His vessel was torpedoed, but the submarine was subsequently sunk. Oates, who is 28 years of age, joined the Navy when war broke out. Previously he was a clerk at the Liverpool Docks.

CORPORAL H. FEATHER, R.G.A., has won the Military Medal for maintaining wireless communication under heavy fire. He was formerly a Mexborough reporter.

Company Notes

Amalgamated Wireless (Australasia), Ltd.

THE tenth half-yearly meeting of this Company was held at "Wireless House," Sydney, on August 29th last, the chair being taken by the Hon. Sir Thomas Hughes, M.L.C., Chairman of Directors. The speech delivered by him to the shareholders emphasized the leading points of a very satisfactory balance sheet and report. He deplored the fact that no revenue had been received from wireless telegraph messages during the period under review, although the Company was obliged to maintain a staff for dealing with official ships' messages, which have to be handled free of charge. He dwelt with much satisfaction upon the successful manufacture by the Company of high-class electrical instruments and apparatus, making special reference to the new type of wireless telegraph receiver based upon the Marconi Company's patents, which was produced by the Managing Director, Mr. E. T. Fisk, and which has been successful in picking up messages over a distance of 12,000 miles. Encouraged by the success of the Company's manufacturing department, the Directors have established a subsidiary Company (registered under the title of Australectric, Ltd.) for carrying on this work.

Sir Thomas Hughes also announced the establishment of a branch of the Wireless Press in Australia, destined to become the centre of supply for all authentic publications in England and America dealing with wireless telegraphy and telephony, besides acting as sole agent for the Wireless Press, Ltd., London, and the Wireless Press Inc., New York. This new enterprise is publishing a monthly magazine entitled *Sea, Land and Air,* the first number of which was reviewed in the June issue of THE WIRELESS WORLD, and which shows every sign of attaining wide popularity.

The following is the text of the Directors' Report presented at the meeting:

REVENUE AND DIVIDEND.—Your Directors have pleasure in submitting herewith the Balance Sheet and Profit and Loss Account for the six months ended June 30th, 1918.

The net profits of the business for the half-year amount to £3,650 15s. 9d., which, together with £574 0s. 5d. brought forward from last account, leaves a balance of £4,224 16s. 2d. to the credit of Profit and Loss Account.

From the above amount, which is available for distribution, your Directors recommend payment of a dividend for the half-year at the rate of 5 per cent. per annum. This will absorb £3,500, and will leave a balance of £724 16s. 2d., from which your Directors recommend placing £500 to Reserves and carrying forward £224 16s. 2d. to the next account.

Your reserves now stand at £25,305 0s. 8d.

SHIPS' MESSAGE TRAFFIC.—During the period under review your business has progressed satisfactorily in every department, except in that of wireless messages, which, as stated in previous reports, bring in no revenue during the war. In spite of the losses from enemy action, the number of vessels equipped with your Company's apparatus is continually increasing.

MANUFACTURING DEPARTMENT.—Your factory is steadily increasing its production of wireless apparatus, and your Directors are pleased to inform you that, as a result of the increased accommodation, plant and staff, the factory output has been greatly augmented during the half-year.

In accordance with the Articles of Association, Messrs. C. P. Bartholomew and James Taylor retire from the Board of Directors; these gentlemen are eligible for re-election, and offer themselves accordingly.

Mr. Alexander Jobson, F.C.P.A., the Company's Auditor, retires in accordance with Article No. 146, and, being eligible, offers himself for re-election.

Questions & Answers

NOTE.—*This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless telegraphy. Readers should comply with the following rules :* (1) *Questions should be numbered and written on one side of the paper only, and should not exceed four in number.* (2) *Queries should be clear and concise.* (3) *Before sending in their questions, readers are advised to search recent numbers to see whether the same queries have not been dealt with before.* (4) *The Editor cannot undertake to reply to queries by post.* (5) *All queries must be accompanied by the full name and address of the sender, which is for reference, not for publication. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a " nom-de-plume."* (6) *During the present restrictions the Editor is unable to answer queries dealing with many constructional matters, and such subjects as call letters, names and positions of stations.*

D. F. (Aberdeen).—The examination for the Postmaster-General's Certificate of Proficiency in Radiotelegraphy calls for a certain degree of skill in telegraphic sending and receiving, a good knowledge of the connections and functions of the instruments used in the system in which the candidate is being examined, ability to trace and clear faults, and a sound acquaintance with the regulations governing the conduct of radiotelegraphic traffic. The standard textbooks for this examination are the *Handbook of Technical Instruction for Wireless Telegraphists* and the *Elementary Principles of Wireless Telegraphy*, both of which you will find advertised in this issue.

2nd A/M. M. (B.E.F.).—The textbook to which you refer, by Dr. Ing. Hans Rein, is known to us, and we have a copy of an earlier edition in our library. It is undoubtedly one of the best of the German manuals, but has not, so far as we know, been translated into English. Dr. Rein, the author, was killed in the war while fighting with his regiment. Very few " wireless " books have been translated from German into English. The two most important translations are Zenneck's treatise on wireless telegraphy—a standard work—and Ruhmer's *Wireless Telephony*, translated by Dr. Erskine Murray. This latter volume is now very much out of date. In reply to your second query, there are several methods of recording wireless signals at high speed. With modern amplifying receivers, signals can be made strong enough to actuate several forms of recorder. One method depends upon the use of an Einthoven galvanometer (see " Digest of Wireless Literature " for November, pp. 437 and 438). Received signals cause a thin wire to uncover a slit, allowing a beam of light to fall upon a moving band of photographic paper. The light acts upon the paper, which is rapidly developed and fixed, the signals showing as long and short black lines upon a white ground. The chief of many disadvantages of this method is that it is almost impossible to differentiate between atmospherics and true signals, and for this reason it is little used. A far more convenient and practical method consists in recording the signals at a high speed upon phonographic wax records, and then running the records so made at a slower speed for " reading up." This method enables atmospherics to be differentiated by sound, and is used to a considerable extent by the Marconi Company. As soon as the " atmospheric " problem is overcome, we may expect important developments in automatic transmission and reception, and it is not too much to expect type printing telegraphs to be adopted for wireless working in the future. The " Lag " and distortion of signals, which is such a hindrance in cable working, is absent in the case of radio signals.

WIRELESS IN THE ROYAL ENGINEERS.—In the October issue we referred a correspondent to Major Handley, at Worcester, for particulars of the Wireless Section (R.E.). We have since been informed that this section was removed some time ago from Worcester to Bedford. All inquiries should therefore be addressed to H.Q., Bedford.

W/O N. M. (Winchester).—The new Order in Council regarding the standard uniform for the Mercantile Marine classes the wireless operators among the officers of the ship (see page 491 of this issue).

" ENQUIRER " (Durban).—Wireless telegraphy on moving trains has not so far been widely adopted. Most of the successful work in this direction has been carried out in the United States, where both radiotelegraphy and radiotelephony have been conducted from certain trains of the Lackawanna Railway and the Union Pacific Railway Company. Considerable success has attended these experiments, and particulars of the Marconi Company's demonstrations on the Lackawanna trains appeared in the February, 1914, issue of THE WIRELESS WORLD. A description of the experimental work of the Union Pacific Railway Company appeared in the Proceedings of the Institute of Radio Engineers for August (see page 490 of this issue). We are not acquainted with the apparatus of the inventor to whom you refer. Some work has been done on inductive telegraphy between suspended wires on moving trains and wires laid along the track side, but this, of course, is not "wireless" telegraphy in the generally accepted meaning of the word. This method does not seem to have met with any great success.

We are interested to hear of the form of spark gap you have devised, but do not think it would give a very sharp discharge if used for small wireless transmitters, owing to the semi-conducting nature of the space in the evacuated bulb. We are glad you think the increased number of lines to the page gives no cause for complaint. Other readers have expressed the same view, and, so far, we have had no adverse comments whatever. This change has effected quite a considerable saving in paper without in any way reducing the value of the magazine.

"AMBITION" (B.E.F.).—(1) There is no book published containing details of the particular instrument to which you refer, although there probably exists an official document on the subject. (2) £50. (3) There is no age limit for candidates for the Postmaster-General's Examination. The Marconi Company, whose service most successful candidates enter, has an age limit, however, and in peace time will only accept men between the ages of eighteen and twenty-five.

CAPITAINE DE LA B. (Boulogne S/M).—It is impossible to discuss the respective advantages and disadvantages of the reaction and cascade methods of valve amplification within the confines of this column, quite apart from the fact that the two methods are essentially different and cannot truly be compared. The reaction method is dependent upon the ability of the valve to generate oscillations, whereas the cascade method is dependent upon amplification purely. Censorship restrictions prevent us giving any really useful information upon this point, but we hope to deal with the question fully as soon as conditions will allow.

A. R. F. G.'S. (B.E.F.).—(1) You do not say to whom you wish to explain your invention, but, in any case, the best method is to give as brief an explanation as is commensurate with clearness, followed by diagrams of circuits, and a statement of the points of novelty in your device. (2) A model is not necessary. (3) Taking out a patent is a highly technical matter, and cannot safely be undertaken by an ordinary individual. Any reputable patent agent will handle the whole matter for a fee, which is certainly well spent if the idea is really a good one. Many a good invention has been lost to the inventor by loopholes in the patent specification, which have allowed wholesale infringement with impunity. Your letter reached us after the November issue had gone to press, and thus could not be answered before.

H. A. (Clitheroe).—The prospects of both you and your friend being appointed to the same ship are rather remote, seeing that both would have to serve first as junior operators under experienced seniors, and therefore on different ships. Afterwards, when you gained experience, you would both be appointed officers-in-charge, and therefore would be again on different ships, unless, of course, one of you consented to serve as junior to the other. The chances are very small, however, and, after all, you have not joined the staff yet, so such discussions are rather premature.

SPECIAL NOTE.

THE MARCONI FREE TRAINING SCHEME IS NOW CLOSED.

Correspondents who wish to train as Wireless Operators should apply to the nearest Wireless Training School or College.