THE MARCONIGRAPH

An Illustrated Monthly Magazine of WIRELESS TELEGRAPHY

EDITED BY J. ANDREW WHITE

Volume I. JULY, 1913 No. 10

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M. J. DAL PIAZ

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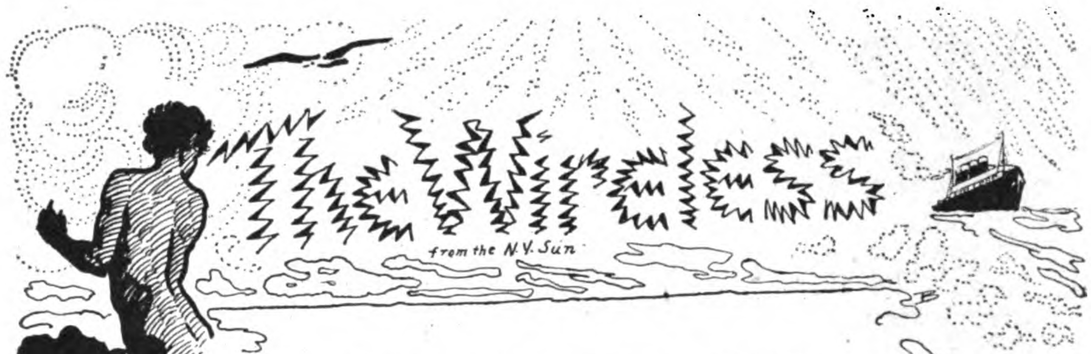
Vol. I. July, 1913 No. 10

NAPOLEON loved to decorate a man on the field of battle for some brilliant flash of courage. But membership in the Legion of Honor goes more often, in our day, to the patient scholar; to the dramatist who makes his desk a field of action; and to the constructive genius who builds bridges or business enterprises. No invention of our time would have interested the conqueror of nations more than wireless telegraphy. With its aid perhaps he might have won Waterloo—*if he alone had had access to it!* Now its magic is at the service of every man, in a world that has no place for Napoleons.

Of the modern school is M. J. dal Piaz, an officer of the Legion for his peaceful services to the state. He is like Napoleon in his indefatigable energy and in his grasp of detail. It is said the Emperor knew all his men by name. M. dal Piaz has a far more intimate acquaintance with all the hard tasks of the various companies in which he is interested, by dint of doing them. For example, he is director of La Compagnie Générale Transatlantique and it is said that he has at one time or another filled practically every important position in that organization, climbing up the ladder of hard work to the top. It would take a whole issue of the magazine to describe all his activities. He is a member of the Upper Council on Navigation and a director and member of the acting committee for La Société des Chantiers et Ateliers de St. Nazaire.

M. dal Piaz was born in the closing year of the American Civil War, whose various semi-centennials we are in process of celebrating. He is of Parisian birth and education, having added to the usual course a study of the law. The petty obstructive tactics of the lesser figures of the court did not suit him, for early in life he realized that there is a positive side of the law and that the greatest lawyers are those who direct progress into right channels instead of steering it out of wrong ones.

As early as 1888 M. dal Piaz began to take an interest in the affairs of La Compagnie Générale Transatlantique, and that meant finding out everything there was to be known about its operations. His rise to the directorship was inevitable, and it was only natural that when wireless telegraphy came into use, a mind so keen should at once recognize its possibilities in the field of transportation. From treating it as a valuable aid, he soon made it one of his primary interests and became one of those who control the Marconi interests in France and the French possessions.



The Wireless

Dead priests that have sung when the world was young at Mercury's temple place,
Your myth, it was true—it is born anew in the death of time and space!

More swift, more fleet, than the sun-stained feet of the Dawns that trample the night—
More fleet, more swift, than the gleams that lift in the wake of a wild star's flight—

Through the unpathed deeps of a sea that sweeps unplumbed, unsailed, unknown
Where the forces untamed, unseen, unnamed, have ruled from the first, alone,

Now the ghosts of thought, with a message caught from the tales of the dreaming past,
Unheard, unseen, with nor sound nor sheen, speed through the ultimate vast.

Battered and lamed and shattered and maimed, the liner crawls into port,
And the bolted tire and the volted wire are the toys of the whirlwind's sport,

And the gray sea's teeth in the depths beneath, where the coiled, green serpents play,
Are crumbling, crunching, mumbling, munching at the cable lengths alway—

But now they may howl, the storms, and growl at the work of the lineman's hands,
For gone is their pride, with the boast of the tide that bit at the deep-sea strands;

For a sentience thrills through the bastioned hills that has neither voice nor form,
Nor recks of the might of the chaos-sprite who lashes the earth with his storm;

Bitted and bridled and shackled and girdled and bound with a linkless chain,
The brute powers cower at the godlike power that dwells in a human brain—

Man has stolen the wings of the deathless Things that range where the spirit is lost—
He is leagued anew with the silence through the strands of a strandless cord.

Where the moonmates dance to the sirens' chants on the floor of a level flood—
O'er the headland's crest and still fiord's breast that are dashed with the dead sun's blood

When the afterglows that are born of his throes coquette with the rising stars—
Through the shine and spray where the noonbeams play at painting a rainbow's bars—

Through the dripping shroud that the hurrying cloud flings over the stark berg's breast,
Unseen, unheard, leaps the Wraith of a Word, like a god on a godlike quest!

Man's feet are clay and they halt and stay with the graveyard worms and clods,
But his plumed thought flings to the wind its wings in the haunts of the careless gods—

For those old gods live, and they weave and give new meanings to old myth,
And blossoms and gleams of the world-old dreams flower afresh from the truth at their pith—

So the tales that twine 'round the ruined shrine where the priests of Hermes sung,
They were true, they are true, they are born anew in the speech of a younger tongue.

A Japanese Technical Paper

電氣學會雜誌第二百八十二號拔萃

Enameled Condensers for Radio-Telegraphy

By W. Torikata, *Kogakushi* & E. Yokoyama, *Kogakushi*

Reprinted Verbatim.

IN the sending system of radio-telegraphy, brush discharge in condenser is one of the most important items among the losses in the whole system and thus various devices are intended to minimize it. Glass condensers are sometimes immersed in oil for the purpose, but the process is very dirty and wants special care especially on board the ship. Fig. 1 shows a group of glass plate condensers filled with wax, which was deviced by Mr. Saiki and is now used in all ship stations of Japanese Teishinsho system.

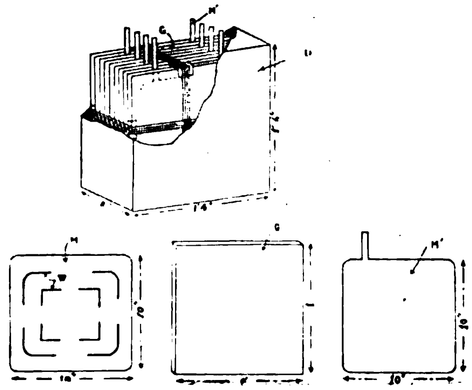


Fig. 1.

G—Glass Plates.
M M'—Metal Plates.
W—Wires soldered on Metal Plates.
D—Mixture of Wax, etc.

The condenser is very simple to make: several glass plates with metal sheet alternately between them are mersed in molten wax which is gradually cooled, with care to leave no air bubbles inside. The waxed condenser is entirely dry in all climates of the world and efficiently prevents brush discharges. The only demerit of the condenser is that it is very heavy and is impossible to find faults, if any, and simply to change the broken plates; thus it requires large spare. The method to varnish the metal edges of glass condenser is commonly known as one to prevent brush discharge but it is not sufficient to stop the loss.

A very efficient process for the purpose was recently deviced by the authors and patented in Japan. The process is to enamel some part or all over the surface of condenser. Fig. 2 shows the various forms deviced for

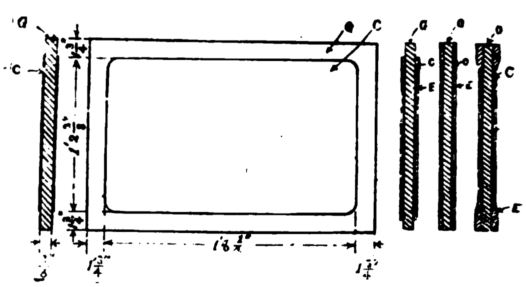


Fig. 2.

G—Glass Plates.
C—Copper Plating.
E—Enamel Compound.

plate condenser and Fig. 3, those for leyden jar. The insulation power of the enamel compound is very high and is quite safe from moisture. The enamel compound sticks very hard on the surface of the condenser and is quite elastic not to split. There are various kinds of enamel compound and the composition and property of it give great effect to the efficiency of condenser. By the results of the following comparative tests of various condensers, the efficiency of the enamelled one is evidently shown. Table 1 and table 2 are examples of the practical tests.

The result for the Moscikki condenser is not sure.

In Table 3, the results got in receiving test are also given. The resistance shunt to the telephone receiver, is that which gives just inaudible signals when the corresponding condenser is used in sender, adjustment of the receiving set being kept constant. The coupling distance is that which gives just inaudible signals when the coupling of the receiving tuner is gradually made loose. It may be impossible to say that the reciprocal of the resistance or the coupling distance is proportional to the efficiency of the condensers, but it will be sufficient to determine the order of it.

TABLE 1.

Total watt losses in glass plate condensers, with and without enamel coating (0.00114 m.f.)

Voltage	6000	6375	6750	9000	10500	12000
Without enamel	18	18	18	31	40	52
With enamel	4	4	5	16	19	24

The glass condenser was made by Nippon-Denki Kaisha and is a type with copper plating on glass plate 2′ x 1½′ x ⅜.

TABLE 2.

Total watt losses in leyden jars with and without enamel coating.

Voltage	15000.	little higher than 15000.
Without enamel	46.0	52.0
With enamel on inside only	42.5	
With enamel on both sides		42.0

In leyden jars 7.9% of the loss was saved by enamelling on one side only and 19.2% by enamelling on both sides.

These two are the results of the experiment with 60 cycle alternating current and it will be possible that the losses when operating in oscillation current will be different from the above results.

As to the test of the practical efficiency, we tried various kinds of condensers in the same sending circuit and measured the corresponding antenna current. The types of the condensers were only changed, keeping the capacity and all other parts quite the same and therefore the antenna current will be the measure of the efficiency of the condensers used. Table 3 is the result of the test.

From the above result, we can conclude that the condenser immersed in oil is the best but we can get practically the same efficient result, by the enamel process.

During the series of the experimental tests about the efficiency of the various types of the condensers, we got generally the following results: (1) The surface as well as edges of the

COMPARATIVE TEST OF VARIOUS CONDENSERS.

TABLE 3.

	Antenna current at the foot of antenna.	Resistance shunt to telephone receiver.	Coupling distance.
Plate condenser in oil	.39	43 ohms.	27.5 cm.
Enamelled plate condenser	.355	42 "	26.7 "
Enamelled leyden jar	.38	43 "	25.0 "
Waxed condenser	.33	52 "	24.5 "
Leyden jar	.355	57 "	24.5 "
Plate condenser	.355	60 "	24.5 "
Moscikki condenser	.42	65 "	23.5 "

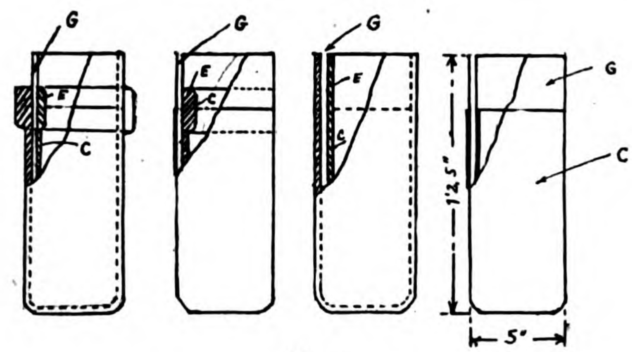


Fig. 3.
G—Glass Cylinder. *C—Copper Plating.*
E—Enamel Compound.

metal coating of the condensers must be very smooth. (2) The smoothness is far more important than the nature of the metal itself, to decrease the total losses of the condenser. (3) Total length of the edges of the metal coating shall be as short as possible. From this point of view, we can conclude that leyden jar type condensers are better than plate type condensers. (4) The enamel process is very efficient, and practically annuls brush discharges thus giving, when with enamel, no difference between various types of the condensers regarding brush discharge.

Pierce Lectures on Radiotelephony

That the wireless telephone is not merely a scientific toy and that it is destined to become one of the most important of modern utilitarian devices for annihilating time and space was demonstrated at the Franklin Institute by Professor G. W. Pierce, of Harvard University, in an illustrated lecture before a joint meeting of the institute and the Philadelphia section of the American Institute of Electrical Engineers. While the lecture was for the most part highly technical, even the layman could appreciate the importance of the several experiments performed by Professor Pierce to illustrate certain points in his study of electrical waves and transmission of energy.

Professor Pierce stated the difficulties that at present stand in the way of any general use of wireless telephones on land, but predicted that they would eventually supersede wireless telegraphy at sea because of the far greater rapidity of transmission of messages. Any wireless telegraph receiving station can receive telephone messages.

The Franco-American Tests

Paris advices report that the experiments of the joint boards of French and American naval officers seeking a preliminary determination of the difference in longitude between the radio station in the Eiffel Tower and that in Arlington have been suspended until the early winter. In the meantime much profitable work has been done in installing the instruments of precision and in tuning the two stations.

During this stage time signals sent from Washington have been recorded by Paris and subsequently confirmed by cable. Owing to an unfavorable radio season, strong atmospheric disturbances and the relatively weaker power of the French installation, the Eiffel signals have been less fortunate.

As unmistakable and practically instantaneous communication is the primary factor in the telegraphic method of comparing respective local times, it has been determined to postpone further experiments until the mechanical adjuncts and the radio conditions are bettered.

Constructing the Towers for High Power Stations

A DESCRIPTION OF THE UNIQUE METHOD BY WHICH THE MOVABLE WOODEN TOPMAST IS USED TO PULL UP THE SECTIONS OF STEEL THAT BELONG UNDERNEATH IT—LIKE PLACING THE ROOF OF A HOUSE BEFORE THE WALLS ARE UP.

THE towers or masts which are being erected by the Marconi Company at the new stations for trans-ocean wireless work, are of an interesting type. The towers at the various stations differ in number and height according to the wave length used, the distance over which transmission is desired and other local conditions; however, a description of one will serve for all stations.

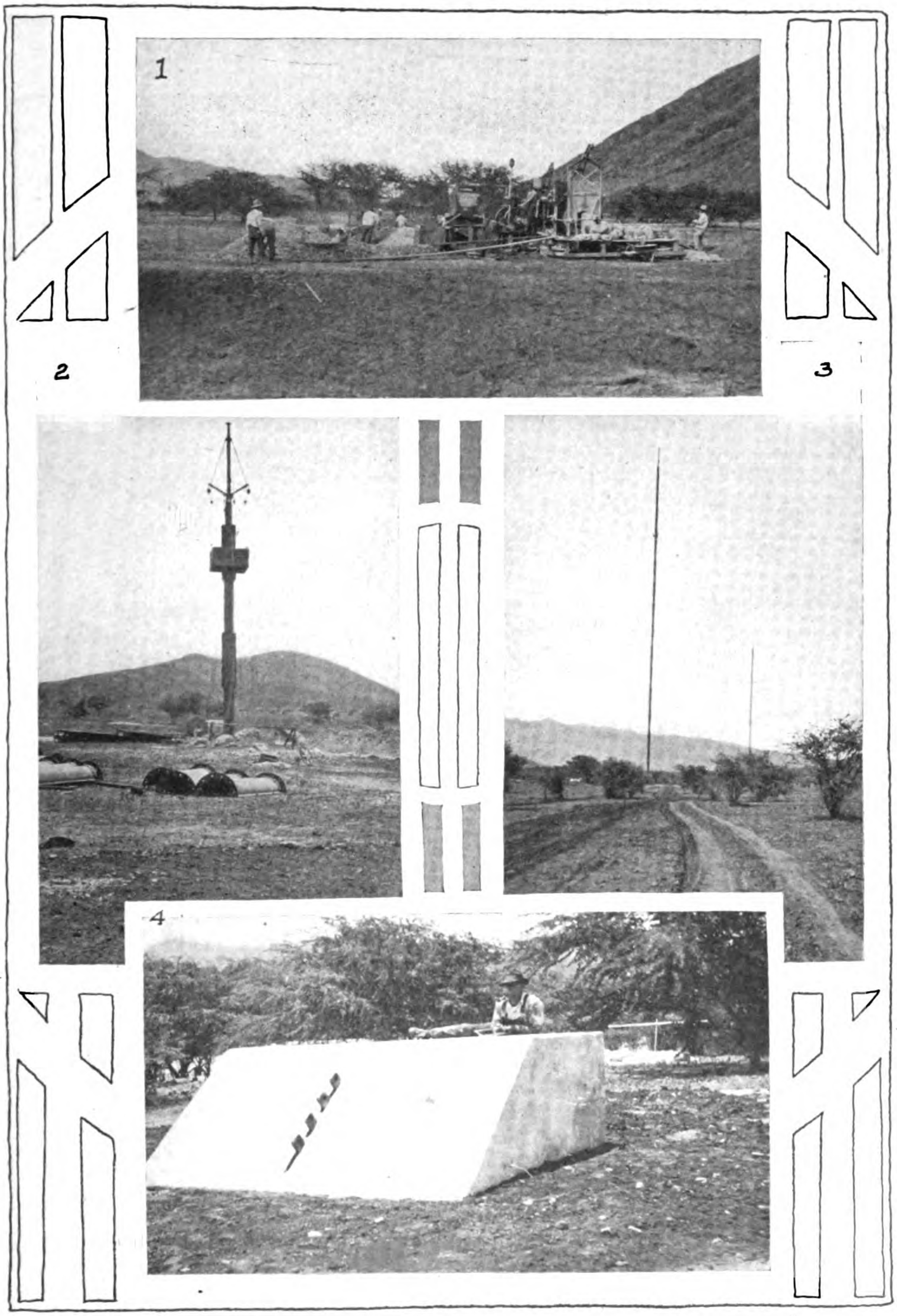
The mast consists of a main portion of steel of tubular sections, surmounted by a wooden topmast extending above the steel structure, the whole standing on a concrete foundation and supported by suitable stays.

The main portion of the mast is made up of composite steel cylinders the lower sixteen of which are made up of four quarter sections flanged vertically and bolted together. Each cylinder is flanged horizontally and bolted to the cylinder above it with a diaphragm plate between. The first section is bolted to a heavy plate carefully leveled and well anchored to a block of concrete measuring 10 feet x 10 feet x 8 feet.

The wooden topmast is the keynote of this novel system of construction; it acts like the man who pulls himself up by his bootstraps. The lower half of this topmast is of square sections and is guided by a square hole in the diaphragm plates between each section. The topmast is fitted with a set of hoisting arms which carry blocks through which reave the material hoisting ropes. A square wooden cage is suspended from the hoisting arms by four chain hoists so that the workmen in it can move themselves up and down to bolt the sections together.

Assume that two cylinders have been bolted to the bed plate, and a mast is rising through the center.

The sections of the third cylinder are raised by a steam winch and bolted in place by the workmen. Then a heavy flexible steel rope is temporarily anchored at the top of this last cylinder and led down through a longitudinal slot in the topmast and around a sheave in the heel of the topmast, then up and around a sheave temporarily bolted to the top of the last cylinder, thence down to the winch. Pulling this rope lifts the topmast and when it is elevated a distance equal to the height of a cylinder, a pin is thrust through holes in the steel and wooden masts, supporting the weight of the topmast until it is next raised. The temporary rope anchor and sheave are removed and the sections of the next cylinder raised and bolted in place. Thus the topmast rises with each additional cylinder. As the proper heights are reached the stay wires are attached. This method of



Views of the Construction Work at Koko Head.

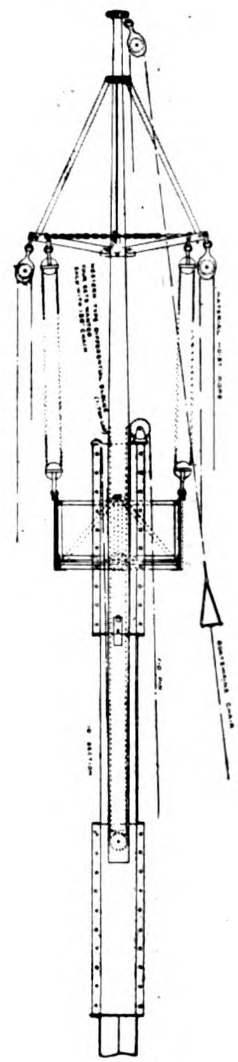
(1) *The concrete mixer.* (2) *A mast in course of erection.* (3) *Two of the completed masts.* (4) *A typical concrete anchorage for mast stays.*

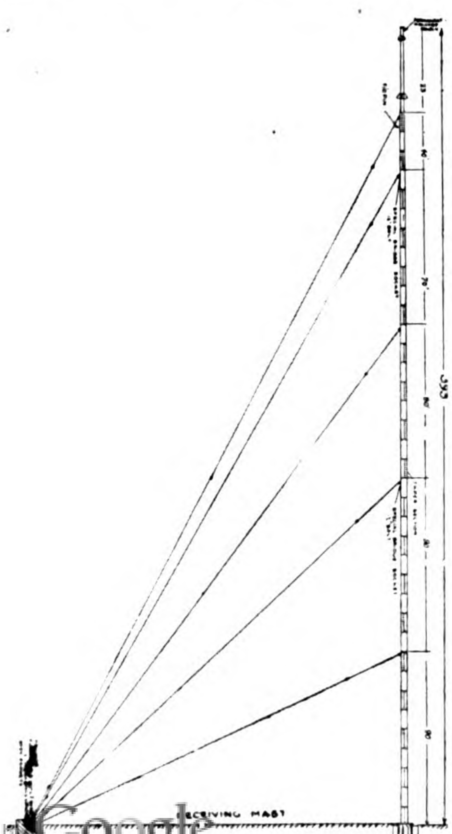
construction is very rapid and the mast when completed is very small in diameter compared to the height, is rigid, offers little resistance to the wind and has a very neat appearance as well.

The mast consists of 16 cylinders 15 feet long and 42 inches in diameter. The next cylinder is a taper section 10 feet long, reducing the mast diameter from 42 to 30 inches. Above this are fifteen cylinders 10 feet long and 30 inches in diameter, making the total height of steel work 400 feet. Above this the topmast rises 30 feet.

The steel cylinders above the sixteenth are all made in half-cylinder sections. The vertical and end flanges are all pressed directly from the main sheet of the section, so as to avoid any riveted joints. All the steel for these masts is being fabricated by the McMyler Interstate Co., of Cleveland, O.

To properly stay such a mast requires nearly twelve thousand feet of one inch diameter plough steel wire rope of exceptionally high tensile strength, made of seven strands of seven wires each. All wire rope is being furnished by the John A. Roebling's Sons Co. Each stay wire is broken up into a number of short lengths by porcelain insulators. This is necessary to prevent absorption of energy by the





wires, which would occur if any length was long enough to have a period of vibration approximating the wave length of the sending station. All energy thus absorbed is lost to any practical work. The insulators used are of the guy strain type and capable of carrying a pull of 75,000 lbs. Every effort has been made to keep the elastic extension of the stays as small as possible. If this extension amounts to only a small per cent. of the length of the stay the mast is liable to vibrate in the high wind and cause excessive strains on the stay ropes. To accomplish this no splices at all will be used on this work, but all connections at mast, insulators and anchorages will be made with specially designed bridge sockets, which give a perfect and straight pull on the rope and will develop the full strength of the rope. This is not possible with any system of splicing when a rope with wire center is used. Further, the style of connections adopted permits the use of a rope with much larger strands which not only stands the ravages of the weather better, but also has much less elastic extension than a more flexible wire rope.

The four stay anchorages are located two hundred feet from the base of the mast and consist of a crib of steel work imbedded in a heavy block of concrete, one strap extending above the concrete for each stay wire. Heavy turnbuckles are used to take up the slack and put the desired tension in the stays.

Wife is Captain Soule's Operator

The case of Mrs. H. E. Soule, wife of the commander of the American Fisheries Company's steamer *Windber,* who has just graduated from the Marconi wireless school as a full-fledged operator may be cited as an example to other wives throughout the country, who would best serve their husbands.

A license was issued to Mrs. Soule after she had put in three months acquiring a mastery of the wireless and she has departed from San Francisco to fill the position of operator aboard her husband's ship.

The Soules made a hazardous trip from the Atlantic in the *Windber* several months ago and upon arrival in port it was found necessary to overhaul the steamer. When the orders were received to proceed north and engage in the cannery business, Captain Soule discovered that in order to carry passengers between the northern stations he would also have to engage the services of a wireless operator.

This new problem gave him no little trouble until his wife came to the rescue with the suggestion that she become the operator.

Inasmuch as the *Windber* was to be laid up at the shipyards pending repairs the captain consented and his wife applied for instruction to the Marconi office.

Now she has received a license and carries the credentials of a first-class operator.

Land Station Items

The erection of the new masts in connection with increasing the capacity of the Port Arthur station has been completed and operations with the 5½-kw. apparatus are about to commence.

Fame Point station at the mouth of the St. Lawrence River has recently been opened for the summer navigation season. This station once again links up the St. Lawrence system with the Newfoundland stations and completes the wireless chain on the summer route to the south of Newfoundland.

The wireless station at Pictou in Nova Scotia which operates only during the winter has been closed down with the commencement of the summer navigation season.

Another Rescue

No more thrilling tale of rescue at sea has been recorded for a long time than that of the passengers of the *Texas,* from Christiansand to Galveston, which gave up her battle with the storm the evening of Good Friday, when her propeller was wrenched off and the wireless house and its instruments were wrecked by the waves.

Helpless in the trough of the sea she rolled for a day and a night, fast drifting from the steamship path.

One of the passengers was Mr. A. H. Geerman, an electrical engineer and wireless expert. With the most meagre equipment he set to work to try to repair damages, and after twenty-four hours' incessant labor, during which time the ship's officers hoped and the passengers prayed, he succeeded in raising a spark. One hundred and fifty miles to the east the *C. F. Tietgen,* of the Scandinavian-American Line, heard the call and responded.

Annual Meeting of American Marconi Company

Initial Dividend of Two Per Cent. Declared—A Year of Progress

THE first dividend on the shares of the Marconi Wireless Telegraph Company of America was declared at the annual meeting held in Jersey City on June 16. The dividend, which is 2 per cent., payable on August 1, is the first that has been paid by any American company since wireless telegraphy has been placed on a commercial basis. President John W. Griggs, who addressed the shareholders, announced that "in the absence of any unforeseen disturbance or setback in the course of present prosperity, the Board will be able to continue the payment of dividends for each six months of current business hereafter." This announcement was received with prolonged applause by the large number in attendance, there being nearly one million shares represented in person or by proxy.

In reviewing the operations of the company during the past year Mr. Griggs said it was gratifying to find a very satisfactory degree of growth and advancement, for it was a striking truth that heretofore the world at large had reaped the greatest benefits from the marvelous work of Mr. Marconi, while those who had furnished the funds to carry on the developments of the wireless system of communication in America had up to then received no returns in dividends earned and paid.

The debt of humanity to Mr. Marconi for life and property saved is already enormous, he added. The navies of the world powers, as well as the merchant ships, now sailed the perilous seas with an assurance of safety immeasurably greater than before and hundreds of thousands of passengers on the great liners were comforted by receiving news of friends at home. And yet, "to accomplish these beneficent results the public has contributed nothing; the genius that has devised has been that of Marconi; the capital that has enabled him to carry out his wonderful work has been that of private stockholders. It is to be regretted that our own Government, which has so freely made use of the fruits of Mr. Marconi's inventive genius, has not as yet in any way made the slightest recognition of the value and importance of his work. The magnetic telegraph was a wonder-working invention; the extension of its principles to the ocean cable made another great step in the advance of worldwide communication; but when Marconi marshalled the wild waves of ethereal energy, reduced them to orderly control, and made them carry with the speed of light the words of men through the vast wastes of space, he accomplished a miracle, surprising, stupendous—almost awe-inspiring."

That the great public had faith in the success of the invention and furnished ample funds to carry on and establish the great designs of the inventor was gratifying, observed Mr. Griggs, and also that after years of experimental work the time had come when there were satisfactory reasons to expect that substantial profits would accrue to those who supported the enterprise with their money.

A full appreciation of the growth of the company's business in the past year was given in a comparative statement of the net traffic receipts. An increase of more than $42,000 over the preceding year was shown in the net receipts for 1912. The total income from messages last year was $109,943.10, as compared with $18,358.29 in 1905. It was stated that the large increase in receipts for the year 1912 was mostly due to the acquisition, in July last, of the contracts to serve the ships previously equipped by the United Wireless Telegraph Company.

A comparison of the number of messages and words sent during the last three years proved interesting. In 1910, 31,051 messages, consisting of 407,173 words were sent; the following year, 41,000 messages, consisting of 550,000 words were sent, and in 1912, 227,944 messages, consisting of 3,863,098 words were sent.

Speaking of the extension of the company's operations the chairman said: "There are now equipped by the Marconi Wireless Telegraph Company of America more than 450 ships of the American Mercantile Marine, and with the addition of the shore stations there are now equipped by the company over 500 stations on the Atlantic and Pacific Coasts. We are justified in saying that practically all commercial vessels flying the American flag are equipped with the Marconi apparatus as supplied, operated and controlled by this company."

It was then explained that contracts which had heretofore been placed on a basis that did not satisfactorily recompense the company for operating the stations were being re-formed and that the steamship companies were agreeing to an amelioration of such contracts with signal fairness in almost every instance, hence it was expected that before long the general run of these contracts would be on a much more remunerative basis.

Mr. Griggs noted that while the figures were very satisfactory, they were small compared with the results which must follow when communication should be established between the United States and Great Britain. The engineers and contractors had given assurance that the co-operating stations in New Jersey and Wales would be completed by next November; thus, allowing for all necessary delays in adjusting and trying out the stations, active commercial business across the Atlantic should be going on by the first of next year.

"The plans of your Directors do not stop, however, with the Anglo-American stations," continued the chairman. "Already well under way is the construction of co-operating stations at San Francisco and in the Sandwich Islands. From Honolulu we look beyond to service connection with the Phillipine Islands, thence to Japan, China and India—an Imperial Chain."

Mention was then made of the contract with the Norwegian Government, for the erection of co-operating high-power stations in Norway and the vicinity of New York, which awaited the ratification of the Norwegian Parliament. (This ratification has since been obtained, as reported elsewhere in our pages.) It was further added that communication by similar long-distance stations between various countries in South America and the United States was under consideration.

After referring to the report of the technical committee appointed in the Parliamentary investigation which acknowledged Marconi apparatus as the only existing system capable of fulfiling the requirements of the British Government, Mr. Griggs read an extract from a letter written by one of the engineers who equipped a 5-kw. set at Zamboanga in the Phillipines. It stated: "I beg to advise that the 5-kw. set is now in operation. The Bureau of Posts is using it a number of hours each day in handling regular business between this station and Jolo Malabang Balvo and Puerito Princessa. As regards the strength and tone of the signals, the Bureau is very much pleased with the set. On Sunday afternoon we were testing with Olganpo, which station is 150 or 200 miles north of Manila, and our signals were perfectly received. The army transport *Merritt*, which arrived in port yesterday, reports that she heard our signals in Manila Bay and all the time on the trip to Zamboanga."

Speaking of wireless as an aid to navigation the chairman noted that "the recent great development in the size and speed of sea-going vessels has enormously increased the responsibilities of the officers commanding and navigating them, and it has been necessary, in order to minimize dangers of collision or groundings, to reduce the speed of these vessels in foggy weather, with a consequent loss of much valuable time and money and even when precaution has been taken, accidents are not infrequent. The Marconi companies have accordingly been led to give considerable attention to the development of an instrument which is now aptly known as 'The Wireless Compass.' The Wireless Compass is a combination of some of Mr. Marconi's recent inventions, and the Bellini-Tosi patents, the sole use of which for the United States has been secured by your company. The Marconi Wireless Compass is quite independent of weather conditions and by its use the position of a ship with regard to any coast station can be determined and the direction of an approaching or overtaking ship can be found. The apparatus is of very simple construction, which is another strong point in its favor. Your company anticipates that the manifest advantages to shipowners of this instrument will cause it to be widely adopted and its sale should add considerably to the revenue of your company."

Mr. Griggs then mentioned the confidence in the Marconi system shown by the people in subscribing to the new stock, in May of last year, supplying the company with ample funds for the establishment of the extensive international stations referred to, and stated that these funds had been temporarily invested in securities of the most approved character and were earning a fair rate of interest.

The chairman then formally declared that "The general Profit and Loss Account for the year ending January 31, 1913, a copy of which has been sent to each stockholder, shows a surplus of profit at the end of the year of $224,-483.65. Your Board of Directors, in view of the very large cash fund on hand, have deemed it fair and prudent to distribute to the stockholders a dividend of 2 per cent. upon their capital stock out of this balance of profit and loss shown by the statement of operations for the past year. In the absence of any unforeseen disturbance or setback in the course of present prosperity, the board will be able to continue the payment of dividends for each six months of current busines hereafter, the amount of which cannot at the present time be precisely estimated.

"I take this occasion to congratulate you upon the safe and sound condition of your company's affairs and to express the most earnest hope for the realization of those reasonable expectations of profitable business that have been so generally entertained on the part of the stockholders of this company."

The ballots showed the election of Hon. John W. Griggs, James M. Townsend and Marcus Goodbody as Directors to serve for a term of five years or until their successors are appointed. The tellers also reported a large vote in favor of the amendments to the by-laws whereby the fiscal year is made to end December 31st, instead of January 31st, and also permitting the Directors to elect additional Vice-Presidents, Assistant Treasurers and Assistant Secretaries.

The meeting then adjourned with many informal expressions of thanks to the chairman and the Directors.

The Report of the Directors

THE Company's business shows satisfactory extension, but the account must not be taken as any criterion of what the Company should do, either in respect of its general business or the extensive telegraph service which will be instituted when the long distance stations now in course of erection come into operation.

The acquisition of the tangible assets of the United Wireless Telegraph Company gave your Company the control of all the coast stations of importance on the Atlantic and Pacific Coasts, besides practically the whole of the American Mercantile Marine, at present fitted with wireless installations. It must be remembered, however, that the Company did not get possession of these assets until the month of July last, that many of the contracts taken over from the United Wireless Telegraph Company were for an unexpired term, on an unsatisfactory basis, and that time was required to rearrange these contracts on more equitable terms, therefore the improvements which will necessarily result from these changes play but a small part in the accounts now submitted. The expenses which were necessarily entailed in taking over these assets were heavy.

At a special meeting of the Company, held on April 18, 1912, the stockholders voted affirmatively for a change in the capital stock, whereby the amount thereof was increased to $10,000,000, of which $7,000,000 was offered to stockholders and fully subscribed by them. Of this amount, 1,880,504 shares have been issued and paid for and 119,486 shares have been subscribed for but not yet issued.

Holders of certificates of stock under the original basis of incorporation or under the amendment of 1910 are entitled to receive in exchange therefor five shares of stock of the present par value, and it is requested that those stockholders who have not already exchanged their original certificates for those of the new issue should do so at once. This can be done by forwarding the old certificates to The Corporation Trust Company, 15 Exchange Place, Jersey City, N. J. Certificates should be sent by registered mail with return registry fee enclosed, and do not require endorsement.

The directors have been able to arrange for the immediate construction of stations to place this country in direct communication with England, and for the construction of stations at San Francisco and Honolulu to communicate through the Philippines with China and Japan. It is intended to extend the service from New York south to Cuba, Panama, and subsequently to each of the South American States. Communication across the Atlantic should be established this year and other stations will be available within the next twelve months.

Agreements have been entered into with the Western Union Telegraph Company and the Great Northwestern Telegraph Company, whereby some 30,000 offices become available for the delivery and receipt of Marconigrams throughout the United States and Canada.

A contract has been entered into with the Norwegian Government for the erection of high power stations in Norway and the vicinity of New York for the purpose of conducting a commercial telegraph service between Northern Europe and America. The receipts of the joint stations will be pooled by the Norwegian Government and the Marconi Wireless Telegraph Company of America and divided equally between them. The contract is for a definite period of 25 years.

The United States Government has now ratified the convention of the International Radiotelegraph Conference of London and federal laws have been brought into force which require that passenger steamers licensed to carry fifty or more persons and trading between ports distanced two hundred miles or more be equipped with wireless apparatus and in addition thereto an auxiliary equipment independent of the ship's main power plant available in case of disaster disabling that plant which must be capable of carrying on communication for four hours over a distance of at least one hundred miles.

Furthermore, all passenger steamers included in the above mentioned Act are required to carry two operators so that a continuous watch may be maintained. After July 1st, 1913, this Act will apply to ocean cargo steamers carrying a crew of fifty or more.

All the vessels operated by this Company, within a very short time after the regulations came into force, were equipped with the necessary auxiliary apparatus and although at the outset it was a very difficult matter to procure the requisite number of competent operators to comply with the requirements of the law, your Company has been able, by starting Schools of Instruction in New York, and in other cities to train several hundred fully qualified men, and competent operators have now been supplied to all steamers.

In addition to the re-equipment of vessels taken over, three 100 K. W. stations have been erected during the year for the United Fruit Company, to provide wireless service between New Orleans and South America. It is of particular interest to note that these equipments replace apparatus of another wireless company.

The American Government in April, 1912, ratified the Berlin International Radiotelegraph Convention, the general purpose of that convention being to procure the maximum amount of efficiency in communication between ships at sea and between ships and coast stations.

The whole of the ship and shore stations which were formerly owned by the United Wireless Telegraph Company and which were sold under decree of the United States Bankruptcy Court, have been acquired by your Company, so that your Company is today operating over 500 stations, ship and shore, which comprise all the important stations on the Atlantic and Pacific Coasts, also those in the District of the Great Lakes.

The work entailed on your Company in taking over, refitting and improving these stations up to date has been enormous, but your directors take pleasuse in informing the stockholders that the stations now conform to the recently enacted requirements of the United States and are in efficient working order.

Your Company has purchased land and equipped a factory at Aldene, New Jersey, with plant suitable for the manufacture of wireless telegraph apparatus for the American Government and other users, and for its own requirements.

Looking to the betterment of condition of operators employed by the Company and with the view of making returns for wireless work more efficient, a bonus scheme, effective from and after January 1, 1913, has been evolved, whereby a certain percentage is set apart and made payable to operators, increasing in proportion to the length of service and satisfactory working. In addition thereto a wireless benevolent association is now in contemplation which will be worldwide, and operators from all parts will be eligible for membership. A moderate monthly subscription will be added to funds on hand and used for sick benefits, also death payments. The nucleus of the fund will be a balance of $3,000 which will remain in the hands of the Committee representing the "Marine Wireless Operators' Fund" after the erection in the City of New York of a drinking fountain, a memorial to Jack Phillips and three American operators who went down with their ships.

Norwegian Contract Ratified

The Norwegian Storthing has ratified the twenty-five year contract between the Norwegian Government and the Marconi Wireless Telegraph Company for the erection and joint operation of high-power stations in Norway and New England. When completed, they will send and receive direct messages over the longest distance between any two wireless stations in the world.

Two locations twenty miles apart will be chosen at once somewhere in Massachusetts or Connecticut and the American Marconi Company will build separate receiving and transmitting stations similar to those now being constructed at New Brunswick and Belmar in New Jersey. They will form a part of the world-encircling chain of stations which includes San Francisco, Honolulu, Wales, Yokohama, etc.

Under the contract the Norwegian Government will spend $560,000 in building a station at Stavanger. The receipts of the joint stations will be pooled and divided between the Government and the American Company.

While the primary object of the new stations is to connect the United States with Norway, they will also furnish a medium of communication with all other parts of Northern Europe.

MARCONI WIRELESS TELEGRAPH COMPANY OF AMERICA

General Profit and Loss Account—For the Year Ended January 31st, 1912

Debit	Amount	Credit	Amount
Administration Expenses, including Salaries of Directors, Executive Officers and Consulting Engineer, Rents, Taxes and General Office Expenses, Reserves for Outstanding Liabilities, etc.	$79,650.73	Profit from Operation of Land and Ship Stations, Sale of Apparatus, Etc.	$170,694.79
Legal, Patent and Stock Transfer Expenses	10,357.42	Interest on Temporary Investment of Surplus Funds	161,548.29
Depreciation on Buildings, Equipment, Etc.	30,989.36		
Profit Carried to Balance Sheet	211,245.57		
	$332,243.08		$332,243.08

BALANCE SHEET—JANUARY 31st, 1913.

ASSETS

Cash in Banks, on Hand and at Call:		
Cash in Banks and on hand	$308,491.11	
Bankers' Certificates of Deposit	775,000.00	
Bankers' Collateral Loans	2,320,000.00	
		$3,403,491.11
Investments and Loans (At Cost):		
Railway Bonds and Notes	$2,108,502.56	
Bankers' Time Collateral Loans	250,000.00	
Foreign Government Bonds	97,875.00	
Municipal Loans	75,000.00	
Bankers' Time Certificates of Deposit	100,000.00	
Shares of Other Companies	1,470.00	
		$2,632,847.56
Interest Accrued		22,717.82
Sundry Debtors and Debit Balances, after providing Reserve for Doubtful Accounts		309,684.56
Patents, Patent Rights and Good-will		2,691,215.29
Real Estate and Buildings, Machinery, Plant, Apparatus at Works, Land and Ship Stations, after providing Reserve for Depreciation of Equipment		806,487.11
		$9,866,443.45

LIABILITIES

Capital Stock:		
Authorized: 2,000,000 Shares, par value $5.00 each	$10,000,000.00	
Less: Subscribed for but not yet issued 119,486 Shares, par value $5.00 each	597,430.00	
	$9,402,570.00	
Less: Stock held in Treasury	500.00	$9,402,070.00
Sundry Creditors and Credit Balances		195,857.47
Reserves for Outstanding Liabilities, Rentals Prepaid, Etc.		44,032.33
Profit and Loss Account:		
Balance, Jan. 31, 1912 (adjusted)	$13,238.08	
Profit for year ended Jan. 31, 1913, per Profit and Loss Account	211,245.57	224,483.65
		$9,866,443.45

We have audited the accounts of the Marconi Wireless Telegraph Company of America in New York and San Francisco, for the year ended January 31st, 1913. We have duly verified the Balances in Banks and on hand, and the securities representing the Investments, as set forth in the Balance Sheet, have been produced for our inspection.

No provision has at present been made for writing off any portion of the book value of Patents and Patent Rights.

Subject to the correctness of the apportionment of Cost Values of Assets acquired during the year, we certify that the above Balance Sheet, in our opinion, fully and fairly sets forth the position of the Company as disclosed by the books as at January 31st, 1913.

New York, June 5th, 1913.

DELOITTE, PLENDER, GRIFFITHS & CO.

The End of the Marconi "Scandal"

British Commons Exonerate Ministers and House Votes to Accept the Regret Expressed

ON June 19, the long-drawn discussion in the British House of Commons over the purchase of shares in the American Marconi Company, by the attorney general and the chancellor of the exchequer, ended in a vote of exoneration. By a large majority the House acquitted Mr. Isaacs and Mr. Lloyd-George "of acting otherwise than in good faith." The motion added that "the charges of corruption against the ministers have been proved to be absolutely false."

In the debate of the closing days, harsh things were said by the opposition; but these largely resolved themselves into general expressions of ill-will or veiled insinuations. The Right Hon. Alfred Lyttelton, formerly Secretary of State for the Colonies, complained that the apologies of the ministers were not humble enough. Henry Edward Duke, of Exeter, said that some facts had been overlooked in the final conclusion. Of course, Lord Robert Cecil in his minority report made out as hard a case as possible. But the worst statement he was willing to commit himself to was this: "I could have said a great many more things and I am quite ready to tell any member privately of some things." It is not known how many curious members profited by his offer.

The two ministers made eloquent addresses in which they expressed regret for their errors of judgment. Sir Rufus Isaacs took upon himself the chief blame. He asked the House to take into account the fact that his brother would very naturally offer him shares out of family affection, without any thought of changing the course of governmental action. Sir Rufus declared that he had honestly believed dealings with the American company to be free of any suspicion of connection with British government contracts. He added:

"If I had imagined that my transactions were open to such misrepresentation, I say plainly that I should not have entered into them." He declared that he wished to be tried by the highest standards, since the best safeguards for the purity of England's public life were the high principle and honor of her public men. The address of the attorney general and that of the chancellor of the exchequer, which followed, were marked with much applause from members on all sides of the House.

Mr. Lloyd-George admitted indiscretion, but protested passionately against the unjust charges made against himself and his colleague. "The charges," he said, "have been exploded, but the deadly after-damp remains." The two ministers left the House together before the vote was taken.

Commenting on these addresses, the *London Daily Mail* said:

"After the speeches of Sir Rufus Isaac and Mr. Lloyd-George we should not have been surprised had the resolution been withdrawn. The public objects sought by its framers have been attained, the standard of public duty has been maintained, and the principle for which the debate was initiated has been fully vindicated."

The *New York Sun* declared that it is "the Opposition and not the Government that comes out at a disadvantage. The Unionists would be in a much stronger position before the country if they had withdrawn the Cave motion implying censure As there was no dissent from Mr. Balfour's admission that the charge of corruption was untenable and absurd, the whole matter should have been dropped."

Andrew Bonar Law, the Opposition leader, said that his party had no desire to drive the ministers out of public life. And as Sir Edward Grey remarked, the House should do everything in its power to relieve the ministers of the injury done them by the charges of corruption bandied about the country, although nothing that it did could right all the wrong they had suffered.

The report is in harmony with Mr. Marconi's previous statement that he had never received from any government department anything in the nature of a favor. "No evidence," declared the House, by its June vote, "was given showing that any member of the British government exercised any influence to procure the contract for the English Marconi Company, or in any way acted contrary to the public interest in behalf of that company, or used knowledge acquired in his official capacity for his private profit."

At a luncheon at the National Liberal Club on July 2, Mr. Lloyd-George served notice that his hands were free to smite. He has suffered deeply and it is time for his enemies to look to the walls of their glass houses.

Newspaper Withdraws Libel.

The *Welt am Montag,* the sensational Berlin weekly which accused the Marconi Company of suppressing the news of the *Titanic* disaster for the purpose of selling it exclusively to the *New York Times,* has officially withdrawn the charge, and the libel proceedings against it have been ended by a compromise. Counsel for the newspaper appeared in court and announced that, as it was unable to prove its accusations, the paper retracted unconditionally. The *Welt* will be called upon to bear the expense of the litigation and to publish the details of the compromise, to which the Marconi Company has given its assent.

The proceedings have been going on for nearly a year. They were adjourned last autumn to enable the court to examine Mr. Marconi's personal statement made before the Senatorial commission in Washington. Conviction having stared the *Welt* in the face, it availed itself of the opportunity provided for defendants in German libel cases to make peace with the Marconi Company before the court found the journal formally guilty.

New Contract for Imperial Chain

A NEW contract between the British Government and Marconi's Wireless Telegraph Company, Ltd., has been drawn and awaits ratification by Parliament. Unless it is ratified by the end of August, it will lapse. If accepted it will result in a round-the-world circuit under British control.

The cost of materials having increased, the new contract provides for an increase per station over the original price. The company named $32,500 as a fair rate. Postmaster General Samuels said that due allowance would be made for the increase, though it might not reach this figure.

The company has agreed to waive the demand of $20,000 which was held to be a just allowance for the cost of delay. A staff had to be maintained in expectation of the ratifying of the old contract.

When the government investigation was started, the company asked to be released from the terms it had offered. The matter was not settled at the time, but Mr. Samuels has declared that no action will be taken to enforce the agreement. The fact that it was never ratified by Parliament relieves the company from obligation in the matter. The only thing the Government could do would be to sue for damages, in which case the burden of proof would rest upon the representatives of the Crown. They would have to show a genuine loss through the repudiation of the contract.

In giving the House the terms of the new arrangement, the Postmaster General explained that the Marconi Company was willing to let the Government erect its own stations, paying royalty for the use of the patents. This was not deemed advisable. It now appears that if the British Empire wants the use of wireless throughout its dominions—and it has certainly been made plain enough that the Imperial chain is wanted, the only possible way to get it without an indefinite delay is to ratify the new contract with the English Marconi Company.

The Year Book of Wireless Telegraphy and Telephony, 1913

A Standard Reference Work, Indispensable to Those Interested in the Development of Wireless

FOR some time past those concerned with wireless telegraphy have felt the need of a reference work which would give them authoritative information in convenient form. The "Year Book of Wireless Telegraphy and Telephony," of which the first issue has just been published, was designed to satisfy this insistent demand for information in a manner intelligible to the novice as well as the commercial and scientific man. So well has this object been attained that it can be said without the slightest hesitation that this, the first volume of its kind, is invaluable to any person interested in or engaged in the development of radio communication.

Before considering the volume from the viewpoint of the reviewer it will not be amiss to record an incident attending the inspection of an advance copy, the first to reach this country. A prominent official of the Marconi Company received the volume on the eve of his departure for Washington and carried it with him, intending to examine it carefully during spare moments. So profitable did he find his initial reading that during the course of the official business with the Government, which had brought him to the capitol, he suggested that a copy might be useful to those engaged in the United States Radio Service and offered the advance copy for inspection. The high Government official to whom the book was loaned and who is known the world over as one of the most important workers in the wireless field, at once pronounced the book absolutely indispensable; he immediately requested that all heads of departments be supplied with copies at the earliest possible moment and entreated the commercial man to leave his copy right where it lay—on the table about which those who are to represent our country at the forthcoming International Conference gathered a few hours later. During their deliberations the volume was referred to many times and proved of incalculable value. A few days later a substantial order for copies to be distributed to the various departments was received from the Government.

The fact that, unsolicited, this book became the officially recognized radio reference work of the country, upon its first appearance, is eloquent testimony to the thoroughness which attended its compilation. One feature alone—the administrative section—contains information which could not be found without extensive research in many directions. In convenient form for the reader are the articles of the London convention of 1912 and the radio laws and regulations of the principal countries of the world, carefully translated into English; even China has not been overlooked, although, to quote the book: "There are no wireless telegraph stations in operation in the Colony of Hongkong (February, 1913), but the Crown Agents for the Colonies are about to call for tenders for a 5 k.w. station, to be erected by the Government in Hongkong."

While this one section will probably be regarded by Government and commercial men as the most valuable feature of the work, there are other chapters which will prove indispensable to the serious wireless worker, whether his interests lie in the commercial or technical phases.

The year-book opens with a calendar, followed by a concise record of the yearly progress of wireless telegraphy during the past seventeen years. This chronological record should prove not only a valuable time-saving reference section, but interesting reading as well. There are a hundred or more items recording the dates of marine mishaps, the opening of important stations, legislative matters, and notable communication feats. In a word, the reader gets a brief but complete record of all the important factors in the development of commercial operation throughout the world.

Following the administrative section, there is a complete list of land and ship stations, designed to be consulted in conjunction with the map of wireless telegraph stations of the world which forms a supplement to the book. Both ship and shore stations are grouped together under the names of the countries in which they are established and classified in alphabetical order. The call letter of every station is given, the normal range in kilometres, the wavelengths employed and the message charges, where these have been fixed. Other particulars include the nature of the service carried on at the stations and the hours during which they are open for public business. An even hundred pages are devoted to this list.

Among other features of the book are technical articles by the greatest living authorities on radio matters. Professor J. A. Fleming, F.R.S., contributes an article on "Electrical Measurements in Wireless Telegraphy," the importance of which is clearly revealed in the opening paragraph. It states: "Exact measurement is the very life and soul of all technical applications of science. Unless we are able to weigh and measure the quantities and effects with which we are concerned, progress is uncertain and improvements are slowly reached." Arthur R. Hinks, Chief Assistant, Cambridge Observatory, explains the method of determining longtitude at sea through wireless time signals; C. E. Prince takes up the question of finding the direction from which wireless signals are arriving and describes the apparatus which solved the problem. Distress signaling is adequately covered by G. E. Turnbull in an article discussing early methods and what is being accomplished to-day; Andrew Gray is the author of an article describing the Marconi System, and "Principles of Wireless Telegraphy Explained by Mechanical Analogies" proves one of the most helpful among the many papers which have come from the pen of Capt. H. Riall Sankey. Major J. E. Cochrane deals with military use of wireless telegraphy, and Dr. J. Erskine-Murray gives a clear explanation of the technical situation of radio-telephony. "Some Facts and Theories of Long Distance Signaling," by Dr. W. H. Eccles, is especially valuable and timely and will take its place among the important treatises of the day. Others no less well known have contributed articles on the equipment of the mercantile marine, methods of producing continuous waves, the development of the transmitter and the phenomenon which plays so important a part in wireless, syntony. Following the technical papers there are a number of formulae and equations useful in radiotelegraphy and a very full glossary.

A dictionary of technical terms in English, French, Italian, Spanish and German, nearly fifty pages of useful data, comprising all manner of tables with their equivalents in familiar measurements and a list of wireless telegraph patents accepted since 1896, and still in force, completes a valuable section.

Full information is given of the leading commercial wireless companies, including date of incorporation, capitalization, assets, directors and scope of operations, as well as biographical sketches of prominent men in the world of wireless telegraphy.

The volume, which contains 563 pages, is profusely illustrated and includes one feature which no wireless worker can afford to be without—a striking three-colored map showing clearly the position of all stations open for ship-and-shore communication, high-power public and private stations and the sites of the trans-ocean stations now in course of erection.

Putting it mildly, no book-shelf can be considered complete without this standard work of reference on wireless telegraphy and telephony. Copies may be obtained from the Book Department of The Marconigraph, 456 Fourth Avenue, New York. Price $1.00.

THE MARCONIGRAPH

An Illustrated Monthly Magazine of WIRELESS TELEGRAPHY

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The Editor will be pleased to receive original articles of timely interest pertaining to Wireless Telegraphy and Telephony. Articles accompanied by good drawings and clear photographs especially desired. If accepted, such articles will be paid for on publicaton, at regular rates.

No manuscripts will be returned unless return postage is enclosed.

Vol. I. JULY No. 10

Editorial

The newly revised regulations governing wireless communication throughout the country and including detailed instructions for operators, have just been issued by the Department of Commerce.

One of the new rules requires that: "Radio operators holding licenses of any grade or class and applying for examination for any other grade or class must submit to the examining officer an additional form . . . in duplicate. If a new license is issued, the license held by the applicant must be surrendered."

This means that in the future operators will be prevented from holding more than one license. The wisdom of this provision is so obvious that no additional comment is required.

All operators must also be able to transmit and receive at least five words a minute.

Cargo vessels with crews of fifty or more are required to carry two operators, under the recently enacted law, effective July 1. The new regulations permit the second operator to be a member of the crew.

It is also stated that no apparatus is too small to escape the necessity of being licensed.

* * *

The licensing of amateurs is an ever-increasing problem, according to the radio inspectors. A young New Yorker, whose experiments have been given a certain amount of newspaper publicity at various times, was recently arraigned in the United States District Court on a charge of operating without a license a wireless telephone apparatus of sufficient power to extend beyond the State.

From authentic sources it is learned that the wave length used by this young man interfered with commercial stations. One who styles himself a private experimenter and former commercial operator, claims that this isn't so; he believes that the wave would not interfere with any other station, for while it is nearest to those employed by the Arlington and Cape Cod high-power stations, there is still enough difference to permit any amateur to read the traffic of these stations while the experimental phone is working. Furthermore, he states, the station of the unfortunate experimenter is very sharply tuned and cannot be heard at all on the wave lengths of other stations; besides, the voice sent out on the ether waves is not loud enough to hamper commercial stations equipped with receiving sets possessing any degree of sensitiveness or selectivity in tuning.

A praiseworthy defense in some respects, but as in the general run of such cases, the one who has voluntarily taken up cudgels for the offender has neglected the really important issues.

The experimental radio 'phone did interfere with commercial business—there is no disputing that fact—for this interference led to the investigation. Then the young man was charged with violating an interstate commerce regulation, operating a set the waves of which traveled over several states. Argue as he will, his defender can give no reason why any young man should not be punished for violating a law which the government framed only after weighty consideration.

It is common knowledge that a low-powered amateur station located near the border of a state can be heard in an adjoining state when transmitting, while one of considerably greater power near the center of a large state would probably not be heard beyond its borders. Any experimenter, and certainly the young man in question, knows of this condition and is equally familiar with the fact that the penalty provided for interstate communication is the revocation of the offender's license and the closing of his plant. Undoubtedly this restriction has proven an inconvenience to may amateurs, which, however, does not alter the fact that since wireless experimenting has been placed under federal control the letter of the law must be observed; even if public sentiment is occasionally aroused over what might appear on the surface to be an injustice.

Critics of the government's attitude in cases of violation of this statute gain nothing by attempting to justify the course of the present offender by calling attention to other delinquents. An example of this misguided attitude recently appeared in a daily newspaper in the form of a letter over the signature of "Experimenter." The writer stated:

"Amateur stations are allowed to use almost any wave length, despite the fact that the law restricts them to wave lengths of 200 meters or less. I know of any number of amateurs who use wave lengths of 300 to 400 meters, just the right wave length to interfere with marine wireless telegraphy, the most important branch of wireless telegraphy, on account of the protection afforded by it to steamship passengers in time of danger."

It does not seem possible that any radio inspector possesses this knowledge or that he would purposely allow the owners to continue using their sets. The only inference to be drawn from a statement of this kind is that, among themselves, amateurs know of many cases of deliberate violation of a law which has been in force for nearly a year. If such a condition exists, why do not the sincere workers—and surely there must be some sincere amateurs—come forward with the names of the offenders? It would be a refreshing experience to meet the young man who has sufficient pride in his country to assist those who are endeavoring to enforce its laws.

The young man who conceals his identity behind "Experimenter" may not realize that he is in precisely the same position as the man who sees a thief enter the house of a neighbor and informs someone other than a guardian of the law that a lawbreaker is at work somewhere in the city, but he prefers not to mention the exact location. Using a wave-length greater than the law prescribes is obviously an offense against the government, and it is a mighty poor citizen—or future citizen—who refuses to disclose the name of the offender.

Let this young man, or anyone, for that matter, who knows of similar violations, send us a list of the names of amateurs using wave-lengths of more than 200 meters, and we will take very good care that the radio inspectors are informed. And, what is better, we will see that the letter of the law is enforced.

Returning to the case of the young man whose radio-telephone experiments landed him in court, it appears from his own statement that he has been engaged in commercial service; he has further claimed that he has secured financial backing for his experiments—certainly, then, he must have been familiar with what the law prescribes.

When the case was called before Judge Mayer, sitting in the Criminal Branch of the Federal District Court, the wireless man's counsel interposed a demurrer to the indictment, claiming that the act of August 13, 1912, was unconstitutional because it interfered with the rights and privileges of citizens of the state and that the National wireless license law could not be properly invoked to prevent him from perfecting his apparatus, because its operation might have an effect beyond the state line. He further argued that the issuance of a license did not prevent radio interference.

The judge replied that the federal license law gives the government control of wireless communication and the power to revoke licenses and shut down plants interfering with transmission, and further called attention to the fact that France has laws governing the navigation of the air, an elaborate series of rules of the road for the regulation of flying machines while in operation. The demurrer was overruled.

The young man has entered a plea of not guilty and will be given a jury trial. Whether or not he is acquitted will undoubtedly rest with the merits of the case, and it will avail him nothing that "Experimenter," in his attempt to justify what he terms a "struggle for his rights against these government regulations" protests that since the wireless telephone was essentially for long distance transmission it was not practicable for the young man to use the wave length allowed to amateurs—200 meters or less.

For there are no such things as "rights" against government regulations —they represent the law, and must be obeyed without question.

If the young experimenter could not develop his apparatus with a short wave, he should have taken the trouble to carefully read the regulations. The Secretary of Commerce and Labor is authorized by section 4 of the act to grant special temporary licenses "to stations actually engaged in conducting experiments for the development of the science of radio communication, or the apparatus pertaining thereto, to carry on special tests, using any amount of power or any wave lengths, at such hours and under such conditions as will insure the least interference with the sending or receipt of commercial or Government radiograms, of distress signals and radiograms, or with the work of other stations."

This is certainly clear enough, and if we are to credit the statements of his supporters—that his apparatus has been heard clearly and distinctly over considerable distances—the young man should have had little difficulty in securing such a license, applicants for which are required to state any technical result they have already produced and their technical attainments.

Contrary to the opinion held in some quarters we maintain that the law is a good and generous one. This unfortunate incident has again brought to our attention the necessity of warning amateur experimenters to comply with the government regulations—now. We have said before, and we again repeat, let a few more flagrant evasions come into court and amateur experimenting will come to a sudden end. And once ended, it will be for all time.

The Share Market

NEW YORK, July 10.

The general condition of the share market remains the same as heretofore, Marconi issues being inactive on the curb. The brokers report occasional private sales at the following bid and asked prices:

American, 3⅞ — 4¼; Canadian, 2¼ — 2¾; English, common, 16 — 18; English, preferred, 13 —15.

New Great Lakes Station

The Marconi Wireless Telegraph Company of America is completing installation of a wireless station at the Ashtabula, Ohio, plant of the Great Lakes Engineering Works Company. It will be put into operation within a few weeks.

Great Lakes Message Rate Reduced

A reduction from ten cents to five cents a word, for wireless messages between ship and shore stations on the Great Lakes, has been announced by the American Marconi Company. This will practically equalize land and water rates, and will be of great benefit to travelers.

Communication Co. Pays Ten Per Cent

At the annual meeting of the Marconi International Marine Communication Company held on June 23, Mr. Godfrey Isaacs stated that 686 ships are now equipped with their system.

Receipts from ship marconigrams and subsidies during last year exceeded $500,000. A dividend of 10 per cent. was declared.

Court Seeks United Shareholders

A notice to stockholders of the bankrupt United Wireless Company has been issued by the Supreme Court of Maine, in an effort to determine who are the bona fide shareholders of that corporation and the amount and nature of their respective holdings.

James E. Hewey, Special Master in the case, requests that all persons claiming to be stockholders in the United Company file their stock certificates with him, on or before August 1. The validity of these certificates will then be determined. It is stated that those who do not observe this mandate will be forever barred from participation in the distribution of any dividends which may be declared and paid out of the assets which may come into the custody of the Receiver.

In order to have a claim properly considered, an affidavit must accompany the certificates, setting forth the number and kind of shares held, the date and number of the certificates, the date of purchase, the consideration paid, where and of whom purchased, and the amount of the indebtedness, if any, owing to the company.

Shareholders whose claims may be questioned by the Master or contested by interested persons, will be given a hearing during the forenoon of July 9 and 23, at Room 15, No. 95 Exchange Street, Portland, Me.

Mr. Marconi Leaves.

Mr. Marconi sailed on the *Mauretania,* on July 1, after spending four weeks in this country, chiefly in the law courts where he testified against the National Electric Signaling Company in a patent infringement suit.

"I had hoped to find time," said Mr. Marconi before sailing, "to make a trip to Glace Bay, N. S., to examine the new high power station there, but did not have the opportunity. All I could do was to inspect the Marconi station in New York and the new one which is being erected at Belmar, N. J., and visit Sing Sing."

In regard to his wireless plans and work Mr. Marconi said: "I found the long distance station at Belmar, N. J., well under way and we expect to have it open for business in October, communicating directly with the English station. After I go to London to attend to some business there I shall start for Norway to see about the construction of the wireless station there. We will also have this in direct communication with a powerful wireless station on the Atlantic coast independent of the Belmar station.

"There is always something doing in wireless invention or in the perfection of wireless apparatus, but there is no public talk about it; it goes on silently but effectively. We hope to bring the cost of the wireless messages down to a point where all merchants will use the wireless and it will be generally used by the newspapers."

English Courts Quash Poulsen Patents

As we go to press, word comes from London that permission to renew the expiring English rights in the Poulsen wireless devices has been refused by Mr. Justice Warrington. This decision is based on the fact that the owners, the Telegraphone Corporation of New Jersey, have never made any use of their rights in Great Britain. The Crown counsel made no objection to the renewal of the patents, so far as the invention itself was concerned. Every opportunity was offered for a complete presentation of the case. The company claimed that a perfected form of the apparatus was being used successfully in America. But no sufficient reason, according to the Court was given for the failure to offer a service to the English public. The patents were taken out in 1899, and the instruments described were said to be for "storing up speech or signals by magnetic influence."

Reports of Goldschmidt Message Denied

Accounts have recently appeared in the daily newspapers of a reported achievement of the Goldschmidt station at Tuckerton, N. J., stating that communication had been established with Naustadt, near Hanover, Germany, a distance of 3,900 miles.

An Atlantic City correspondent says that an interview with Manager Emile Mayer, over the long-distance 'phone, has proven the report false. Mr. Mayer stated he would be only too glad to give out such news were it true. He could not account for the report, but it was obviously impossible for the messages to have been sent in view of the fact that no machine for handling them has as yet been installed.

Manager Mayer also took occasion to deny the report that there have been indications of a labor strike and said that the work on the tower was progressing satisfactorily.

Canadian Government Ships Equipped

Acting under instructions received from the Canadian Government, the Marconi Company of Canada have equipped the C. G. S. *Canada* and *Dollard* with wireless apparatus.

The *Canada,* originally a torpedo boat destroyer, was purchased nine years ago by the Dominion Government for fishery protection service in Canadian waters, being stationed at Halifax, N. S. In 1905 she was fitted with a coil set of wireless apparatus, but with the advent in 1910 of the *Niobe* and *Rainbow* which were intended to form the nucleus of a Canadian Navy, the *Canada* became a training vessel and as all the available accommodation was required it was found necessary to dismantle the apparatus.

The vessel has recently been commissioned on fishery protection service, and bearing in mind the excellent results of the first wireless installation, the government decided to equip her again. The new apparatus consists of a 1.7-kw. synchronous disc discharger, transmitter and valve receiver, with a coil transmitter and magnetic receiver as emergency gear.

Call letters V. D. C. have been allotted to the *Canada* which is the property of the Department of the Naval Service and under its control.

The C. G. S. *Dollard* is a new vessel recently delivered to the Department of the Naval Service by the Kingston Ship Building Company, of Kingston, Ont., where her wireless installation was fitted. The equipment consists of 1.7 kw. synchronous disc discharger and emergency gear. The *Dollard* is also intended for fishery protection service on the Great Lakes and has been allotted call letters V. D. O.

Removal of the Montreal Wireless Station

The rapid growth of the port of Montreal will necessitate the dismantling of its present station in order to provide space for the erection of steamship sheds on Tarte Pier, where the wireless station is now located. The selection of a site for the erection of a new station at Montreal is now occupying the attention of the Dominion authorities.

Because of the steady increase in the number of vessels entering the port of Montreal the Government have under consideration the erection of a station of greater capacity than the existing one, giving the port wireless facilities in keeping with its importance. The station is to be capable of communicating with Quebec to the East and Kingston, Ont., to the West, thus linking up the wireless system on the Great Lakes with that on the East coast and the Newfoundland system.

The Department of the Naval Service have addressed a letter to the Montreal City Clerk suggesting that the new station be erected on Mount Royal.

WIRELESS ENGINEERING COURSE

By H. Shoemaker

Research Engineer of the Marconi Wireless Telegraph Company of America

CHAPTER VII.

The Alternating Current Transformer

The alternating current transformer is the simplest of all electrical appliances and the most efficient. It consists of two coils of wire (primary and secondary) wound over an iron core. Electrical energy is consumed in the primary and regenerated in the secondary. The process is as follows: The alternating current flowing through the primary magnetizes the iron core periodically, causing a varying flux through the core. This varying flux induces an E. M. F. in the secondary, which will cause a current to flow if the secondary circuit is closed. The secondary current flows in the opposite direction from the primary current and, as it increases, it demagnetizes the core or reduces the flux in the core, so that the self-induction of the primary is reduced, causing more current to flow in the primary. This is the reason why the A. C. transformer can be made a simple self-regulating device.

Two general types of transformers are in use commercially, viz., the constant voltage and constant current transformers. The former operates on a constant voltage circuit and gives a constant voltage at its secondary terminals, while the latter is generally used with a constant voltage on its primary and gives a constant current from its secondary.

As constant current transformers are best adapted for use in wireless telegraphy, for reasons which will appear later, they are of greatest interest here.

Transformers used for power and lighting purposes have closed magnetic circuits as shown in Fig. 27, in which C is an iron ring made of thin sheet iron laid up in the form of a square; P is the section of the primary, and I is the insulation between the primary P and the secondary S. The dotted line shows the path of the magnetic flux. The primary P and secondary S are placed as close together as good insulation will permit, so that the mutual inductance will be as great as possible. This form of transformer

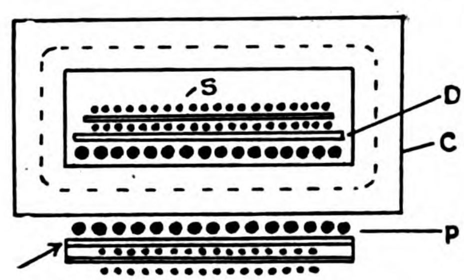


Fig. 27

will give constant potential regulation and the ratio of the primary voltage to the secondary voltage will be the ratio of primary turns to secondary turns.

The size of wire in both primary and secondary will depend on the capacity of the transformer and the magnetic density of the core, for a given ratio of voltage of transformation. The density or magnetic flux per square cm. or inch which can be used depends on both the quality of the iron and the frequency. At very low frequencies densities approaching saturation can be used, while with higher frequencies lower densities must be used. This is due to the fact that the losses in the iron increase with the frequency, causing the iron to heat. This loss must be kept sufficiently low so that the core will not get hot enough to damage the windings and insulation. The densities generally used are as follows:

25	Cycles	60,000 to 90,000	per sq. in.
60	"	40,000 to 60,000	" " "
120	"	30,000 to 50,000	" " "
500	"	5,000 to 10,000	" " "

The total flux for a given size transformer depends on the magnetic density and also on the number of turns in the windings. The exact relations which these parts bear to each other are expressed by the formulæ:

$$E = \sqrt{2}\,\pi\, Nn\, \emptyset\, 10^{-8} = 4.44\, N\, n\, 10^{-8} \text{ or } \frac{4.44\, N\, n}{10^8} \qquad (23)$$

$$\emptyset = E\, 10^8 / \sqrt{2}\,\pi\, N\, n \qquad (24)$$

Where: E = Volts effective.
N = Frequency.
n = Number of turns in series.
Also: $\emptyset$ = B x S where B is the density per sq. cm., and S is the cross section of the iron core.

$$B = \emptyset / S. \qquad (25)$$

The current required to produce the maximum flux $\emptyset$ in a magnetic circuit depends on the reluctance R and is expressed by:

$$\emptyset = \frac{4\pi n I \sqrt{2}}{R} \qquad (26)$$

where I is the effective value of the current.

Multiplying by $\sqrt{2}$ gives the maximum value of the current. The quantity n I is the ampere turns. I is also called the magnetizing current and is that current which the primary takes when the secondary is open.

It will be seen from these equations that when the reluctance of the magnetic circuit is made as low as possible both the number of turns and the magnetizing current can be reduced.

This is the great advantage of using the iron core. If the permeability of the iron is known, then the number of turns required for a given transformer can be predetermined.

$$\text{The reluctance } R = \frac{L}{S\mu} \qquad (27)$$

where L is the length of the magnetic circuit, S the cross section and μ the permeability.

If we substitute for R its value $\frac{L}{S\mu}$ in equation 26 we have:

$$\emptyset = \frac{4\pi n I \sqrt{2}}{10 L / S\mu} \qquad (28)$$

And:

$$n = \emptyset \frac{L}{1.257\, I \sqrt{2}\, S\mu} \qquad (29)$$

The above formulæ are used in one form or other to calculate the quantities involved in the design of transformers. The permeability must be determined by experiment or test.

The following table gives approximately the total flux used in different sized 60~commercial transformers.

1	kilowatt	300,000	lines.
2	"	400,000	"
3	"	500,000	"
4	"	600,000	"
5	"	675,000	"
10	"	1,000,000	"

As the frequency increases the total flux can be decreased without increasing the number of turns or amount of wire.

In transformers which have open magnetic circuits the reluctance is greatly increased and it therefore requires a greater amount of wire or turns to get the necessary magnetizing force.

A general impression exists among those who are not familiar with the construction and operation of transformers, that the closed core transformer is more efficient than the open core type. This is not true, as the latter can be made just as efficient as the former, but it requires more turns and larger wire to keep the resistance losses the same and, in consequence, is much more expensive to construct.

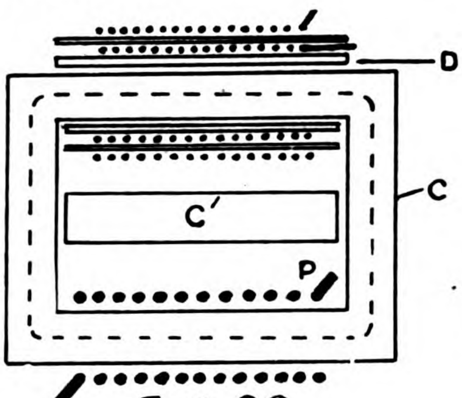


Fig. 28

Fig. 28 shows the construction of a transformer for operating on a constant potential primary circuit and giving a constant current in the secondary circuit. C is the iron core frame, C′ is another iron core which is separated by air gaps from the core frame. When the current flows in the primary P the flux takes the path shown by the dotted line if the secondary S is open. If the secondary S is closed so that a current flows through it, a back or counter flux is produced which tends to reduce the flux through P. As the core C′ and the air gaps offer very little reluctance this flux will be diverted through the core C′. The self-induction of the primary will not be greatly reduced and the current flow through it will not be increased. The secondary S will give a maximum potential when open and will vary with the resistance in the circuit, while the current flow will remain constant. This type of transformer can be used to advantage in wireless telegraph work.

The open core transformer which finds such extensive use in wireless telegraphy, has the same characteristics as the above. It has a further advantage that its construction simplifies the problem of insulation of the secondary for high voltages.

Fig. 29 shows a section of the open core transformer. C is the core which can be constructed of fine iron wires or sheet iron. Around this core is wound the primary P; over this primary is the insulating tube I which is constructed of a material which will withstand the required potential and the heat. Over this tube is placed the secondary S. In this type of transformer the reluctance of the magnetic circuit is high and the magnetic lines take the path shown (Fig. 29), by the dotted lines.

As the primary and secondary in this type are so situated with respect to each other that there is considerable magnetic leakage, the ratio of transformation will not be in proportion to the turns. It will therefore be necessary to increase the secondary turns by an amount depending on the mutual induction between the primary and secondary. This factor is generaly determined by experiment as it is almost impossible to predetermine the characteristics of the magnetic circuit where large air gaps are involved.

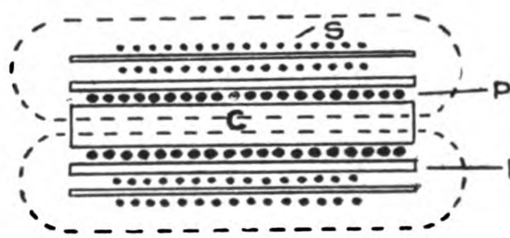


Fig. 29

There is considerable heat generated in both the iron core and the winding of transformer, so means must be provided for keeping them cool. In lighting and power transformers this is accomplished by immersing the windings and core in oil. The oil is heated through coming in contact with every portion of the windings and core, which causes it to circulate; and coming in contact with the cooler walls of the containing case, it is again cooled. In large station transformers this cooling is sometimes effected by means of an air blast forced through the windings and over the core.

The iron losses in transformers and the consequent heating are due to two causes, viz., Eddy current and hysteresis. The former are the currents generated in the iron core and are greatly reduced by laminating or dividing the iron and insulating the small masses from each other with varnish. The latter is due to the molecular structure of the iron and depends on the quality of the iron, the frequency and the magnetic density.

The reader will find a full treatment of the magnetic properties of iron in "Electricity and Magnetism," by S. P. Thompson, Arts., 362 to 368 inclusive.

(To be continued. This course commenced in the December, 1912, issue.)

The First Chapter of Wireless as a Commercial Fact

Mr. Marconi's Narrative

THE hearings in the injunction suit of the Marconi Company against the National Electric Signaling Company gave to the public the story of wireless, told by Mr. Marconi himself, who had come over from Europe to appear as a witness in the United States Circuit Court, in Brooklyn. The average man cares little for the forms of law, but he is always eager to learn how great things have been done. When the late Mr. Morgan appeared before the Pujo Committee in Washington, everybody forgot about "interlocking directorates" and rules of the clearing house. Here was a *man* whose words were the stuff history is made of.

The story of the beginnings of wireless is here given in Mr. Marconi's own words, the details of court procedure being omitted. Other instalments will be printed in later issues. The inventor, after giving his testimony and inspecting the new sending and receiving stations now being erected at New Brunswick and Belmar, sailed for England early in July. He will return in October.

THE FIRST EXPERIMENTS

GUGLIELMO MARCONI

I was born in Italy, in the town of Bologna. I was educated in various primary and secondary schools and I also attended some lectures at Bologna University. My family resided at Bologna, but when I was a child I was taken sometimes to England, where relations of my mother resided.

In the summer I lived in a country home of my father's near Bologna. It was a large house and the estate was about two and a half miles long by half a mile broad.

From a boy I was always interested in physics and in electric phenomena generally, and I think in the summer of 1894 I read of the experiments and results of Hertz in Germany. I also was acquainted with the works of Lord Kelvin and with the theoretical doctrines of Clerk Maxwell. I experimented with electrical waves, as I considered that line of research very interesting, and during these tests or experiments I thought that these waves, if produced in a somewhat different manner—that is, if they could be made more powerful, and if receivers could be made more reliable, would be applicable for telegraphing across space to great distances.

In 1894 and the beginning of 1895, I constructed apparatus which was practically the same as the original Hertz apparatus, for transmitting these waves; and I made a receiver which contained a detector which manifested or revealed the presence of these waves at the receiving end. I had always in mind telegraphic transmission and for this reason I had a Morse signaling key at the sending end and some kind of detector which could be used telegraphically at the receiving end.

I made sketches of the apparatus. At one side of the table is a transmitter which consists of an induction coil and a spark gap. Attached to the spheres of the spark gap are two plates. The primary of the induction coil is energized from a battery, the current of which goes through a telegraph key. On pressing that key the current passes through the coil and is transformed into high-tension electricity which causes sparks to jump across the gap and, according to the principles which were then well known and promulgated by Hertz and others, when those sparks occur the spark gap and the plates radiate electric waves into space. These waves travel across the distance which, in this case was simply the distance between one end of the table and the other, and produce induced currents between the two resonating or collecting plates of the receiver, an improved Branley tube connected in circuit with a battery and a telegraph instrument. The tube was a non-restoring coherer, that is, after being influenced by electric waves it would go on conducting. Therefore it would be impossible to reproduce dots and dashes of the Morse code. To restore it and keep it in its sensitive condition, the same current which actuated a telegraph instrument acted upon a tapper which shook the tube and restored its sensitiveness after the receipt of impulses. In that manner it was possible to transmit the signs of the Morse code over a distance of three or four feet.

(To be continued.)

A Striking Instance of the Value of Wireless

London *Fairplay* in its issue of April 10 uses the recent accident to the steamer *Robert Dollar* to illustrate the almost inestimable value of the wireless to vessels when at sea. The item is as follows:

The British steamer *Robert Dollar,* while crossing the Columbia River Bar recently, drawing 25 feet, struck heavily, but as the vessel was not making any water and there was no apparent damage, she proceeded on her voyage to Japan. When, however, one hundred miles off shore her stern post and rudder broke off close up to her counter and dropped into the ocean, leaving her helpless and a big sea running with a high wind. A few days before sailing she had been fitted out with a Marconi wireless outfit, which was immediately put into use, the captain sending a coded message to the owners, which no one intercepting could read and take advantage of the information to get a big salvage. The message gave the latitude and longitude and told correctly the situation, which the owners, nine hundred miles off, received inside of an hour after the accident occurred, and as a result, the nearest available tug was obtained to proceed to her assistance, and this inside two hours after the accident had happened. The tug, which was also equipped with wireless, had hold of her in eighteen hours. As the *Robert Dollar* was out of the track of steamers, it is problematical when, if ever she would have been heard of had it not been for the wireless.

French Medal for Heroic Operator

"Jack" Scheetz, the boy wireless operator, who in August, 1911, saved the steamship Lexington off the South Carolina coast, is to get a medal from the Societe des Hospitaliers Sauveteurs of Brittany, France.

On the way from Savannah to Philadelphia the Lexington went aground and her wireless was put out of order. Scheetz, who was only sixteen, climbed to the top of the mast, in a ninety-mile gale, repaired the wireless and flashed an S O S message that summoned the United States revenue cutter *Yamacraw.*

Editor's Note: — Primarily designed to familiarize the commercial wireless operator with the functions and construction of the component parts of modern wireless equipment, this series of instruction articles should prove of interest to all amateur experimenters, as well. The rapid development of radio communication has brought about many changes in the design of apparatus and the demand for increased efficiency is responsible for other changes which are constantly occurring. It is planned to incorporate these developments in the series and at the same time thoroughly acquaint the professional man with the details of the various types of apparatus now in commercial use. Wireless instruments and operating are to be treated only in an elementary way in this department; the student who desires to delve more deeply into the technical phases of wireless is provided for elsewhere in our pages.

Chapter I.

In order to comply with the recently enacted radio laws, it has become incumbent upon all operators, both at ship and shore stations, to secure a license certificate attesting their skill and knowledge of the wireless art.

With this in view, and to aid the operators to become more familiar with the technicalities of the various sets, this series of articles has been prepared, giving a clear and simple explanation of the various electrical and magnetic effects actually taking place during the operation of wireless telegraph instruments.

It is assumed that the operator has some knowledge of elementary electricity and magnetism, but should the reader be a novice, various books may be consulted, particularly the "Navy Manual of Wireless Telegraphy for 1911" by Commander Robinson.

Electrical Drawings — A student's course should comprise the study of the circuits involved in a complete wireless telegraph system; in fact, this is probably of more importance than a discussion of the actual construction of the apparatus.

In drawings of electrical apparatus and circuits, certain conventionalities rather than actual detail drawings are used to designate various parts of the equipment.

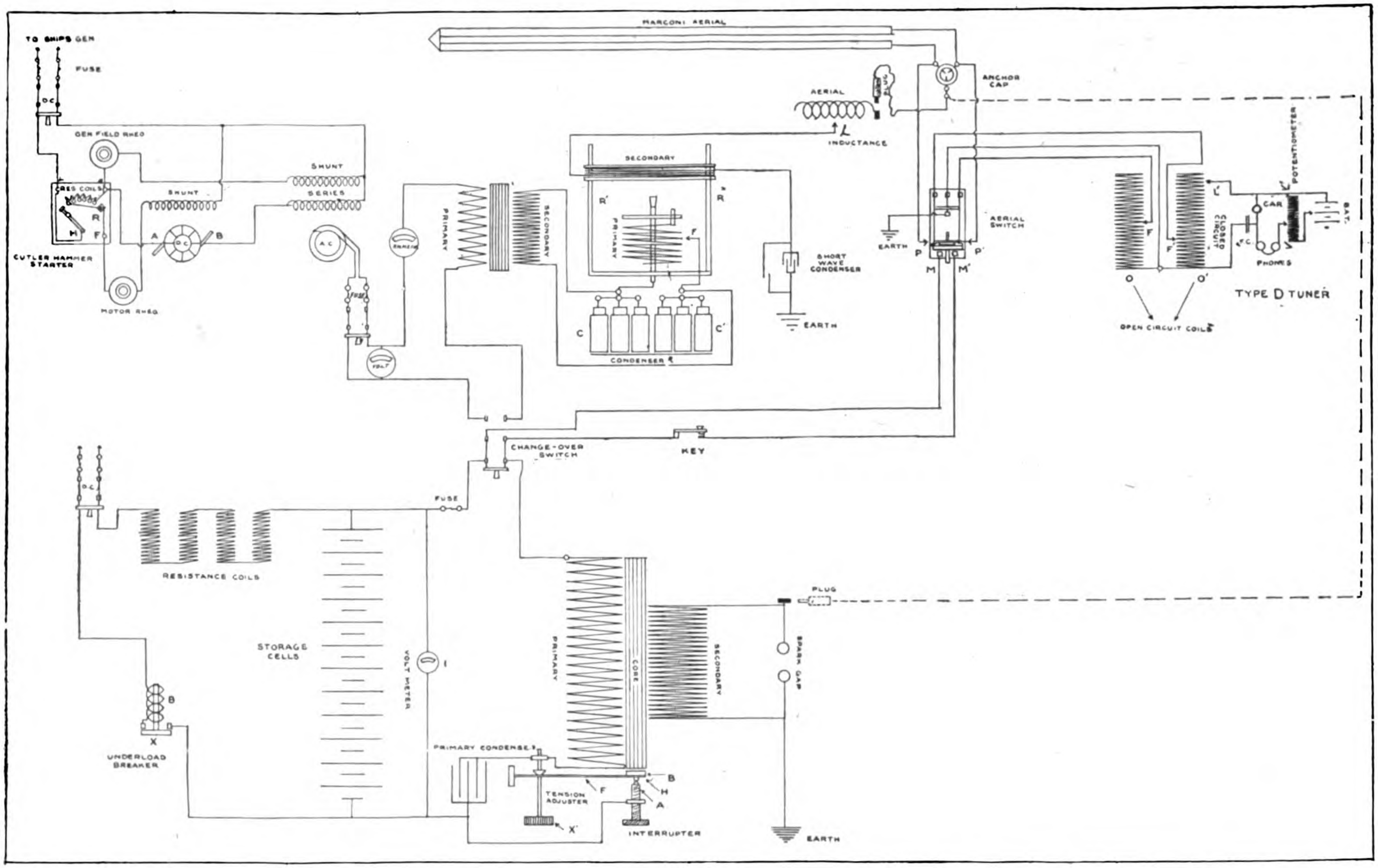
It is assumed that the student has some knowledge of these representations and they will not be further discussed except where they are referred to in explanation of the drawings.

Marconi Wireless System—Fig. 1 is a complete representation of a type of apparatus at present in use at many of the ship and land stations of the Marconi Company on the Atlantic and Pacific coasts. It will be noted that the circuits of the complete apparatus are shown starting from the D. C. switch up to, and including, the aerial.

Source of Power—Alternating current is necessary to operate modern wireless telegraph sets, and at stations where this is not directly available a motor generator is used to generate alternating current from a direct current source of supply.

Motor Generators.—The motor generator consists of a direct current motor driving an alternating current dynamo. In order to make the unit compact both are mounted on the same base and the armatures usually built on the same shaft.

Motor Generator Circuits.—The circuits of one type of machine are


MARCONI AERIAL
TO SHIPS GEN
FUSE
D.C.
GEN FIELD RHEO
SHUNT
SERIES
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MOTOR RHEO
A.C.
VOLT
PRIMARY
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CONDENSER
AERIAL
INDUCTANCE
L
SHORT WAVE CONDENSER
EARTH
ANCHOR GAP
AERIAL SWITCH
EARTH
P
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O
O'
OPEN CIRCUIT COILS
CLOSED CIRCUIT
L'
CAR
PHONES
POTENTIOMETER
BAT.
TYPE D TUNER
KEY
CHANGE-OVER SWITCH
D.C.
FUSE
RESISTANCE COILS
STORAGE CELLS
VOLT METER
B
X
UNDERLOAD BREAKER
PRIMARY
CORE
SECONDARY
PLUG
SPARK GAP
PRIMARY CONDENSER
TENSION ADJUSTER
F
B
H
A
X'
INTERRUPTER
EARTH

Fig. 1.

clearly indicated to the left of the drawing (Fig. 1).

The D. C. armature consists of a number of coils of wire wound laterally in slots over a soft iron core. The terminals of these windings are connected to the segments of the commutator. The current enters the armature windings through the commutator segments as they pass under the brushes A and B. The divided circle between brushes A and B represents the commutator; in electrical drawings it is understood that this indicates a direct current dynamo armature.

Field Coil Windings—The field coil windings of the motor are represented by a simple spiral of wire marked "shunt," and if connections are traced backwards it is seen that the terminals of these windings are in reality connected across the D. C. main line, i. e., in shunt with the armature.

The windings of the field coils are made around a soft iron core and wound so that the turns of each pole are made in the opposite direction to the one preceding it. This creates alternately magnetic fields of North and South polarity.

The Commutator—The function of the commutator is to maintain the polarity of the magnetic flux of the fields and the armature core in such relation to one another that there will be a constant attraction or repulsion between the magnetic fields, causing rotation of the armature. For instance, consider any single field coil and suppose it was of North polarity, then the commutator would maintain the flux so that the portion of the armature approaching that of the North pole would be of the South polarity, causing attraction, while that portion of the armature on the opposite side would be of North polarity, causing repulsion. The necessary changes of current in the coils of the armature to create these changes of flux are made by the commutator.

The A. C. Generator—The A. C. generator armature is denoted by the two circles marked A. C. These are known as collector rings and are connected to the two terminals of the armature windings. The current is taken from the collector rings by means of two brushes in sliding contact.

Generator Fields—The student will note that above the generator armature there are two field windings, one marked "series" and the other, "shunt." The "series" winding is connected in series with the D. C. armature, and the "shunt" winding is in shunt with the D. C. line. The field windings of this generator are said to be cumulatively compounded.

Such an arrangement of the field windings gives a steadier voltage than could possibly be obtained otherwise. For if a strong load is thrown on the motor generator it has a tendency to slow down and at the reduced speed the rate of cutting lines of force by the generator armature is reduced; consequently, if it is desired that a normal voltage be maintained a greater number of lines of force must be produced around the armature.

This is done automatically, for when the increased load is thrown on the generator armature, the D. C. armature requires more current, which causes an increase of current in the series field because it is connected in series with the D. C. armature. This increase in current in the series field causes an increase in the magnetic lines of force surrounding the generator armature with the result that a normal voltage is automatically maintained.

The Starting Box—The drawing gives the circuits of a Cutler Hammer starting rheostat or starting box. The function of this starting rheostat is to prevent an enormous rush of current which would take place were the armature connected directly to the D. C. mains.

This is due to the fact that when the motor is started there is very little counter-electro-motive force to oppose the inrush of current, consequently the windings will take excessive current. However, by inserting resistance coils (marked RES) in series the current flowing into the armature at the start is reduced. Immediately when the armature starts rotating a counter-electromotive-force is produced which increases with the speed. As the counter electro-motive-force increases the resistance can gradually be cut out by means of the handle H until finally the D. C. mains are connected directly to the armature.

The Release Magnet—The release magnet R is connected in series with the shunt field coils and acts as a protection to the motor armature.

For example, if one of the field rheostats should burn out, the circuit to the shunt field would open and the release magnet R would instantly lose its magnetism and the handle H fly back, cutting off the current from the armature.

And again, if the D. C. main line is opened at a distant point, the release magnet R again will let go its hold on the handle H and automatically open the circuit to the motor armature.

If there should be no release magnet and the handle H is in the full running position, and if the D. C. line is opened at a distant point and then closed again, serious damage to the armature will result, as these windings are not made to carry the current that would flow in the coils under such conditions.

Regulation of Speed—The speed of the motor can readily be increased or decreased by varying the amount of current flowing through the shunt field windings by means of the motor field rheostat. For instance, if the resistance in this rheostat is increased the current in the field coils will decrease in value. The magnetic lines of force surrounding the armature will decrease accordingly, with the result that the motor speeds up. This is due to the fact that there is less counter electro-motive-force generated by the armature at the weak field than when the magnets are excited to a normal condition, consequently more current flows through the armature, resulting in an increase of speed.

Generator Voltage Regulation—The voltage of the A. C. generator is increased or decreased by altering the resistance in series with the field coils, thereby increasing or decreasing the number of lines of force surrounding the armature.

The Transformer Circuits—When the aerial switch handle is down and the transmitting key depressed, alternating currents of low frequency (60 to 120 cycles) surge backward and forward through the primary coil of the transformer.

These surgings cause rising and falling magnetic lines of force which are considerably increased in number by the iron core. These lines of force reverse their direction with the reversals of the current in the coil and at the same time cut through the secondary winding (which is composed of a great number of turns of very fine wire) inducing in it an electric current of very high pressure or voltage.

In common wireless practice current at 110 volts is taken into the primary circuit while the secondary voltage may be 15,000 to 30,000.

This transformer is known as a step-up transformer because the current taken in by the primary circuit is at a lower voltage than that produced in the secondary circuit. It is also known as an open core transformer because the magnetic circuit is completed through the air on the outside of the core, in contrast to the closed core transformer where the magnetic lines of force have a complete path through the iron.

The voltmeter indicates the pressure at the terminals of the alternator and the ammeter measures the current passing through the transformer.

Condensers—The condenser or the capacity is represented at C and C^1. This condenser may consist of glass plates covered with tin foil or glass jars coated inside and outside with copper. For instance, in a 1 K. W. set there are 6 jars in parallel in either bank and the two banks are connected in series. This is known as a series-parallel connection. The reason for so connecting the jars is that the voltage or pressure on each jar is thereby considerably reduced.

For example, if a leyden jar is connected directly across the secondary terminals of a transformer whose secondary voltage is 30,000, the dielectric will be subjected to the full potential, resulting in considerable strain. However, by placing two banks or units in series each jar is subjected to a potential of but 15,000 volts. The strain being reduced, the chance of puncture is decreased.

High Frequency Circuits—When the condensers become fully charged a discharge takes place across the spark gap, producing an intermittent series of high frequency electrical oscillations each of which takes place in a very small fraction of a second.

It will be observed that the discharge of the condenser takes place through a portion of the primary of the oscillation transformer, the amount of inductance actually in use being determined by the variable contact F.

Spark Gap.—The spark gap acts as a valve, keeping the oscillation circuit idle until the condenser becomes fully charged; then the discharge of the condenser through the spark gap produces high frequency electrical oscillations.

Open and Closed Circuits—The circuit including the condenser, spark gap, and the portion of the primary of the oscillation transformer in use is known as the closed oscillatory circuit, while the circuit including the aerial, through the secondary helix to the earth is referred to as the open oscillatory circuit.

The amount of inductance in the open circuit is determined by the variable contact L.

Time Period of Oscillatory Circuits.—A circuit possessing capacity and inductance has a natural time period of oscillation, that is, it requires a certain definite time for a complete reversal of current to take place in it.

Such a circuit is said to have a definite wave length.

For example—Electricity travels at a rate of 300,000,000 meters per second. In a straight wire 100 meters in length a complete oscillation must travel a distance of 200 meters, that is, the wire has an electrical length of 100 meters. Then the time period of the circuit would be 200/300,000,000 or 1/1,500,000, that is, a complete oscillation takes place in that circuit in 1/1,500,000 of a second. Therefore, the circuit oscillates 1,500,000 times per second and its wave length is 200 meters.

The wave length of an electrical oscillation is then said to be the distance through space traveled by the wave or oscillation during one complete oscillation or cycle.

The wave length of any circuit is determined by the inductance and capacity in the circuit; if either one is increased the wave length is increased.

Referring to the drawing, if the number of leyden jars C and C^1 are increased the wave length is increased; and again, if the number of turns of the helix included by the variable contact F is increased, the wave length is increased.

In an oscillatory circuit composed of inductance and capacity the time period of the circuit is dependent upon these two factors, consequently if either is increased the wave length is increased.

Wave Length of the Open Circuits.—The wave length of the open circuit is increased or decreased by the helix clip or variable contact L, accordingly as more or less turns are included in that circuit.

Closed Circuit. — The necessary change of wave length in the closed circuit is secured by means of the variable contact F.

Transfer of Energy.—When the condensers C and C^1 discharge through the helix via contact F, magnetic lines of force rise and fall about the helix turns of the closed circuit which not only cut through these turns but likewise interlink with, and cut through the turns in the secondary of the oscillation transformer, inducing in the open circuit oscillatory currents of high frequency.

The Anchor Gap.—The oscillations induced in the open or antenna circuit leap the anchor gap. The resistance of this gap to the high potential currents of the transmitter is very small, but it will readily be seen that the oscillatory currents produced in the antenna circuit when receiving are of small potential or voltage and cannot jump the gap. Hence, the primary circuit of the receiving tuner is automatically disconnected from the antenna, thereby preventing the received signals being earthed through the secondary of the transmitting oscillation transformer.

Anchor gap points should be adjusted to just permit of a piece of thin paper passing between them.

It is proposed at an early date to eliminate all anchor spark gaps in the Marconi service.

Resonance.—For the best working it is of course of supreme importance that the open and closed circuits be placed in resonance. That is to say, they must both have the same period or wave length, or more strictly speaking, the product of the inductance times the capacity in each circuit must be the same or very nearly the same. By so proportioning the circuits, currents of large value are induced in the antenna.

Oscillation Transformer.—The oscillation transformer consists of a coil of fixed value of inductance placed immediately above the turns of the closed circuit helix. This coil is supported by the wooden pillars R and R[1] in such manner that the distance between the fixed inductance and the closed circuit helix can be increased or decreased as desired.

Magnetic lines of force produced by the passage of the oscillations through the closed circuit helix interlink or cut through the turns of the secondary, setting up in it corresponding oscillations of high frequency which are reflected up and down the antenna, producing electrical waves.

The function of the oscillation transformer then, is not only to transfer energy in the form of high frequency oscillations from the closed to the open circuits, but also to place these two circuits in resonance, and further, to allow the wave length of either circuit to be increased or decreased as desired.

Emission of Wave Lengths.—If the transmitting set shown in the drawing is in use, and the secondary of the oscillation transformer is placed too near to the primary, two wave lengths are emitted from the antenna. This is caused by the reaction of the magnetic flux in the open circuit upon the closed circuit, or vice versa, which changes the effective period of the coupled circuits as a whole; consequently the antenna is set into vibration at a wave length longer and shorter than the natural wave length or either circuit.

Therefore, when the coupling is too tight there are two periods of vibration in the antenna circuit and the operator at a distant receiving station, by proper manipulation of his set, may be able to "tune in" to either one; or by securing the proper degree of coupling in the receiving apparatus, may be able to receive the energy of both waves. All sets are now tuned with very loose coupling so as to emit practically but one sharp wave.

Inductive Coupling.—The above set is said to be inductively coupled because the transfer of energy from the closed to the open circuit takes place by electro-magnetic induction.

Coupling.—The coupling (the interlinking of the magnetic lines of force of the two circuits) can be varied at will by increasing or decreasing the distance between the secondary coil of the oscillation transformer and the turns of the closed circuit helix, and the emission of two wave lengths readily reduced to one as before stated.

Aerial Tuning Inductance.—A separate coil of inductance is connected in series with the secondary of the oscillation transformer and the antennae, thus enabling the wave length to be varied as desired. This coil is popularly known as the "loading coil."

Changing From Power to Auxiliary Set.—In changing from the power to the auxiliary set (Figure 1) a flexible cord with a plug contact is connected to the bottom electrode of the anchor spark gap as shown. When it is desired to use the auxiliary set for transmitting this plug is removed from the aerial tuning inductance and connected to one terminal of the induction coil as shown. The double pole, double throw switch is also thrown, connecting the key on the primary of the induction coil.

A short wave condenser is connected

in series with the open circuit and is used when operating the set on the 300 meter wave.

Spark Frequency. — The student should not confound the term "spark frequency" with the natural time frequency of the oscillatory circuit.

The term "spark frequency" or "group frequency" refers to the number of sparks bridging the gap S per second; while the period of vibration of the circuit depends solely upon the inductance, capacity and resistance of the circuit.

For example—Suppose the circuits of a 60-cycle transmitting set to be so proportioned that the spark discharged synchronously with the charging current; or in other words; a spark is produced at each alternation of the charging current. Since a 60-cycle current is composed of 120 alternations per second (two alternations constituting a cycle) then 120 sparks will pass the gap in one second time. Each spark may consist of anywhere from 10 to 50 oscillations. Each complete oscillation taking place in from 1/200,000 to 1/2,000,000 of a second.

Electric Waves.—Currents of high frequency traverse the antennae circuit producing around it fields consisting of electrostatic lines of force and electromagnetic lines of force. Owing to the rapidity of the reversals of current these lines of force do not collapse back upon the wire as they do in currents of lower frequencies, but a portion of the energy is radiated into space. These displacement currents which take place in space about the antenna create electric waves, and it is by means of these that communication between stations is effected.

The Aerial or Antennae Switch.—Owing to the high potentials used in the transmitting apparatus, it is necessary to disconnect the receiving apparatus from the antennae while transmitting; also, in order to preserve the sensitiveness of the receiving detector it is necessary to disconnect the earth connection from the tuning coils.

This is accomplished by the multiple blade switch known as an aerial or antennae switch. This is represented to the right of the drawing. When the handle of the switch is depressed, the receiving apparatus is disconnected from the antennae at contacts P and P^1. The transformer circuit is closed through contacts M and M^1. Thus the set is in a transmitting position, and when the operator presses the key, high frequency oscillations are produced in the antennae circuit. When receiving, the switch handle is lifted up and the reverse action takes place. The primary of the transformer circuit is disconnected and the receiving apparatus is connected both to the antennae and the earth.

The Receiving Tuner.—The receiving tuner represented is known as type D and it should be noted that the aerial is split and two leads brought to the receiving apparatus. This arrangement is known as a "looped aerial."

As in transmitting circuits, the receiving apparatus has both open and closed circuits. The open circuit is represented by coils O and O^1.

The wave length of the open circuit is varied by contacts F and F^1. A closed oscillatory circuit is bridged around one of these coils and the inductance included in that circuit is varied by means of the sliding contact L^1.

The closed oscillatory circuit includes the carborundum crystal (car), the fixed condenser marked FC, and whatever amount of inductance is used as determined by contact L^1.

It will be noted that the coil to the right of the tuner O^1 is the one which transfers energy from the open circuit to the closed circuit.

The coil to the left of the tuner is the one in which the principal change of wave lengths is made.

The action of the tuner is as follows:

When the two coils O and O^1 are connected to the antennae circuit by means of the aerial switch, and the sliders F and F^1 properly adjusted to secure resonance, high frequency electrical oscillations traverse these coils. Those produced in coil O^1 set up magnetic lines of force which interlink with the adjacent turns of the secondary, setting up a counter electro-motive force which passes through the closed oscillatory circuit including the carborundum detector.

A small battery current when flowing through the crystal increases its sensitiveness, and also because different values of current are required for different crystals, a device known as a potentiometer is used. This is clearly indicated in the drawing.

Potentiometer.—A potentiometer is a variable resistance connected in shunt to the battery. It may be inductive or non-inductive. In this case it consists of a number of carbon resistance rods connected to a variable point switch in such a manner that the resistance can easily be adjusted. It will be noted that as the sliding contact V is moved towards V^1, the curent flowing through the head phones and detector will rapidly decrease. If V is moved away from V^1 the current through the head phones and detecto is then considerably increased, consequently we have a device by which we can easily adjust the amount of current flowing through the crystal and head phones. The number of cells in use is determined by the variable contact.

Adjustment of Detectors.—Some experience is necessary in order to properly adjust a piece of carborundum to its maximum degree of sensitiveness and this can best be obtained by practice. The operator should be careful to see that the local battery current flows through the crystal in the proper direction, or if it flows in the wrong direction, the sensitiveness of the crystal will be materially decreased. These crystals vary in sensitiveness and it will be necessary to apply different values of battery current in order to secure the most efficient results. Some crystals require a strong pressure in the crystal holder and others a light pressure. It will also be found of advantage to try different points on the crystal until the most sensitive one is found.

(To be continued)

Arctic Wireless

The Crocker land expedition, which recently sailed from Boston for two and possibly three years of scientific work and exploration in the Arctic regions, differs from the many other expeditions which have pushed their way into the frozen wastes of the far North during the past four centuries in that it will keep in practically constant communication with civilization by means of wireless telegraphy. An expert wireless operator, detailed by the government, will go along, and his station will be set up at the head of Flagler Bay, Ellesmere land, which will be the base of operations and the place where the *Diana* will leave the party and their supplies next fall. That point is near latitude 90, that is, about 600 miles from the North Pole.

The outfit has power to send messages through the air for 1,500 miles, and Flagler Bay will be in communication with the post of the Hudson Bay Company in the far northern part of Canada. From that post there is wireless communication to the Canadian Government post at the foot of Hudson Bay, and thence there is telegraph communication to Ottawa. The Canadian Government will get by this route a system of daily weather reports from 1,000 miles beyond the Arctic circle. These reports are expected to be of much meteorological value, and will be awaited with great interest, both in Ottawa and in Washington.

Hammond's Boat Sinks

With wireless apparatus and other machinery valued at several thousand dollars on board, the boat owned by John Hays Hammond, Jr., and used by him in telautographic experiments, is submerged in the harbor off the Hammond estate at Gloucester, Mass., and the cause is a mystery.

Delicate mechanism designed from patents of Mr. Hammond and valued at about $6,000 is on board.

Mr. Hammond is about to build a torpedo boat; the apparatus on board the wrecked boat was to have been installed.

In this department the affairs of the various wireless clubs and associations will receive attention. Believing that all amateurs are interested in the experiments and research work of others the publishers plan to give readers each month distinctive items on the progress made by club members, thus offering all an exchange of ideas in organization and experimental matters and bringing students in closer touch with each other. To this end we will also publish a Wireless Club Directory. The names of the officers and the street address of the secretary are requested from all clubs. Notification of any changes should be forwarded at once. Short descriptive articles of experiments or new stations with distinctive features, accompanied by drawings or photographs, will be published.

The unusual privilege of testing existing wireless installations on board ships has been granted students of the College of the City of New York, who are pursuing the course in advanced experimental physics. The set of one of the big ocean liners was tested by some of the men. The United States radio inspectors have been given the privileges of the laboratory at the college, adjusting their instruments there in comparison with exact standards. Through the operation of the commercial wireless companies it has been made possible to exhibit the very best modern apparatus.

* * *

Among the 150 candidates who took the Government examinations for licenses as amateur radio operators at the Brooklyn Navy Yard a few days ago, was a boy of 13, Charles Banks Belt. All the other candidates were men, and, by successfully passing all of the twelve questions asked, young Belt, it is said, became the youngest licensed wireless operator in the country.

His license is No. 2,706, and states that his knowledge of general adjustment, operation, and care of apparatus is very good; that in transmitting and sound reading, Continental and Morse, he surpassed a speed of eight words a minute, and that his general knowledge of international regulations and of acts of Congress to regulate radio communication was likewise very good.

* * *

Clarence Evans, of Somerville, N. J., obtained some unusual results during the past winter while experimenting with indoor aerials.

With a small aerial comprising two strands of No. 36 S. C. magnet wire ten feet long and employing lead pencils for spreaders, he managed to pick up the Cape Hatteras, some 330 miles away. During the early morning hours other stations were heard clearly; these included N. A. G. at Fire Island and M. H. E. at Philadelphia, and various commercial and amateur stations in New York.

The building in which the aerial was suspended is located on the side of a hill and the antenna wires were suspended about 21 feet from the ground directly under the ceiling of a second story room. A receiving transformer, galena detector, fixed and variable condensers, 3,200 Ohm phones and loading coil were the instruments used.

Wireless amateurs residing in Brooklyn are notified that the membership of the Lexington Electrical and Wireless Club of America has almost reached its full complement and prospective members are requested to apply immediately to John H. Schlichting, 245 Monitor street, Brooklyn, for application blanks.

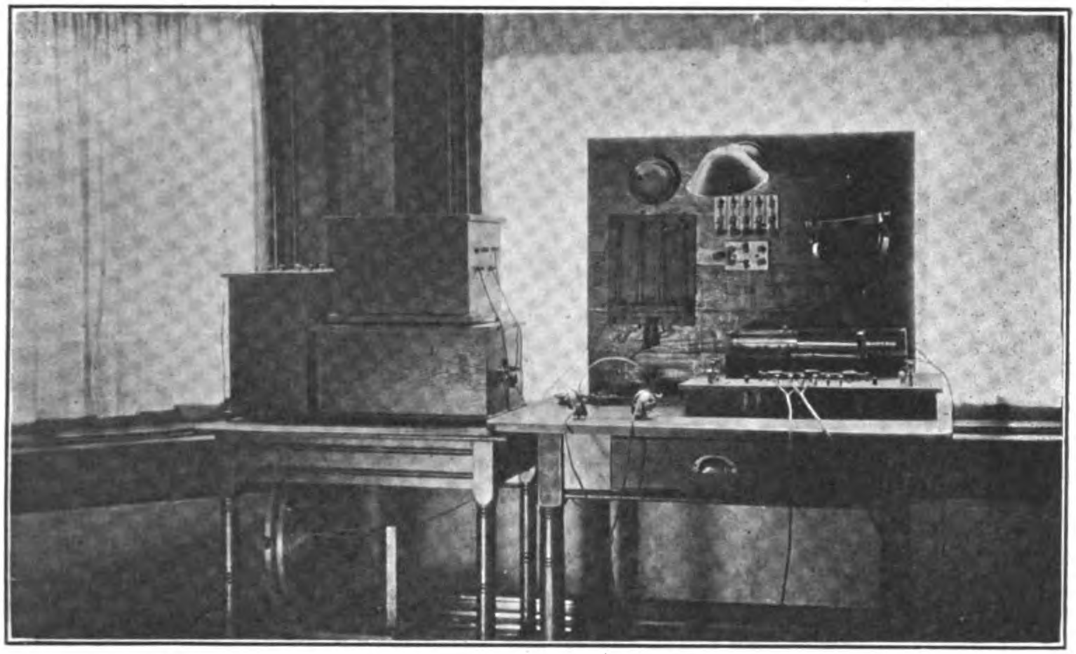
The club has just celebrated its fifth anniversary.

* * *

Amateurs in Wheeling and Pittsburgh are in daily communication, using only 1 ampere. The Wheeling station has been able to hear Pittsburgh with ½ ampere. This is more notable when the nature of the country is taken into account. The two cities are fifty miles apart, the Pittsburgh station is in a valley, surrounded by high hills, and the direct air line between the two stations is broken by hills.

Our correspondents have shown a good deal of interest in the suggestion made in the June number that if another flood comes to this region, these and other amateur stations will be of immense value. Besides Wheeling, ing, Pittsburgh can work New Castle and Canton which relays to Cleveland, Mt. Vernon and Michigan and Ohio State Universities. The illness of the Wheeling operator prevented the use of the instruments during the late flood. But daily communication of a practical nature was held between Pittsburgh and New Castle.

The Pittsburgh outfit, shown in the illustration, is entirely home made. T. D. Richards and G. B. Richards, Jr., describe their set as follows: Transmitter—½ kw. closed core transformer; adjustable condenser of sheet brass, separated by 1/9 inch glass and immersed in oil; inclosed rotating spark gap; a nine-inch hard rubber disc with 16 studs mounted on the shaft of a 1,700 r.p.m. motor. This rotary produces a tone like that of the Marconi station at Cape Cod. The oscillation transformer is of the pancake type, and there are two ordinary telegraph keys with heavy silver contacts.



Effective amateur set of T. D. Richards and G. B. Richards, Jr.

Receptor—loose coupler with 2,000 meter range; three-slide tuner with 3,000 meter range, to be used either alone or as a loading coil, one switch being changed; two ferron type detectors, using galena and silicon; two rotary variable condensers; an adjustable capacity fixed condenser; an unused graphite rod potentiometer; two pair of Brandes trans-Atlantic receivers. The antenna consists of four 7-22 phosphor bronze wires, 250 feet long, 100 feet and 80 feet high at the ends.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with india ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

A. F. N., Maryville, Tenn., writes:

(1) The college power plant, 13 kw., 110 v.d.c., is within 100 yards of my station and when receiving there is a continual rhythmical "zing, zing, zing," the same sound that is heard at the commutator of the dynamo. This is most likely caused by small sparks at the brushes, although none are visible. This interference has a rather broad wave, but can be tuned out by adding inductance. Unfortunately it has the same wave as most of the stations I receive from, so it is almost impossible to receive on those wave lengths. How can I eliminate this interference? [Let me state that after much experimenting I found that a one M. F. condenser connected between the positive wire and ground decreased the sound and slightly lowered the wave. Adding more capacity didn't help. I have tried almost all the receiving hookups (except Fessenden I. P.), with the following instruments: Loose coupler, two rotary variable condensers, fixed condenser, audion detector, Brandes' navy 'phones. My aerial is 65 feet long, 90 feet high at one end, 80 feet at other end, lead-in, 60 feet].

Ans.—This is a difficulty often experienced when the antenna is placed near to power circuits. While there may not be severe sparking at the commutator of the dynamo, you will find that this difficulty is undoubtedly caused by pulsations of current due to irregularities in the generator. This sets up a magnetic flux which cuts through your antenna and excites it at or near its natural period; however, as you increase the inductance in the receiving circuit this difficulty disappears, owing to the fact that the choking effect of the inductance eliminates the current due to inductive effects from the generator circuits. If you had described more fully the conditions surrounding the antenna, distance from power circuits, etc., we could answer your question more intelligently. We suggest that you put two 2 M. F. condensers in series across the line and connect to earth at the middle point.

(2) Why is it that after 5.30 or 6.00 P. M. I can pick up "N. A. O.," "N. A. M.," "N. A. R.," "H. A.," etc., quite loud, but in the daytime I have never been able to hear stations further away than 15 miles? Other amateurs in this vicinity have the same trouble.

Ans.—This is a condition which you will note over the entire United States, viz.: that all stations have an increased range of communication at night, several times over daylight range, and as there are no stations in your vicinity within the daylight range, you only hear them at night.

(3) How much difference in intensity of signals, close tuning, etc., between a loose coupler whose primary is No. 28 S. C. C. and one wound with 22 bare wire?

Ans.—This question is rather broad but we would prefer the primary wound with No. 22 wire whether it is bare or insulated.

(4) What causes the blue glow around the nickel foil in my E. I. Co. audion when the voltage of the high-voltage battery is too great?

Ans.—It is caused by the electronic discharge in the bulb due to breaking down of the vacuum by the high potential. You will note that this glow is preceded by a sharp click in the telephone receivers, indicating that the battery current has completely broken down the vacuum. The audion is then in an insensitive condition.

The Secretary Radio Regulation Club, Maryland, writes:

Having received my March issue of the MARCONIGRAPH, and being very much interested in this department, I took particular notice of the questions asked by "A. G. W.," Philadelphia. In his fourth question he asks, "Why is it that I have to keep touching the key to my buzzer test when I am receiving? If I do not do this the signals die out altogether."

"A. G. W." does not give you a very clear idea as to what he means, although I think I understand just what his trouble is, having had the same trouble with my detector. In your next issue of THE MARCONIGRAPH I would like to have you explain this.

I use a Blitzen tuner, Blitzen variable condenser, fixed condenser, perikon and galena detectors and a pair of 200 ohm Marconi 'phones. The piece of galena I have been using is very sensitive—the kind that is known as "Radion," being called that by Dr. DeForest, of the Radio Company. This piece has held its sensitiveness for some time but gradually has become weaker, and now when I get a good point by buzzer test it holds until a signal is heard, then it breaks down and cannot be restored except by readjustment for a new point of buzzer test, only to show again the tendency to break down. This happens not only on loud and nearby signals, but on the faintest and most distant signals. Perhaps you can tell me of some method to restore the crystal to its original state of sensitiveness, or explain why this detector acts in this manner. The point I use is a sharp pointed piece of No. 30 copper wire, also a strip of thin brass foil cut to a point and sharpened on emery. This makes a very sensitive detector when adjusted properly.

Ans.—The difficulty you refer to in the operation of galena is often experienced in all types of crystal detectors except the carborundum or perikon. The actual conditions surrounding the sensitive contact of a piece of galena, or say, a piece of silicon when in working condition, are not exactly known, but it is certain that to secure the best rectification of current, a condition must be maintained between the contact and the crystal which is of an unstable nature and this "unstableness" may be subject to shocks such as heavy currents from nearby transmitting stations, atmospheric disturbances, etc. You would get far better results if you used a contact composed of a sharp piece of steel, rather than a piece of copper wire.

Referring to the buzzer test, there is no doubt that when the above stated decrease in sensitiveness is experienced, if the circuit to the buzzer is closed, the shock imparted to the contact point on the crystal restores the unstable condition. The actual method by which it is accomplished would be rather difficult to explain. Often this decrease in sensitiveness is caused by damp air surrounding the instruments. Any of the above types of crystal, if breathed upon when in a sensitive condition, will decrease in sensitiveness owing to the moisture of the breath.

The application of the term "Radion" to an ordinary "chunk" of galena is, to say the least, amusing.

A gradual decrease in sensitiveness in all crystal detectors is often noted. This condition is less manifested in carborundum than in crystals of other types.

J. A. B., Brooklyn, N. Y., requests answers to the following:

(1). What is the normal wave length used in sending with the following set: Aerial, 70 ft. long, 5 wires No. 14 aluminum wire, 70 ft. from ground one end, 60 ft. from ground other end. Coil 1 inch spark induction coil run by 6 v. storage battery. Condensers, 2 condensers consisting of 4 in. by 5 in. glass plates, one containing 8 plates, the other 14 plates, in series with ground lead. Spark gap, zinc open gap.

Ans.—The wave length of your antenna is approximately speaking 180 meters. We can see no reason why you connect 14 plates of condenser in series with the ground lead.

(2). Will the above set be more efficient with or without a helix?

Ans.—We would advise you to discard both the helix and condenser with this set and simply connect the spark gap of your 1 in. coil directly in series with the antenna; however, if you wish to make experiments in tuning you should use a helix. You will find, however, that one of the 4 x 5 inch condensers connected across the terminals of the coil will be of sufficient capacity if you use a helix, and as the U. S. laws require a sharp wave a helix should be used. While you would be able to communicate at a greater distance with the spark in series with the aerial, the U. S. laws do not allow this and an oscillation transformer should be used.

(3). What is the limit of my sending range?

Ans.—About 10 miles.

(4). What is normal day communicating range ith similar station?

Ans.—Same as day range.

(5). How far should I be able to receive with the following receiving set and the above aerial? Loose-coupler, fixed and variable condensers, perikon detector, Western Electric phones, 1500 ohms each.

Ans.—100 miles daylight and 600 to 800 miles after dark.

S. R. E., Cliftondale, Mass., requests information regarding textbooks as follows:

Please print under queries and answers the name and author of books on algebra, advanced algebra, square root, cube root, etc., with answers in the back; also on the use of logarithms which you think best for use in studying the Wireless Engineering Course by H. Shoemaker, now running in THE MARCONIGRAPH. What textbooks should one get to study the arithmetic end of the course. I have bought "Elementary Lessons in Electricity and Magnetism," by Thompson, and shall get Flemings and Prof. Pierce's books on the principles of wireless, to which Mr. Shoemaker refers, but need textbooks on the arithmetic end of it.

Ans.—We herewith give you list of books best suited to your purpose.

(1). The Naval Manual of Wireless Telegraphy for 1911, which gives elementary information regarding wireless telegraph mathematics that is indispensable to the beginner.

(2). We would then suggest, Elementary Algebra, by Wentworth.

(3). First Steps in Algebra, Ginn & Company.

(4). Elementary Geometry, Wentworth.

(5). Geometry, Ginn & Company.

(6). Trigonometry, Wentworth.

(7). Trigonometry, Ginn & Company.

(8). Algebra, including logarithms, Wentworth.

(9). Analytical Geometry, Wentworth.

(10). Analytical Geometry, Ginn & Company.

(11). Differential Equations, Moore.

(12). Differential Equations, Longmans & Company.

(13). Mathematics for the Practical Man, by Howe, D. Van Nostrand & Company.

* * *

On page 429 of our June issue a typographical error appeared in the answer to E. L. T.'s second query. The paragraph should have read: "No, because you might have a wave length of 3,000 meters and a 5-kw. transmitting set, or you might have a 100-kw. set and use the same wave-length."

Wireless Again Saves Suffering

Arrangements completed by Marconi wireless made it possible for the authorities at Quarantine to hurry August Savado, an Italian sailor, from the steamship *Brazos* when she arrived to the Marine Hospital at Staten Island for treatment for injuries suffered in a fall into the hold.