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THE WIRELESS AGE

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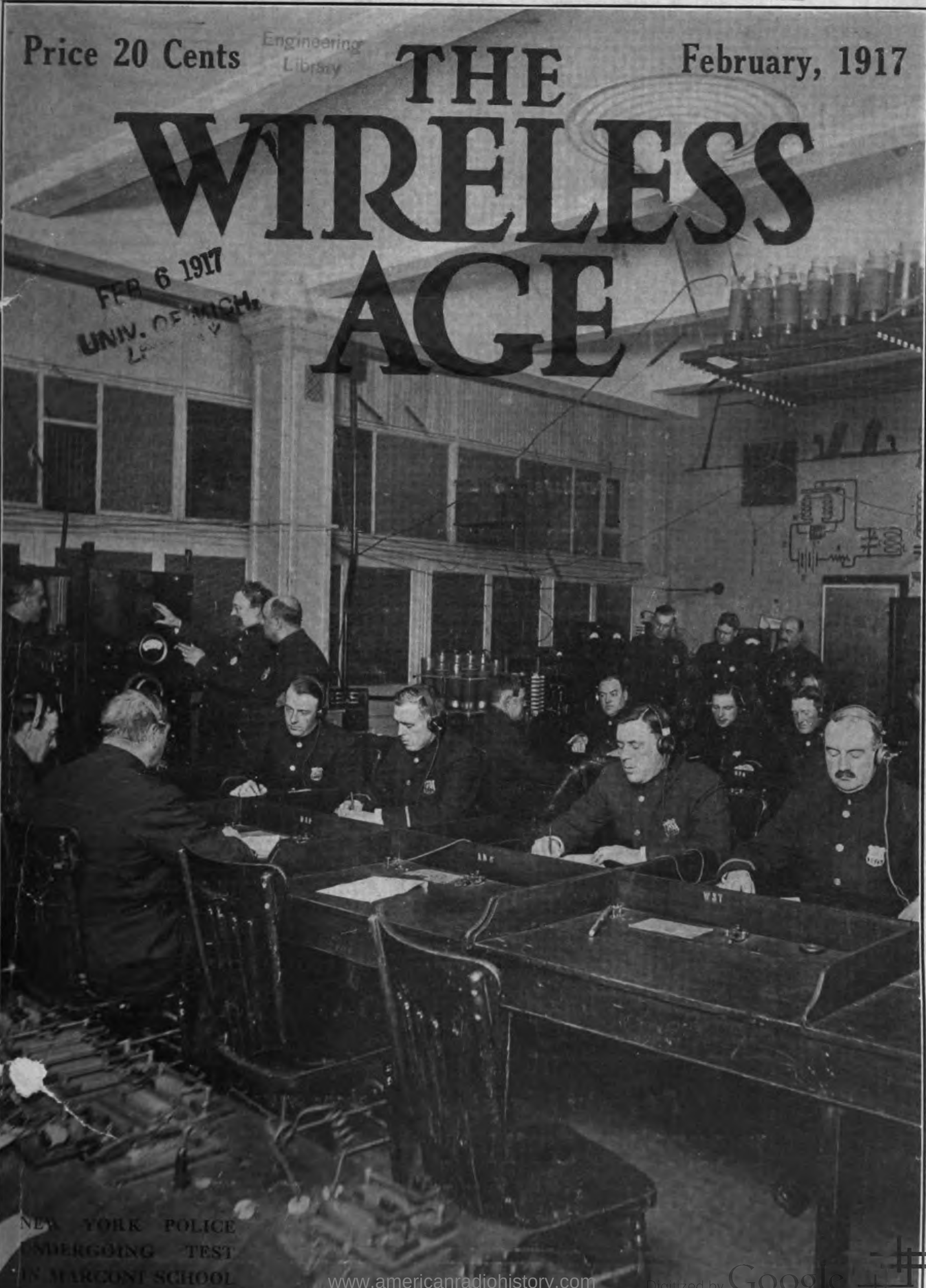

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THE WIRELESS AGE

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FEBRUARY, 1917

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Government Ownership of Wireless

The Navy Comes Out Openly for Government Ownership—Sayville Citation an Argumentative Boomerang—The Invitation to Foreign Reprisal—Recommendation to Take Over Coastal Stations Based Upon Misinformation—Marconi's Economical Proposition Refused Under Taft Administration—Military Necessity of Monopoly Refuted by Experience of Other Nations—Encouragement and Aid to Private Enterprise Abroad—Difficulties of Government Operation With International Marine and Transoceanic Stations—The Spirit of Preparedness Under Existing Conditions

As reported in the January issue of THE WIRELESS AGE, the new legislation proposed for the regulation of radio communication and apparently designed for Government ownership and control, has been vigorously pushed forward by the Navy. As we go to press the Bill is in the hands of the Committee on the Merchant Marine and Fisheries, Hon. J. W. Alexander, chairman. The provisions as submitted show only minor changes from the text as printed in full in the January issue.

The proponents of the measure began their presentation of arguments before the Committee on January 11th, those in opposition, one week later. It is announced that all hearings will be public and interested persons may attend as many as may be convenient.

That the Bill has been designed to invade the existing commercial field is definitely disclosed in an official letter from Secretary Josephus Daniels, of the Navy Department, under date of December 26th.

"The bill," says Secretary Daniels, defining the attitude of the Navy Department, "covers the purchase of coastal stations only, that is, only those used to communicate with ships, and, by permitting the Navy Department to open all of its stations to commercial business, discourages the extension of any existing commercial systems or the organization of new systems.

"The department strongly recommends that the committee provide for the purchase of all stations used for commercial purposes. In some cases the status of existing stations is constantly changing, and decisive action at this time will result in a saving of public funds. I recommend that Section 6 of the bill provide for the purchase, through the Navy Department, of all existing coastal and commercial stations in the United States, Alaska, Hawaii, Porto Rico, and the Swan Islands within two years at reasonable valuation, and that no license be granted to any such station for operation after two years from the date of the passage of the bill."

Secretary of the Navy Openly Advocates Government Monopoly

Secretary Daniels indorses the other provisions of the bill, especially those relating to the ownership, the licensing, and the control of stations by the Department of Commerce,

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Mr. Daniels explains that the Navy Department "is convinced that Government operation and control of all stations used for commercial purposes, other than those on board merchant ships, is necessary on account of the mutual interference between stations.

"One station or system," he says, "must wait for another to finish; there are many chances for disputes which sometimes are carried on between operators by radio, especially when the operators are not under strict control, adding to the time wasted; there is needless duplication of effort, and in cases of distress the confusion resulting from many interests attempting to render aid, get news, or satisfy curiosity, is very dangerous.

"Since only by the closest regulation can the best use of this art be obtained, not only for commerce and safety at sea, but for military purposes, radio telegraphy is a strict Government monopoly with the larger number of foreign nations, and in those foreign countries where commercial stations are permitted the Government control is generally so strong as to amount to a monopoly.

"Authority to take over and operate or to close commercial stations in time of war will not suffice. The stations must be in full Government operation before the first hint of possible hostilities."

Citation of Sayville Case In Support of Navy's Contentions

Following the publication of this letter, Mr. Daniels added informally:

"I am firmly convinced that Government control of wireless is absolutely necessary to the best interests of the nation. I deem the matter most urgent. Delay only will increase the difficulties under which we are working; delay also will mean an increased outlay to the Government when the step finally is decided upon."

The Navy Secretary and others, although refusing to comment publicly on certain phases of what Government controlled wireless means to a nation, privately pointed to what absolute control of wireless has meant to Germany and the Central Powers, "which otherwise would be completely and totally cut off from the rest of the world, except for their submarines."

This drew a published reply from Edward J. Nally, Vice-President and General Manager, Marconi Wireless Telegraph Company of America, substantially as follows:

How the Sayville Incident Actually Disproves the Government's Case

The Administration measure for Government ownership of all wireless stations, as advocated by the Navy Department, is now being revealed in the light of its true purpose, a monopoly in Federal hands, rather than domination of the public-serving utility by legislative "control." In hearings on the bill held in Washington before the Committee on Merchant Marine and Fisheries it has been represented that effective operation of Government and commercial wireless stations is not possible under present conditions, and only through the acquisition of private stations can national security be obtained.

The selection of radio as the opening wedge in a campaign obviously designed for eventual Government ownership of all communication lines in the United States, appears to be based principally upon the supposition that the advocacy of a radio monopoly for the Navy will have a fair chance for success by reason of the present popularity of the preparedness plans for the department. The proponents of the bill, and notably the Secretary of the Navy, argue that the necessity for Federal ownership is supported by the assumption that had it not been for absolute Government control of wireless by Germany and the Central Powers, these nations "would be completely and totally cut off from the rest of the world, except for submarines." It is at once obvious that this reasoning is faulty. Germany's ability to maintain communication by wireless with the United States today is in fact due to the establishment and maintenance, before the war, of the station at Sayville, Long Island, as a commercial

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plant operated by the Atlantic Communication Company, a private business enterprise, incorporated under the laws of the State of New York. This company transacted commercial wireless business with Germany in the usual way, using the Telefunken system which originated and had been developed in that country. With the outbreak of hostilities, the Sayville station was placed under rigid censorship and has since been operated under the supervision of the United States naval officers, in much the same way that the regulations provide for the conduct of any station owned by any American company. That a United States Government license was issued for the Sayville plant—without which no wireless station can operate in this country—is a direct refutation of the contention that control of its wireless by the German Government kept that nation from being "cut off" from the rest of the world in wartime. For it is not credible that our Government would have issued a license to erect and operate the Sayville station on United States territory had it been represented that the equipment was owned and operated by the German Government. It is thus readily seen that the existence of Germany's connecting communication link with the United States today is entirely due to the fact that the German nation, instead of monopolizing its field of wireless communication, encouraged development under private enterprise. In direct contravention to the lesson to be learned from this significant incident, however, the Navy Department sees a supposed necessity for wiping American commercial companies out of existence.

Real Preparedness Found In Wartime Availability of Commercial Enterprise

The weak structure of argument that points to national security being possible only by enacting the present Bill and placing all stations in the United States under Government ownership, undertakes to ignore the abundance of laws now on the statute books for the control of radio stations in time of war or public peril. Since 1912, all ship and shore stations have been operated under the control and supervision of the Department of Commerce under powers so broad that it is difficult to imagine any emergency which the present Government regulations would not meet.

Voluntarily placing the highly developed equipment and skilled operating staff of the Marconi Company at the disposal of the nation in time of public peril, constitutes a preparedness measure of immeasurably greater importance than control of wireless stations by Government monopoly. For many years the Government has been a large user of wireless, yet it has not contributed any of the important advances which have been made in the art during that time, the invention itself and all important refinements of apparatus being the result of private experimenting of a purely scientific nature or in the interests of commercial companies. In time of national peril, this country should have the best wireless equipment obtainable, and it is obvious that with the market for private enterprise removed by wireless becoming a Government institution, most of the incentive for scientific effort toward further development will be removed.

The Policy of Other Nations and the Danger of Reprisal

The high efficiency to be obtained by encouragement of commercial development has been recognized by other nations. The direction of England's fleet in the present war is principally conducted through the Marconi station at Carnarvon, in Wales, taken over by the Admiralty at the commencement of hostilities. Great Britain had Government-owned stations before the war, just as we now have them, yet it is a matter of record today that the most important wireless work of the nation is being done by commercially owned and developed stations turned over for the nation's use in emergency.

The short-sightedness of the proposed American legislation is further revealed in the fact that the Bill undertakes to exclude from the United States "any company of which any officer" or more than one-third of the directors or stock-

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holders "are aliens." Mr. Marconi, to whom humanity owes an enormous debt of gratitude, being an alien, is thus to be deprived of his just reward as a shareholder and prevented from continuing as an officer in the management of his own company. To enact this Bill would therefore not only deprive this country of the benefits of future Marconi inventions, but in discriminating against the distinguished alien inventor, invites a reprisal from other nations in the form of legislation directed against Americans. All of the cable companies of this country, for example, are dependent upon foreign countries for landing rights, and England could say to the Western Union and Commercial Cable companies that because they are controlled by aliens they are not entitled to do business in England.

Full Government supervision over wireless, or any other industry, is perfectly proper and in order with the progressive spirit of the times. This is provided for, however, in the present laws governing radio communication. For the United States to go a step further, as the present Bill advocates, and make radio a Government monopoly, is not only a dangerous proceeding and one in violation of the rights of American citizens, but a proposal that calls for additional taxation to conduct a wireless telegraph business in time of peace, now more efficiently and cheaply handled by commercial interests.

When the public realizes the true state of affairs, a vigorous protest against the present Bill will be registered. Setting aside considerations of a dollar and cents aspect, it is not likely that Americans will sit idly by and see the possible destruction of the valuable humanitarian asset represented in Marconi's recorded service in safeguarding life at sea.

The Proposal to Take Over All Coastal Stations

Mr. Nally further supported the arguments of the Marconi Company that Government ownership is impractical, by appearing before the Committee in Washington on January 18th, at which time he presented undeniable facts in the following words:

It is recommended in this Bill that the Government be permittted to acquire and operate all commercial coast wireless stations; that the Government, through the Navy Department, assume a monopoly of the commercial radio business of the coasts of the country, which means as well all ship to shore communication.

"It is conceded in the recommendation that the Government now owns and operates sufficient radio stations, and has ample Congressional authority for the construction of others for its entire needs. Congress has also permitted certain of the Naval radio stations to do a commercial business. This commercial service feature was adopted to meet commercial needs, particularly in Alaska, and at some other points where no commercial stations had then been established.

The Navy's Assumption That Commercial Coast Stations Are a Burden

"The Radio Bureau of the Navy reports that it has handled this commercial service entirely to its credit and benefit. In recommending the extinction of commercial competition, complaint is made that the operation of the commercial companies prevents the naval operators from obtaining the requisite amount of telegraphic practice."

The Vice-President and General Manager of the Marconi Company then drew attention to Section 5 of the Bill which provides for the opening by the Government of its radio stations to general public business, and noted that if this provision is enacted into law, it will create a condition of competition between Government and private interests, resulting in a heavy financial loss to commercial companies, which have spent considerable sums of money and years of labor in the development of efficient radio stations, so as to provide a satisfactory commercial wireless telegraph service to the public.

"Section 6 seems to anticipate the condition referred to in the preceding paragraph," Mr. Nally observed, "in that it provides that, 'The Government, through the Navy Department,

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shall have authority to acquire by purchase, at a reasonable valuation, any coastal radio station now in operation in the United States which the owner may desire to sell.'

"Much has been said during the hearing given by this Committee to the proponents of this Bill, about the willingness, even the anxiety, of the commercial companies to dispose of their coastal stations to the Government.

"So far as the Marconi Company is concerned, no one has been authorized to make any such statement," he stated with emphasis, "and I can only think that, with the Navy Department, the wish is father to the thought.

The Value of Shore Equipment and the Relation of Commerce to Development

"It is not stated who shall determine on the reasonableness of the valuation which the Navy Department may wish to place on property belonging to commercial interests.

"The values which have already been stated by the spokesmen for the Navy before this Committee are perfectly ridiculous in the light of the Marconi Company's investment, and the figures which they mention as being adequate for the purchase of the coastal stations and high power stations of the entire country represent far less than the investment of the Marconi Company alone.

"The Marconi Company's principal business is that of selling service. While it does manufacture some apparatus for sale, yet this branch of its business is merely collateral, and is not its principal object, which, I repeat, is to sell service.

"For this reason it does not sell apparatus to ships, but it sells ships certain service for a certain sum per month, just as the telephone company, or electric light company, sells its service to a customer.

"In order to give perfect service and to make the apparatus which it installs on ships serviceable in the greatest degree, it has erected and maintains land, or coastal, stations, from the most Northerly point on the Atlantic Coast to the most Southerly point; also on the Gulf, on the Great Lakes, and on the Pacific Coast north to Alaska.

"These stations were erected, and are maintained, as the essential, indeed, vital link in ship and shore service, and the long list of rescues at sea, and of lives and property saved because of the ready response which ships in distress at sea have been able to obtain by reason of these coastal stations, co-operating with other ships at sea, makes a long and honorable record, of which any company may well be proud. And this tremendous service in the salvation of life and property, already rendered by wireless, has earned for it at least the right to be developed and made useful and available to the fullest possible extent.

"Such development can only come through private enterprise," insisted the commercial authority. "It is impossible to formulate legislation which will foresee and provide for the future usefulness of radio communication. It is just as impossible to formulate legislation which will place on the Navy Department, or any other Government organization, the responsibility for increasing the commercial use of radio communication in its present state of availability. If the Navy Department had been given a monopoly of the telephone, when that means of communication was first developed, would the United States today have, as it has, the greatest telephonic development of any country? And yet the telephone has not supplanted the telegraph. It occupies an entirely new field created for it by the persistence of private enterprise.

A Definition of the Relationship of Shore Stations to Marine Service

"It is true, as the proponents of the Bill have stated (although they lay entirely too much stress and make too much of the fact), that these coastal stations, *per se*, are not money makers for the company, but as part of the complete service they are essential, and what they contribute to the service is vital.

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"Are not telephone exchanges vital to the telephone service?

"Are not terminal stations vital and necessary to the conduct of railroad service?

"Do telephone exchanges, *per se*, or railroad terminal stations, *per se*, or the great main operating rooms of the different telegraph companies, *per se*, earn money for the telephone, the railroad, and the telegraph companies?

"They all contribute the vital and necessary service to make the whole service complete. Who would think of separating the central exchange from the work that it performs for the subscriber, or the terminal station from the railroad; or the main operating room of the telegraph company from the customer, or the branch office through which the customer deals? No one, save the Government.

Unbusinesslike Proposals of Government Contrasted with Offer to Supply Stations for Its Use

"The Government could do such an unbusinesslike thing, because the Government is not in business. The Government has not the experience to be gained only in business getting. The Government's sole function is to spend; it does not have to earn money before it can spend it. Its method is a complete reversal of business methods. It can spend money that it does not earn. Commercial companies must earn so that they can spend.

"In 1912, when the plans of development of wireless telegraphy in contemplation by the Marconi Wireless Telegraph Company of America were being discussed, President Taft accorded the Honorable John W. Griggs, president of the company, an interview, at which he explained the company's plans to the President and representatives of all the Government departments, as well as the military.

"At this interview he made the Government the following proposition:

"That in connection with its scheme of transoceanic wireless commercial service, the Marconi Wireless Telegraph Company of America would enter into a contract with the Government to build, in the Canal Zone and in the Philippine Islands, at its own expense, under the direct supervision of Mr. Marconi, and to be equipped with the most approved apparatus known to the art, high power wireless stations, capable of communicating 3,000 miles, and the Marconi Company would agree to operate same, under an arrangement with the Government as to rates and service that would be just and fair, giving preference at all times to Government messages; agreeing that the employees and operators connected with the stations should be so attached to the Government service as to be subject to impressment at any time the Government might take over the operation and control of the station; and also agreeing that at any time, on notice by order of the President of the United States, the Government, in case of riot, tumult, disorder, war, accidental catastrophe or other emergency, might take over the control and operation of the stations, for such time, as, in the judgment of the President, the public interest might require.

"It also agreed to erect these stations within such a reasonable time as the judgment of the Government might require; and generally, agreed to such terms and conditions in the carrying on of commercial business by arrangement with the Government, as might be found reasonable and just.

Marconi Proposal Not Considered and Expenditure of Public Money Since

"At this same meeting it was explained to President Taft that the Government of Great Britain had entered into a contract with the British Marconi Company, whereby that company assigned to the British Government the right to use the patents and inventions of Mr. Marconi, and agreed to build a chain of high power stations between Great Britain and her various dependencies in Europe, Asia, Africa, and Australasia. A system of high power long distance stations thus constructed would insure the benefit of direct and friendly communication with stations

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to be erected for the British Government.

"Our proposition in connection with the Canal Zone and the Philippine Islands was not given consideration. The Government has since gone about this work independently, and at great expenditure of public money.

Commercial Service Cheaper and Better and Arm of Government in War

"Since 1912, the Marconi Wireless Telegraph Company of America has completed great stations on the Pacific Coast, and in Hawaii, for service between this country and the Hawaiian Islands and Japan. The service with Hawaii was opened up on September 24th, 1914, and with Japan on November 15th, 1916. The delay to the latter service was owing to the delay in completion by the Imperial Japanese Government of its high power stations near Tokio.

"The American Marconi Company also completed high power stations of the same type as those constructed on the Pacific Coast, in New Jersey—the transmitting station at New Brunswick and the receiving station at Belmar, for service with Great Britain. But before these stations could be operated for commercial service; indeed, while they were being tested out, the great European war broke out and England took over the stations in Wales which were to work with the New Jersey stations.

"The Marconi Company has about completed similar stations, of great power, in Massachusetts, the transmitting station at Marion and the receiving station near Chatham, Cape Cod, for transatlantic service with Norway and Northern Europe. The war has also interfered with this service; Norway was unable to complete its station, and England would not permit the shipment out of the United Kingdom of the high power apparatus which was being manufactured abroad, under Mr. Marconi's personal eye, for the Marion, Massachusetts, station.

"The Marconi Company insists upon its ability to handle long distance business for the Government, and for the public, cheaper and better than the Government can do it.

"It repeats its offer to constitute its staff, its equipment and its general organization, as an arm of the Government in times of war, or stress, or peril.

"It asks, in the meantime, that is, in times of peace, to be permitted to conduct its commercial service and to continue its development and extension of the art."

Mr. Nally expressed the conviction that his company recognizes in the radio service there exists a potent power for defense in time of war, and in preparation for war.

"On this point," he said, "it is acknowledged that in time of war, military necessity should not be under the slightest obligation to take into account the industrial or commercial welfare of the nation, but serious consideration is asked when it is proposed, on the ground of military necessity to legislate the Government into the permanent monopolization of an industry.

"Particularly weak must be the claim of military necessity to monopolize the commercial wireless business, inasmuch as Congress has but recently provided for more complete Federal control over radio communication than has been taken over any other industry. This control goes to the extent of providing that no radio station may be erected without a Federal license; the operation of any station may be suspended under Federal authority, and any and all stations may, by order of the nation's Executive, be placed completely under the control and operation of Federal employees. Complete censorship may also be maintained by the Government over all international communication.

Experience of Other Nations Proves Monopoly No Military Necessity

"Every one of these methods of control has been exercised by the Government during the present European war, and no lack of authority is complained of. It is a fair statement then, that the present request to have the Government take a monopoly of the commercial coast wireless business is not justified on any ground of military necessity."

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He emphasized the fact that other great nations recognize that commercial companies have contributed to the value of the art. "While England and Germany, and France, and Italy, and Canada, and other countries, have and are making the most of radio possibilities," he said, "still they have left the development of the art to commercial companies, even assisting them by subsidy, and financial allowance.

Result of England's and Germany's Encouragement of Private Enterprise

"England, for example, encouraged private companies to the extent that the Marconi Company, for instance, was able to build up an immense works at Chelmsford, employing thousands of men, which was immediately taken over by the Government for military purposes, and there practically all of the wireless apparatus needed for the war has been constructed.

"England also took over a large part of the staff, having held them in reserve for this purpose.

"Germany has done precisely as England did. Germany has encouraged the private companies, leaving the development and manufacture of apparatus to such great concerns as the Siemens & Halske A. C., the Siemens Schuckertwerke G. m. b. H. and the Allgemaine Elektricitats Gesellschaft, utilizing their skill and product for its military purposes.

"Canada not only leaves the operation of the coast stations to the Canadian Marconi Company, which practically has a monopoly of the business in the Dominion, but has assisted the company by generous subsidy and allowance.

"The Marconi Company of America has never asked for subsidy, or assistance of any kind, except the right to carry on business and develop the art, just as other telegraph and telephone and other public utilities, are doing.

"Radio communication is in the very infancy of its possibilities, yet there is already an investment of forty millions of dollars in its commercial development in the United States.

"Rightly considered, all of this investment, representing the latest and most powerful stations and trained organizations, is an adjunct to the Government in times of military necessity. If opportunity for development is left open, this investment, this equipment and the personnel will increase, *and all are completely at the disposal of the Government in times of need!*"

In view of these considerations, Mr. Nally noted, it would seem that "where the development of an industry which lends itself naturally and completely to the possible military necessities of the country, and over which the Government is exercising complete control, there exists not a single valid reason for making such an industry a Government monopoly.

"There is also an important international phase of the radio problem, the solving of which requires the development of extended control of equipment standards, operating practice and language qualifications. If the ships of the sea are to develop among themselves and to the shore, universal intelligible communication, which is undoubtedly within the possibilities of radio development, a Government department, it will be admitted, can hardly be qualified to insist on the disciplining of an operator on a foreign ship who may be lax in duty or deficient in qualifications. There are daily possibilities here for the development of unpleasant and embarrassing international complications."

The Cumbersomeness of International Marine Regulation

The Committee's attention was called to the fact that private enterprise is already rapidly working out this problem through the means of equipment contracts, binding ships to employ only operators possessing standardized qualifications as to language, etc., and amenable to a central discipline as to the observance of certain mechanical and operating regulations.

"The abandonment of the ideal of the universal intelligibility of wireless is to abandon its future development," said the Marconi executive, "but such abandonment is inherent in a Government monopoly of the art, as can readily be seen from the limitations of the jurisdiction of a Government, and the cum-

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bersomeness of its international representation."

A good deal has been said at the hearing, by the proponents of the Bill, as to the need for taking over existing high power stations. Mr. Nally remarked that it is not clear whether they wish them solely for Government work or to do a commercial business in competition with the cables.

Impracticability of Government Entering Transoceanic Business

"If, for example," he argued, "this Government were to take over our New Jersey stations, how could it operate them for commercial service with Great Britain, except through a connection with the Marconi Company of England, which owns the corresponding stations in Carnarvon and Towyn?

"If it takes over the Sayville and Tuckerton stations, now the property of private companies in America, would they continue to work with the privately owned stations in Germany? And in what way would the Navy, or the Government, benefit by such an arrangement?

"From every possible point of view, there is not a sound reason for placing the Government in the commercial radio business. There are controlling reasons of every character why this should not be done."

Marconi Company's Repeated Emergency Offers of Staff and Service

In closing, Mr. Nally asked the Committee to consider that it is a matter of record that the Marconi Company has repeatedly offered to place at the disposal of the nation, its stations and its operators, "even going so far," he noted, "as to secure from its operating personnel, individually signed expressions of readiness to enter Government service in event of war, which records were all turned over to the Navy.

"The Vera Cruz incident also brought forth a voluntary offer for the free use of Marconi stations for the battleship fleet, tendered to the Secretary of the Navy, and accepted."

The address concluded with this important statement as to national preparedness: "Before leaving New York I arranged, at the request of Rear Admiral Worthington, to furnish him with a list of all employees engaged in our Aldene Works, with the idea of constituting the entire force, including the official staff, a Naval Reserve, to be called upon by the Navy in time of emergency."

Your Obligation to the Wireless Field

The attention of all readers of the Magazine is directed to the Navy's advocacy of Government ownership of wireless. Without exception, all scientists and active workers in the art have opposed this dangerous proposal. The existence of the entire field of experimentation is threatened in the Bill dicussed in the foregoing article, and in its provisions the people of the United States are brought face to face with a crippling of the communication resources of the country, instead of a preparedness measure, as the supporters of the new legislation have described it. The enactment of the Bill into law must be vigorously opposed. Every reader of this Magazine should write a protest immediately to the Congressman representing his district at Washington. Write a personal letter, attacking the Bill (H. R. 19350), using the arguments presented in the above article, expressed in your own language and according to your convictions. *In addition to the letter to your Congressman,* write also to any member of the Committee who may represent at Washington the State you live in, as shown in the following list:

JOSHUA W. ALEXANDER, Missouri, *Chairman.*

RUFUS HARDY, Texas.
MICHAEL E. BURKE, Wisconsin.
EDWARD W. SAUNDERS, Virginia.
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The Fascination of the Wireless

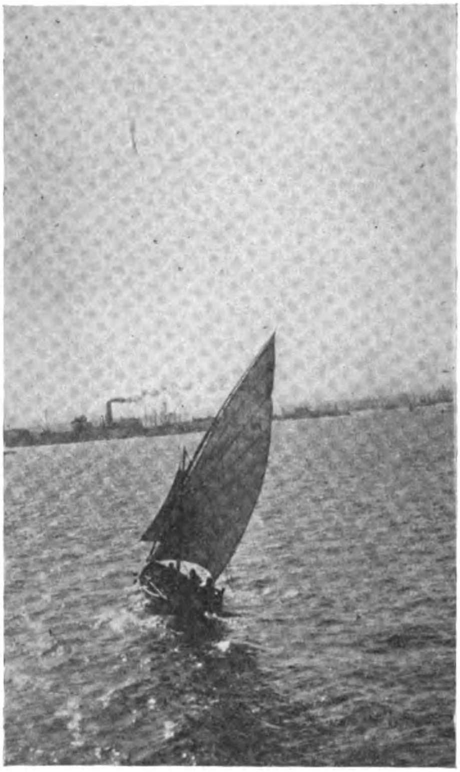
Day-by-Day Incidents in the Life of the Man of the Key

By Edward Gwaltney Maxwell
Operator s. s. H. H. Rogers

WHEN a ship gets into trouble nowdays and her wireless apparatus plays an important part in the rescue of those aboard, we hear much of the operator and his heroism. But of the thousands of vessels that are going about in safety, and of the duties and life of the operators on them, only brief mention is ever made. This story is written mainly for those who spend their lives ashore and who, perhaps, would be glad to get a glimpse of the little things that are all in the day's work of a wireless man afloat. In it are included some incidents that took place aboard a Standard Oil tanker on a voyage to Argentina.

The operator occupies a unique place on shipboard. He is the only member of the crew not directly in the employ of the owners; answers solely to the Captain for his deeds or misdeeds; is permitted to roam around almost unchallenged; and, as the one link with the rest of mankind, is cultivated and cajoled.

Life on a tramp is always slow, but generally worryless and untroubled. When reading tires, one goes back aft to listen to the crew's complaint about the First Mate and the food; to hear the Chief tell his four old stories again; then up forward to watch the flying fish and an occasional Portugese man-'o-war. Sometimes the wireless man borrows a length of sailmaker's twine and a piece of pork from Cooky and tries to catch a gull, or else, with the Skipper's consent, relieves the quartermaster at the wheel for an hour. However, the everyday routine is eat, sleep and listen in.



An Argentine fishing boat with lateen rig on the River Plate

To the operator whose wireless experience has been limited to the Northern Hemisphere the working of South American stations is extremely novel. The International Regulations are not so strictly observed down on the Brazilian coast as around Sea Gate, and the oldtimer is reminded of the days when it was permissible to send almost anything through the air. Latin-America is very curious: it wants to know who you are, where bound, and all the rest of the QR's whenever you pres sthe key. It likes to exercise its little stock of English and its greater stock of politeness. After giving one

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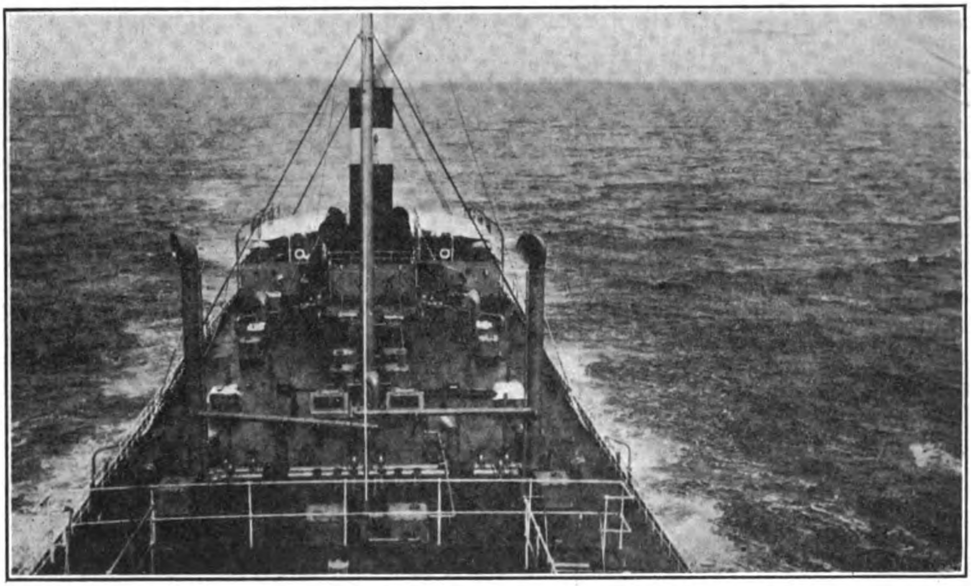
of the Lloyd-Braziliero boats a full account of ourselves he acknowledged, amid a chorus of HI's from the Americans in range, as follows. "Thank I you my dearest friend." These wireless men of the Tropics do not lack skill by any means as regards the ability to pound a key; their failing lies in their lack of knowledge in the handling of traffic.

In Argentina, at one of whose ports we touched, they have that troublesome habit of sealing your operating room. A young naval officer who came abroad to do the work, was affability itself. We became well acquainted as time passed, the friendship being more firmly cemented by the transfer of a couple of Mexican cigars from an American to an Argentinian hand.

Throughout the voyage I was struck by the remarkable system of press relaying. An instance of this is found in the fact that Arlington's output is likely to be flashing about Rio Janeiro the night following its original transmission.

The feeling of proximity to persons far distant which wireless conveys was brought forcibly home in a pathetic way. Two days' run ahead was an American-Hawaiian ship, and at a corresponding distance was another vessel of the same fleet. The master of one of these craft had brought along with him a nine-year-old boy, evidently the son of an officer of the steamship company, who was stricken with appendicitis. Each night an account of the boy's symptoms and condition was wirelessed back to the other skipper way up to the Northward, who returned suggestions regarding treatment. A score of English-speaking operators in the neighborhood were as much concerned as the captains and helped to relay between the two ships when static interfered. This exchange of messages went on for perhaps a week until, one night, word was flashed that the youngster was much better and that the contemplated stop at Pernambuco for medical aid seemed unnecessary. The next morning, however, came word of a relapse and subsequent messages told of the boy's death and burial at sea.



The H. H. Rogers, taken at sea from the crow's nest

Although this recital, strictly speaking, has to do only with wireless, it would not be complete unless the untimely ends of some pet animals on the ship were chronicled. First a mongrel

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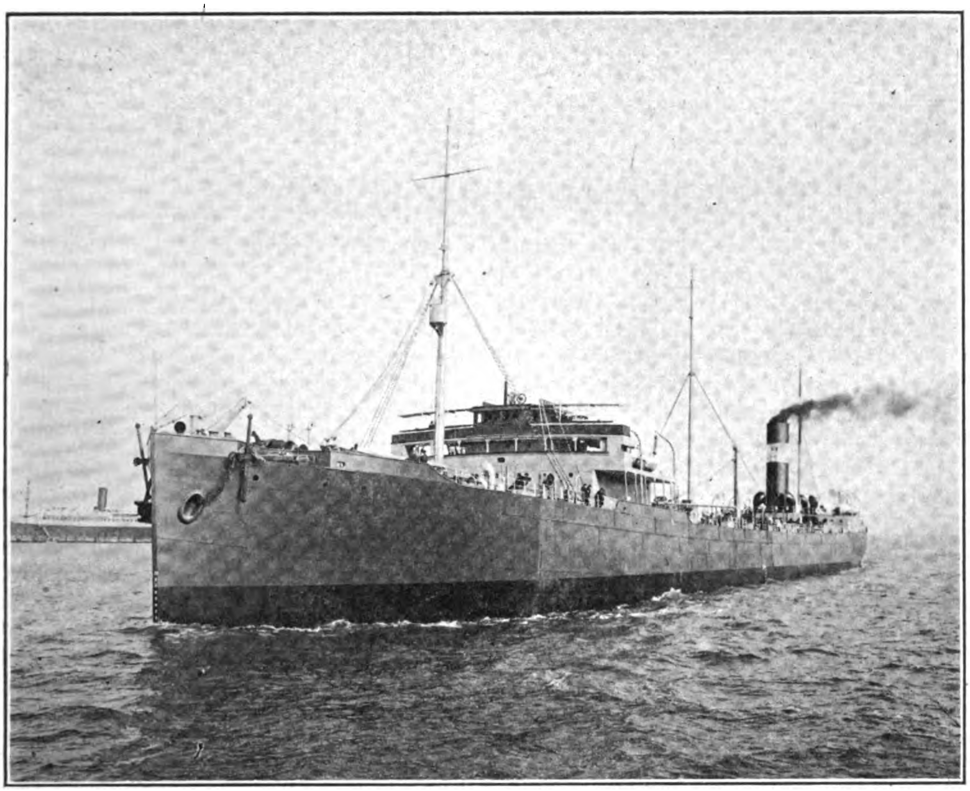

The H. H. Rogers, one of the largest tankers afloat, as she looked on her trial trip in Hampton Roads

puppy, after biting an oiler's hand, was thrown overboard. Then Martina, a queer little Mexican squirrel, bought from a Tuxpam boatman for two bits Americano, accidently slipped over the side soon after finishing his exploration of the ship, including the three mast-heads. Hardly had the excitement due to this incident subsided when Vasco da Gama, fifteen ounces of pitch-black kitten, was foully murdered by an enemy and the officer's messboy, proven guilty of the deed, became an outcast.

A sea bird with unbelievable wing-spread, half heron and half gull in appearance, with a long, round bill like four inches of a marlinespike's business end, broke the spell of ill-luck which surrounded the ship's pets. Coming aboard the vessel in mid-ocean, he perched on the upper bridge and stared fearlessly at all who came near him. He was as tame as the proverbial kitten, but notwithstanding he declined to become domesticated in so far as it involved accepting food from the members of the ship's company. Instead it was his custom to fly away from the vessel on foraging expeditions, returning to jockey for a landing on the bridge rail. Like an aeroplane in a gale he would circle about until he finally accomplished his object. For almost a week he made his quarters on the ship and at the end of that time he darted away to the westward and never returned.

In conclusion it should be said that there is something about the life of an operator, the peculiar fascination of existence on shipboard, that haunts the mind in after years. We may break away from the business, go ashore to live and seemingly forget it; but every now and then some reminder of the past crops up. It may be only the sight of an amateur's aerial or just the printed word "Marconi," but the memories brought back refuse to stay covered up. It's a great game!

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General Advice for the Amateur Experimenter

By Eimer E. Bucher

A REVIEW of the radio situation throughout the United States shows that the amateurs' problems, regardless of the locality, are more or less alike and that considerable confusion and misunderstanding prevail regarding the operation of apparatus, the design of equipment and general knowledge of the art. The experimenter about to take up wireless telegraphy would do well to purchase an elementary textbook on the subject and study the fundamentals of radio, for in this manner he can save himself considerable trouble.

A question frequently discussed among experimenters has to do with the type of receiving apparatus the beginner should construct or purchase. This question cannot be answered unless the stations from which the amateur desires to receive are definitely known. It should be remembered that transmitting stations throughout the United States employ both damped and undamped waves, long and short waves, high and low powers, and that their possible range is a somewhat variable factor. An amateur in the central part of the United States should first construct a receiving set for 200 meters to communicate with stations in the immediate vicinity of his installation and a second set for the reception of undamped waves up to 10,000 meters. With these equipments he will be able to receive signals from any station within the range of the apparatus.

Receiving equipment of both types is fully described in the book "How to Conduct a Radio Club," in previous issues of the Monthly Service Bulletin of the National Amateur Wireless Association and also in the Proceedings of the Institute of Radio Engineers. The September, 1915, proceedings of the Institute give an explanation of the Armstrong oscillating circuit, but do not contain the dimensions of the coils, nor the capacity of the variable condenser. This information, however, is contained to a measurable extent, in the book "How to Conduct a Radio Club."

Then, too, there is the usual misunderstanding between some manufacturers and the amateur, the former supplying to the market a receiving equipment that does not actually respond to the wave-lengths for which it was advertised, principally because the equipment was designed by guess work, rather than by the application of a few scientific principles. With knowledge of the art within reach of everyone this condition should not prevail.

There is no reason why the amateur in the United States should build a receiving tuner for use with a crystalline detector to be responsive to the wave-length of 10,000 meters, because no spark stations within range operate on this wave-length; hence, a receiving set responsive to damped waves, exceeding the 2,500-meter wave of Arlington, is practically useless. Of course, this tuner can be made to respond to undamped waves by means of a tikker or an oscillating vacuum valve, but the latter requires additional apparatus and complications of circuits which makes the tuner an expensive proposition. Again, one not familiar with the fundamentals or the handling of receiving equipment, should not attempt to work apparatus of this type during the first weeks of experimentation.

The questions, "How shall we know about the design of a receiving tuner?" "How can we calculate the dimensions of the coils for a given wave-length?" and "How shall we determine the wave-lengths of stations within range?" frequently come up.

We can answer the third question by

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stating that a list of radio stations of the world is published by The Wireless Press, Inc., 42 Broad street, New York City, and a call list of the stations in the United States by the Government Printing Office, Washington, D. C. The very latest amateur calls issued by the Department of Commerce also appear in the Monthly Service Bulletin of the National Amateur Wireless Association.

Designing A Receiving Tuner

In designing a receiving tuner the constructor should begin with the secondary winding. It should be understood that the secondary winding of a receiving tuner to be used with the vacuum valve detector should be designed so that at the upper range of wave-lengths the maximum capacity of the variable condenser is shunt to this winding does not exceed .0002 to .0003 microfarad, but in the case of the carborundum crystal or other crystals, capacities of .0006 to possibly .0008 seem to give good results. All of which means that for the vacuum valve detector the secondary winding for a given value of wave-length should possess greater values of inductance than in the case of the crystal. This statement, however, should be qualified, for with certain types of windings, the crystalline detectors respond best in circuits where inductance predominates and the capacity values are as low as those with the vacuum valve detector. Assume, for example, that the experimenter has decided to construct a tuner responsive to 3,000 meters in order that the time signals from Arlington may readily be received. The necessary value of inductance may then be calculated by the following formula, namely:

$$L = \frac{\lambda 2}{355^2 \times C}$$

Where L = the inductance of the circuits in centimeters

λ = the wave-length in meters

C = the capacity of the secondary condenser in microfarads

Substituting these values we have:

$$L = \frac{3000^2}{355^2 \times .0002}$$

giving roughly a value of 12,600,000 centimeters or 12,600 micro-henries.

The required value of inductance having thus been obtained, the dimensions of the coils corresponding to this value are next in order. By referring to pages 81 and 82 of the second edition of the book "How to Conduct a Radio Club," you will find a table showing first the diameter of the various sizes of bare and insulated wire in the B. & S. gauge from No. 20 to No. 40; also a simple formula whereby the inductance of a coil of given dimensions can be determined. To make this calculation we must know the mean radius of the coil in centimeters or inches, the over-all length and the number of turns composing the windings. Rather than reverse this formula, it would perhaps be better for the experimenter to first assume a secondary winding, let us say of No. 32 S. S. C. wire of given dimensions, and calculate its inductance, thus finding out whether or not a coil of increased dimensions must be employed for the value required. If, of course, the value obtained by direction calculation is in this particular case in excess of 12,600 micro-henries, a coil of smaller dimensions must be substituted. Using the same formula, the correct value of inductance for various values of wave-length can thus be determined and, if desired, a dead end switch inserted at the correct point.

Obtaining Closeness of Adjustment

There need be no argument concerning the number of taps to place upon this winding because all experimenters will understand that the greater the number of taps, the closer will be the adjustment for a given wave-length, but generally it is not found necessary to have less than fifteen turns between each set of taps, the necessary closeness of adjustment between the taps being obtained by the shunt variable condenser. The amateur market is well supplied with small variable condensers which will give on the first few degrees of the scale, a capacity of .0003 microfarad.

To determine the value of inductance for the primary winding of this tuner we must first know the inductance and capacity of the antenna with which it is to be employed and to obtain these data,

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the experimenter should refer to page 107 of the November, 1916, issue of THE WIRELESS AGE, tables 1 and 2, where the total inductance and the total capacity of various dimensioned aerials are given. Even if the experimenter's antenna does not duplicate the dimensions and the spacing between wires assumed in these tables, he should select the values nearest to it, which will be sufficiently accurate for general calculation.

The Antenna System Inductance

The inductance of the antenna system is composed of the distributed inductance of the antenna and the localized or concentrated inductance comprising the primary winding inserted at the base. While we may use the same formula as in the case of the secondary winding for the determination of the inductance value, it will be plain from the article by A. S. Blatterman in the October and November issues of THE WIRELESS AGE, that the formula for calculating the wave-lengths of the antenna system is somewhat modified, the ratio of the distributed inductance of the antenna to that of the concentrated inductance of the coil being considered.

However, in cases where the inductance of the coil is large as compared with that of the antenna, the amateur experimenter may, for practical calculations, ignore the inductance of the latter. We might state then, briefly, that for the value of L in formula No. 1, we may add the inductance of the antenna to that of the coil and for the value of C, we substitute the capacity in microfarads as obtained in tables 1 and 2 of the November issue of THE WIRELESS AGE.

In designing the receiving tuner there is always difference of opinion regarding the size of the wire, and whether or not it should be single silk covered or double silk covered. Experiment seems to indicate that a primary winding made of No. 24 S. S. C. wire and a secondary winding of No. 32 S. S. C. wire, give the highest degree of efficiency, but if wires of this size are not immediately available, other sizes, such as No. 26 and No. 28, can be substituted for the primary and No. 30, or perhaps No. 34, for the secondary.

In a similar manner the experimenter may determine the correct dimensions for a tuning coil of increased range of wave-length and, if desired, the entire inductance of the primary and secondary may be included in a single set of windings or a smaller coupler employed and the necessary inductance values obtained by loading coils.

Another point regarding which there is considerable difference of opinion is the effect of the condenser in shunt to the primary winding. According to tests reported in the Proceedings of the Institute of Radio Engineers, while the use of this condenser may assist in tuning under certain conditions, it is detrimental to the strength of signals and louder signals can generally be obtained by a properly designed loading inductance.

Calculating the Antenna Natural Wave Length

The calculation of the natural wave-length of an antenna from its dimensions is an ever-present problem to the amateur and unless he has had the proper technical training to enable him to solve the problem by the formulæ generally presented, he gives it up in despair. If, however, he will refer to the article by Mr. Blatterman on pages 108, 109, 110 and 111 of THE WIRELESS AGE, he will have no difficulty in selecting an antenna suited to his requirements or in calculating the wave-length on an antenna which has already been erected. It should be remembered that this formula does not take into account the presence of near-by conductors and consequently an antenna of similar dimensions to those given in the tables may not upon measurement possess the natural wave-length indicated by the data; at any rate the result given by the curve will be near to the actual value.

A set of curves of considerable value to the amateur experimenter is that appearing on pages 110 and 111. Here the natural wave-length of aerials of given dimensions is presented with an inductance coil of 10,000 centimeters inserted in series at the base. This inductance may represent the secondary winding of an oscillation transformer

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and is generally of sufficient value to permit the absorption of energy from the primary circuit. The experimenter may calculate the dimensions for a coil of this value of inductance by making use of the formula appearing on page 106 of the same issue; thus he may construct an inductance of just the required value for any other wave-length. The entire set having been designed in accordance, an antenna may be selected from the curves that will radiate a wave-length very near to the value of 200 meters. The formula given for the calculation of inductance may also be employed for determination of the dimensions of the primary inductance and if the capacity of the closed circuit condenser is definitely known the formula $\lambda = 59.6\sqrt{LC}$ may be at once applied.

Transmitting Apparatus Troubles

Two points in connection with transmitting apparatus give constant trouble to the experimenter in some localities, one being the blinking or flickering of the lights and the other induction troubles when the power wires of the house are near to the antenna wires. In the first place a transmitting aerial should never be erected parallel to a power line as inductive disturbances are bound to be set up which may injure the circuits of the power line; furthermore, there are only two methods by which this trouble can be overcome, one being to place the power wires in conduit under the earth or to remove the antenna and erect it at right angles to the power wires; or, what is better, to remove it to a distance of several hundred feet if possible. Many experimenters are under the impression that, even though the transmitting aerial sets up disastorous inductive influences in the power line, these induced potentials may be conducted to earth by means of protective condensers, but nothing could be further from the fact. Generally, when the potentials are high enough to damage considerably the meters, let us say, of a power circuit, they will also puncture the dielectric medium of the protective condensers and the only remedy in this case is to take down the aerial or remove the power line.

The flickering of the lights at a transmitting station is generally due to the fact that the transformer is improperly designed and does not possess sufficient magnetic leakage. When the spark discharges across the spark gap the secondary winding of the transformer is practicaly short-circuited and unless there is a certain amount of magnetic leakage in the core of the transformer the self-inductance of the primary winding drops to a very low value; in consequence an excessive value of current takes place which causes the lights in a given vicinity to flicker. Sometimes the effects may be obviated by means of a reactance coil inserted in series with the primary winding, or by a change of capacity at the secondary condenser or a decrease in the length of the spark, but the most effective method is to design the transformer so that it will have a certain amount of magnetic leakage, such as may be provided by the ordinary magnetic leakage gap.

Another method is to shunt a reactance coil or resistance coil about the transmitting key and cause the transformer to take a portion of the load at all times. Then, when the key is closed, normal value of current flows and the spark discharges cross the gap.

Flickering of the lights is due many times to the fact that the house transformer has insufficient capacity to take care of the load and therefore a second transformer installed specifically for operation of the power set will offset the difficulty.

Overcoming Disturbing Effects

In cities where the telephone lines are *not* placed underground, amateur transmitting sets often set up disturbing inductive effects which may interfere with telephone conversations. One experimenter overcame this difficulty in the following manner: Instead of bringing in the twin conductor from the telephone pole to the house in the ordinary manner, a triple conductor was employed. Two of the wires completed the ordinary telephone circuit, while the third was connected to earth. In this manner the potentials due to electrostatic induction were completely eliminated.

In employing the formula for the calculation of the capacity of a condenser the amateur frequently finds consider-

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able discrepancy between the results obtained and the actual measurements of the capacity by some of the well-known methods. This is due to the fact that the specific inductivity of glass varies widely according to the grade and the textures of the glass, the value lying somewhere between six and ten.

We may state generally that a single plate of glass, 14 inches by 14 inches, covered with tinfoil 12 inches by 12 inches, the glass being approximately 1/8 of an inch in thickness and varying from this value to 3/32, will have a capacity of .002 microfarad and similarly, a sheet of glass eight inches by ten inches covered with tinfoil 6 inches by 8 inches, will have a capacitance of about .00066 microfarad. Since the capacity in a closed circuit of an ampere set to be operated at the wave-length of 200 meters cannot exceed in any case .01 microfarad and is preferably .008 microfarad, it is easy to arrange a parallel or a series parallel connection of plates whereby the desired value of capacity can be obtained. For example: Four of the 14 inch by 14 inch plates connected in parallel will have a capacity of .008 microfarad, but if a series parallel connection is required to reduce the strain on the condenser, sixteen plates will be required, eight plates in parallel in each bank and the two banks connected in series. In other words, a series parallel connection always requires four times the number of plates of a single parallel connection.

Some grades of glass 1/8 of an inch in thickness will withstand a potential of 15,000 volts, but ordinarily pressure in excess of 10,000 volts should not be applied; when the transformer has a potential in excess of 10,000 volts a series parallel connection should be used.

(To be continued)

THE WIRELESS AMATEUR

Some may not know that, through amateurs in wireless operation, communication betwen the Government and the cities and towns of the country is established. And, too, this method of communication is instantaneous and thoroughly reliable at all times. In every city and town of the United States there is always someone that is experimenting with wireless. A great many of these experimenters become, after a few months, competent operators. They include all manner of persons, young and old of both sexes. In fact, one of the widest known and most efficient dabblers in the art is a young woman, of St. Mary's, Ohio.

At ten o'clock every night in the year, the amateurs sit down to their wireless tables and "listen in" for Arlington, the largest of the Government wireless stations, situated just across the Potomac River from Washington, to send standard time signals and weather reports. Here, then, is the medium of communication with the rest of the country, which the Government may at some time find very valuable. Arlington could, in the case of sudden need of energetic action in an emergency, send out directions and even orders to members of the militia or to any other officials.

The objection may be raised here that the average experimenter would be unable to copy these messages. But such is not the case. It takes but very short time for a clever boy to become able to copy these signals as sent out from Arlington, and, besides, there would be several copying the same message in a great many towns and cities. It certainly would constitute a very effective means of getting instant action in an emergency.

The Government can foster this important adjunct to its national defense, or it can destroy it. It must seem likely to every person that such a valuable mode of communication should not only be tolerated but encouraged. It is to be hoped that Congress, if it intends taking any action at all, as has been at various times reported, will see the wisdom of regulating the wireless amateur and not of abolishing him.—From the Rochester (N. Y.), Union and Advertiser.

The Fowler Radio Club of Cleveland is carrying on a campaign to obtain more members.

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Crossing the Equator

Impressions That King Neptune Made on a Wireless Man

WE of the aging generation whose boyhood ambitions were fired by the fantastic narratives of writers, prefer to remember their romantic descriptions while we forget the hardships and privations that must have been undergone by their heroes and heroines. Even our own griefs and disasters become less memorable as the years pass. The pleasant things of life are far easier to remember than the unpleasant. Thus it is natural that the romance of the old sea tales should linger in our memory long after the hardships are forgotten.

We must not forget, however, that sixty years of steam navigation have greatly altered the character of sea travel. No longer are voyages entirely dependent upon the vagaries of ocean winds. No longer are voyages unduly delayed by adverse gales and long-protracted calms. Sea-going is now a business, an affair of furnaces and boilers, of engines and propellers. Voyages are matters of such definite calculations that the date of arrival can be predicted with accuracy before the vessel sets sail.

Yet there are some incidental features of the old-time deep-sea life that have survived. Here and there, in over-sea journeys to the antipodes and such distant parts, a few events crop out that hark back to the days of the old square-riggers and their clouds of billowing canvas.

One characteristic observance of the old-time sailors has survived the decadence of the others. This is the peculiar ceremony held on shipboard during the crossing of the equator, when all sea-going novices, and all "land-lubbers"—often including the passengers—who have never passed at sea from the northern to the southern hemisphere, or vice versa, are introduced to King Neptune and his court. The event is a seaman's frolic, projected and carried out by the crew, with the consent and assistance of the officers. Originally it was intended for the initiation of sea-going apprentices, and sailors who had never before "crossed the line." During recent years, however, large passenger steamships have been employed in antipodean voyages and in cruises around the world. Upon these ships there have been hundreds of cabin passengers, whose interest in this unique sailors' prank stimulated them to participate in it. At first the participation of passengers came from their own initiative and request. The sailors took no liberties with the passengers and went no further than the passengers themselves desired. But the latter looked upon the affair as no end of a lark, as a chance to play jokes upon one another, as a diverting incident in a long and otherwise uneventful voyage, until now passengers as well as sailors and wireless men are regularly initiated and welcomed to his domain by King Neptune as a matter of course.

Previous to the inauguration of the ceremonies a large, water-proofed canvas tank has been rigged up on deck, with a "boatswain's chair"—minus a back—fixed at its forward end. This is filled to the depth of three or four feet with sea water, and in it, during the ceremonies, stand two burly minions of his nautical majesty. The purpose of the tank and the offices of these satellites will be disclosed later.

In the meantime one member of the crew has been chosen to represent King Neptune, being made up in crude fashion with royal robes, a crown and a long beard—the latter being usually constructed out of oakum or rope yarn. His Consort, Queen Porsperine—another of the crew—is appropriately clothed as befits her station, and her long flaxen hair is also of oakum. There are various court attendants in fantastic garb, among whom the royal barber occupies an important position.

Upon the day of crossing the equator, before the ceremonies begin, those who are to undergo the initiation are gathered together, and told to prepare themselves for the trial, which preparation consists principally in putting on

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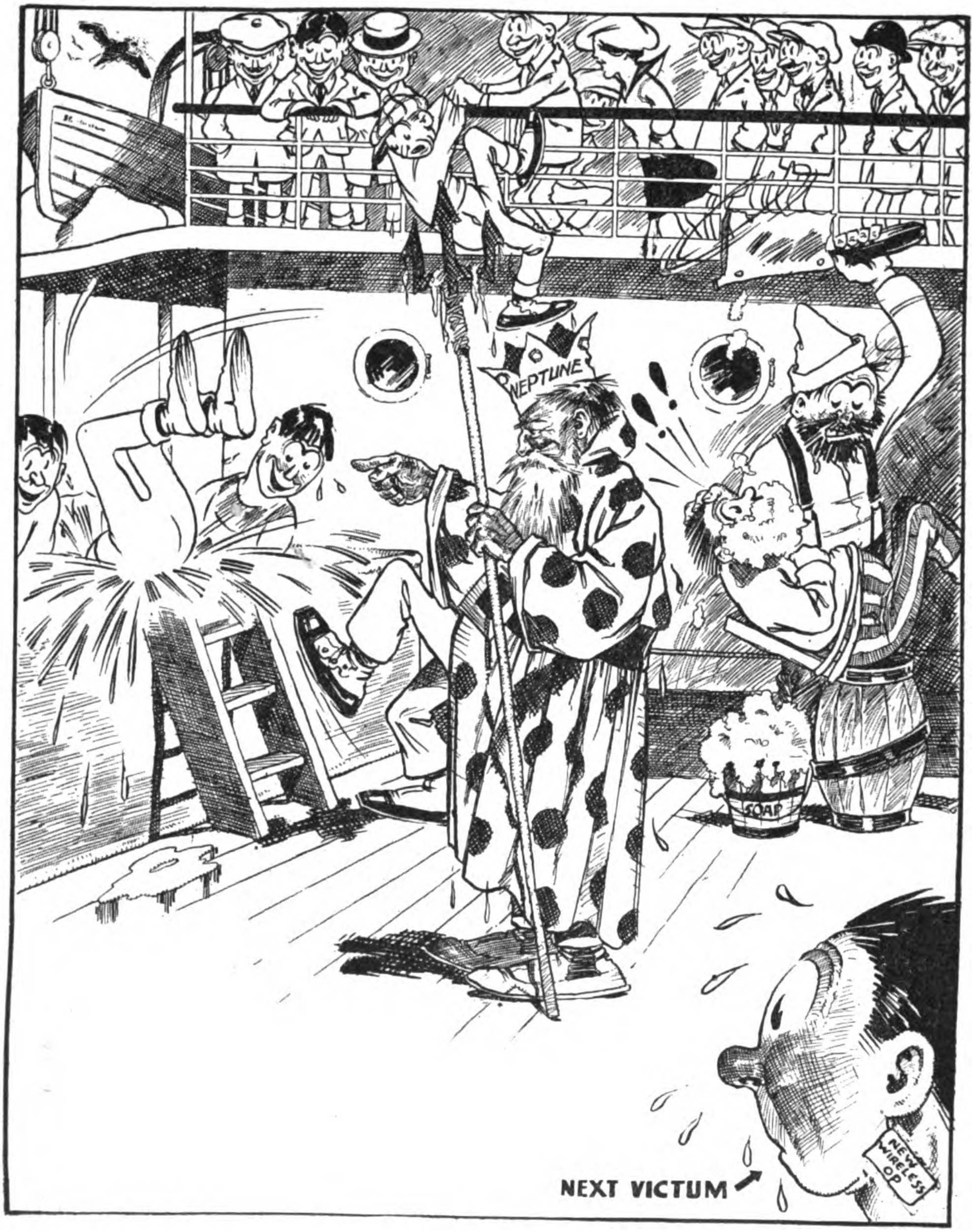

An active period during the visit of King Neptune

some of their old clothes—as few as possible—and those that water will not injure.

At the beginning of the ceremonial, Neptune and his court appear on deck and take their places at the opposite side of the open space before the great canvas water tank, at the end where the boatswain's chair has been rigged, the king seating himself upon his throne, and the queen placing herself beside him. The court attendants group themselves on either side. (In the old days Neptune and his court always boarded the vessel

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over the side, but this part of the royal arrival has been moderated and is frequently omitted on modern steamships.) The court herald announces that his royal master has learned that there are on board a number of culprits who have invaded his domain without his royal sanction, and these are ordered before his majesty in order that proper punishment may be meted out to them, and that they may be duly initiated, and later accepted as his subjects.

The row of victims is lined up before the king, who addressed them, asking them why they came to sea and why they have invaded his dominions, and finally sentences them to be shaved by the royal barber, and also to undergo other attentions at the hands of the two strapping attendants standing waist-deep in the canvas tank.

The first-selected culprit is seized and dragged to the chair, into which he is thrust with no gentle hand. The barber's assistant, armed with a huge paste brush and provided with a bucket of lather—in these days and in the case of passengers it is made of soap, but once upon a time and in the days of sailing ships it was composed of that unsavory compound known as "slush"—daube the face of the victim all over, not forgetting to cover up his eyes and fill up his ears and, if possible, his mouth. The barber seizes the victim by the hair of the head, and proceeds to shave him with a large wooden razor, or saw-edged cleaver. The operation is artistically and quickly done, though not delicately. Then the barber or his assistants grasp the victim by the legs and dump him over backwards into the canvas tank, where he is instantly seized by the two attendants who have been waiting for him, and by whom he is soused three times under water. If the initiate takes his sousing philosophically and does not struggle, the immersions are quickly over, and he is released and allowed to scramble out of the tank amid the laughter of the lookers-on. If he put up a resistance, however, all the worse for him. The two attendants have been selected for their ability to accomplish what they are expected to do. Resistance is futile, therefore, and only prolongs the infliction.

The first victim out of the way, the next is brought forward, to undergo the same treatment, and so on until the list is completed. The king and court afterward take their leave, first having held a reception during which they welcome the initiates and wish the captain a prosperous voyage.

Ladies among the passengers are usually exempt from the ceremonies attending the crossing of the equator, but occasionally some of them elect to be initiated. These self-chosen victims thereupon undergo the same treatment allotted to the male contingent, but it is usually noticeable that the royal barber and his associates do not handle them with any unnecessary roughness.

Upon some modern passenger steamships in recent years that have been engaged in vacation voyages, the passengers have not been satisfied with the old-time observances of crossing the equator, and have introduced some modifications of their own. These are usually in the nature of "horse-play," and, while they are frequently very diverting, they are examples of spontaneous gayety rather than any real part of this unique and time-honored marine pageant. For instance, upon an American steamship which has made voyages through the Panama Canal and down the west coast of South America, passengers had the hose laid which is used to flush down the decks of the ship, and went about with this, seeking unsuspecting victims upon whom to turn a stream of water. In this pastime they did not give their victims any warning or any opportunity to prepare for the infliction by a judicious selection of clothing. They caught them as they were, and wherever they happened to be on deck—whether asleep in a steamer chair, alone in some quiet corner absorbed in an engrossing book, or in a small group engaged in intimate converse. All, alike, were soused, and all, alike, fled shrieking from the unexpected drenching. It is only fair to say, however, that in the tropics the temperature of the water is too agreeable to make even an unexpected drenching objectionable, and when all are subjected to it indiscriminately, few are likely to take serious offense at the infliction.

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Radio Telephony

By ALFRED N. GOLDSMITH, PH.D.

Director of the Radio Telegraphic and Telephonic Laboratory of the College of the City of New York

ARTICLE II

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5. (b) **CAUSES OF SPEECH DISTORTION IN RADIO TELEPHONY.** In radio telephony we are, of course, vitally concerned in preserving faithfully the exact quality of speech from the speaker to the ear of the person receiving the message. That is, the wave form of the original sound (as shown in Figure 3 and also in the dotted outline in Figure 6) must be in no way distorted in transmission and reception. This requires considerable care in the various stages of the process of radio telephony, as will appear from the following review of the causes of distortion and their remedies.

To begin with, there is a type of distortion which may be termed "fly wheel" or inertia distortion. It arises in a fashion which can be made clear from a mechanical analogy. If we have a fly wheel in rapid rotation, there is a marked and well-known tendency of the wheel to maintain a constant speed because of the large amount of energy stored in its rotating mass. If we attempt to change the speed of the wheel very greatly in an exceedingly brief time, we shall meet with almost insuperable opposition. The "inertia reaction" of the wheel will be very marked. If, on the other hand, we attempt to change the speed slightly in a considerable longer time, we shall find the task a much easier one. In other words, the fly wheel resists, markedly, rapidly recurrent changes in its speed of rotation but permits, fairly well, slow changes in its speed. Of course, the same effect exists with any mass. If we attempt to start and stop a heavily-loaded freight car a thousand times per second, huge forces will be called into play if the to-and-fro swing of the car is appreciable. If we attempt to start and stop the same car only once per second, the opposition will be but a thousandth as great.

The application of this principle of inertia reaction to the telephone transmitter diaphragm and the telephone receiver diaphragm is not far to seek. It is clear that there will be much more difficulty in getting the telephone diaphragm to respond proportionately to the higher overtones of the human voice than to the lower pitched components. This is one reason why a high-pitched voice generally fails to get over a telephone line with complete satisfaction to the listener. We may say, then, that the telephone transmitter diaphragm smooths out the high overtones of the voice, with the result that crisp, clear enunciation is in part lost. The obvious remedy is to have light transmitter diaphragms without much pressure on them from the carbon grains behind the diaphragm. We are much limited in the design of a transmitter by other considerations, so that it is generally necessary to use the normal transmitter. As regards the receiver diaphragm, there have been made a number of attempts to use thin small sheets for this purpose, and it has been noted that they respond much more readily to the present-day 500-cycle spark signals than did the older, heavier diaphragm receivers. On the other hand, it is desirable to avoid receivers in which the diaphragm is markedly resonant to any frequency within the

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normal range of speech, else this frequency will be relatively exaggerated out of all proportion to its actual magnitude. The result will be an extremely annoying "howling" whenever the resonant frequency occurs in the speech.

There is another possibility of a sort of "inertia" distortion due to the fact that the radio frequency generator (arc, bulb, alternator, etc.) will not supply sudden violent changes in output. Consequently, a similar smoothing down of the higher overtones will occur unless the radio frequency generator is without "electrical inertia" (that is, has small inductance) and also is operated by a powerful generator.

It is well at this point to indicate clearly what is meant by "electrical inertia." The behavior of an ordinary inductance when an alternating electromotive force (voltage) of various frequencies is applied at its terminals is as follows: The current which passes through the inductance is inversely proportional to the frequency; that is, the inductance acts like an electrical mass and does not permit the ready passage through it of the higher frequency currents. It is to be noted further that the effect of a capacity is exactly the opposite in that it exaggerates the passage of higher frequency

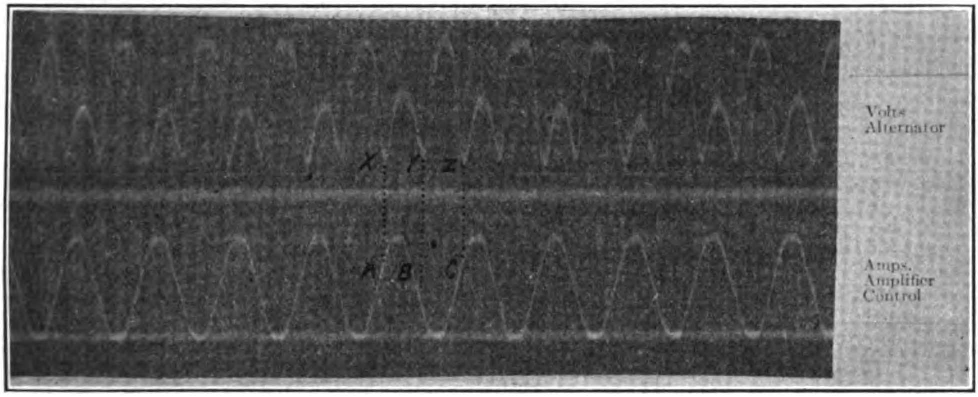

Figure 5.—Oscillogram showing distortion when range of linear proportionality is exceeded

while relatively retarding those of lower frequency. This is the basis of ordinary tuning, which is nothing more than balancing the choking action of an inductance at a given frequency by the opposite effect of a capacity.

It is clear enough then that high inductance in any of the circuits in which speech currents flow will produce an objectionable smoothing out of the overtones in speech so that the speech will become "drummy" through the exaggeration of the basis tones. An excess of capacity in any speech circuit will exaggerate the overtones, and the speech will become "squeaky." A little practice in telephony soon enables the skilled observer to tell which type of distortion he is getting.

A smoothing-out effect, causing drummy speech, is also obtained when a highly persistent antenna is coupled to the sustained wave generator or when a highly persistent receiver secondary is coupled to the antenna. This is due to the fact, first shown by Bjerknes, that with loose coupling a persistent secondary will not follow the sudden variations in the primary oscillations except with a time lag and diminution in the abruptness of change. It is this effect which has led Poulsen and others to use entirely aperiodic secondaries in their radiophone receiving sets. In this way, the persistency distortion in coupling is avoided, though at the cost of loudness of signal and selectivity, *i. e.*, freedom from interference from other stations. These

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matters will be further considered under receiver design.

A fairly prolific source of speech distortion, or rather speech destruction, is that curiously imperfect instrument, the carbon microphone as used in the ordinary telephone transmitter. This has been shown by de Forest, who states that when speech from an ordinary transmitter is very greatly amplified, it is found to be fairly teeming with crackling and hissing sounds caused by small local arcs or mechanical disturbance effects in the microphone. This is not astonishing when the nature of the variable-resistance carbon contact is considered. The alternative suggested by de Forest, namely the use of an ordinary Bell receiver *as a transmitter of the induction type* is feasible only if one is willing to amplify greatly the extremely small output of such a transmitter. On the whole, the investigator will in general be bound to use carbon transmitters with small currents so as to avoid "packing," hissing, and other disturbances.

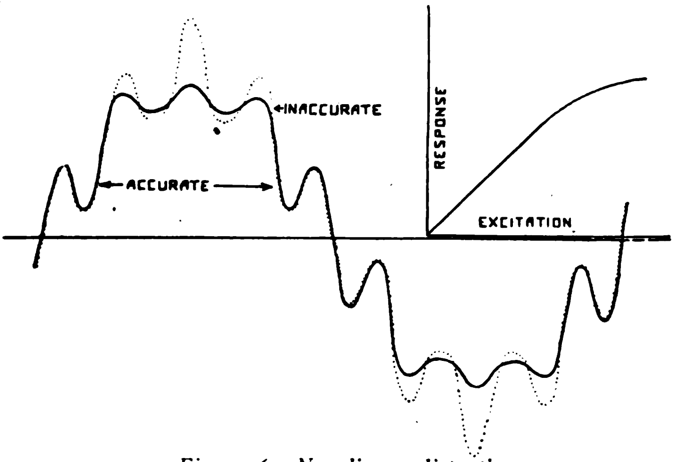

Figure 6.—Non-linear distortion

If iron cores are used in the coils of transmitting circuit (e. g., in magnetic amplifiers, or speech-controlled frequency doublers), a further distortion will arise because of the "saturation" effect in the iron. That is, iron core coils do not have a constant inductance at all, and the change in their inductance is particularly marked when heavy currents are passed through the coils thus saturating the iron. An interesting example of the distortion produced in a magnetic amplifier is taken from E. F. W. Alexanderson's paper in the April, 1916 "Proceedings of the Institute of Radio Engineers." The lower curve of this figure shows an oscillogram of the current (amplified speech current) passing into the magnetic controlling amplifier. The upper curve shows resulting voltage of the controlled radio frequency alternator. The distortion is seen to occur not between points *X* and *Y* (corresponding to *A* and *B* in the lower curve) but between points *Y* and *Z* (corresponding to *B* and *C* in the lower curve). That is, the distortion occurs for the high current values in the iron-core amplifier control winding between *B* and *C*. Of course, such effects are avoided by working the iron on low field density so that the flux is at all times proportional to the magnetising current and the control range is not exceeded. This can be accomplished, though sometimes at the cost of great amplification and large output.

It will be noticed that in discussing the saturated-iron distortion, we have encountered a case of non-linear amplification, and resulting distortion. Non-linearity of amplification is sufficiently common and important to warrant detailed consideration.

(c) **NON-LINEAR AMPLIFICATION AND SPEECH DISTORTION.** Let us consider again an ordinary phonograph record of speech, and let us suppose that the record in question is to be "amplified" mechanically. That is, we wish to produce a record similar in all respects except that the up-and-down ripples in the groove are to be accurately magnified

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to a definite extent in their vertical dimension but their length is to remain unchanged. Such a record would produce a sound of much greater loudness but with the pitch or frequency unchanged. (We are here referring to a vertical cut record, of the cylinder type.) This amplifying procedure would be quite satisfactory if the mechanism that cut the new record always followed the original record accurately, and faithfully multiplied every vertical dimension by the same amount. Then, in Figure 6, the new record would have the cross-section of the dotted line in the figure. If, however, the amplifying mechanism magnified accurately only for displacements near the axial line but responded disproportionately feebly for portions of the curve lying at considerable distances from the axial line, we should get the type of distortion shown in the full line of Figure 6. It will be seen that the overtones are blurred at the upper portion of the curve, which is accordingly labeled "inaccurate." In the lower portion of the curve, where linear proportionality is obtained, the curve remains accurate. The whole matter is shown in a different way in the right hand diagram of Figure 6, where input of the amplifier or "excitation" is plotted horizontally against output of "response" vertically. It will be seen that, for the accurate portion of the wave, the response-excitation curve is a straight line, hence the name "linear amplification." Up further it flattens out, somewhat like an iron saturation curve and it is here that the distortion occurs. Speech of this type would generally be called "drummy."

In Figure 7, the reverse type of error, leading to what is usually termed "squeaky" speech, is pictured. It will be seen that the amplification is linear for low excitations, and that consequently the lower portions of the wave near the axial line will be accurately amplified. On the other hand, the greater excitations produce a disproportionately great response, and the overtones are exaggerated near the peak of the wave. The result is a high tinny quality to the speech.

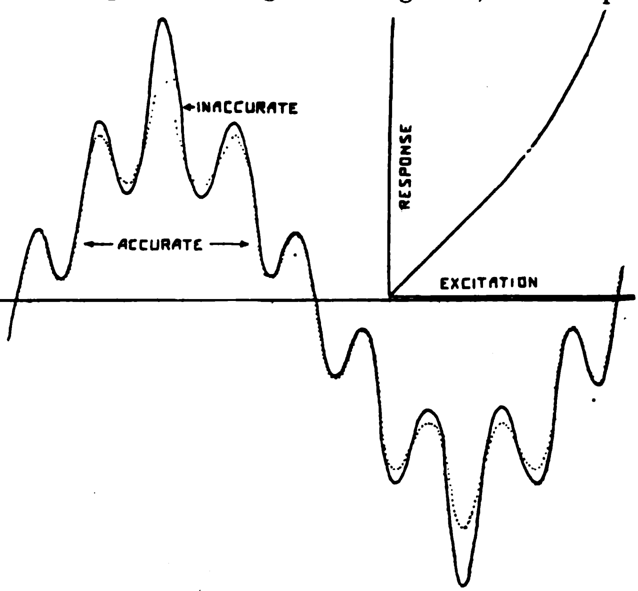

Figure 7.—Non-linear distortion

In Figure 8 is shown a sort of combination effect of these two, which is not uncommon. It consists of a disproportionately feeble response for small excitations, a proportional response for moderate excitations, and a disproportionately feeble response for great excitations. The resulting wave is, as will be seen, accurate only for moderate values, but flattened as to overtones near the axis and far from the axis. This would be badly blurred or "muffled" speech.

It is quite clear that we should use linear control systems in the radiophone transmitter and linear amplifying systems in the radiophone receiver. With the magnetic amplifier for transmission, this implies lower iron field-

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densities, and with the audion receiving amplifier it implies working far below the saturation current point.

(d) **SECRECY OF COMMUNICATION IN RADIO TELEPHONY.** If a frank expert were to be asked whether "complete" secrecy could be obtained now with radio telephony, he would be compelled to answer in the negative. If he were of a cynical turn of mind, he might add that secrecy was no more obtainable in radio telephony now than in wire telephony or any other form of communication, a remark which recent revelations as to the comparative prevalence of official "wire-tapping" would more than justify. Of course, any wire telephone line can be tapped, and with remarkable ease under most conditions. At one time, the telephone companies judged it necessary to maintain wire communication from New York to Boston over one line and return communication from Boston to New York over another line traversing an entirely different route from the first. In this way, even the adroit interloper would hardly be likely to tap more than half a conversation. As a matter of fact, the drastic expedient suggested was not adopted since it was unnecessary then and will probably continue to be so. A combination of severe laws against tapping, and an efficient corps of radio inspectors would practically solve the problem, at least in communities no more law-defying than those of the United States.

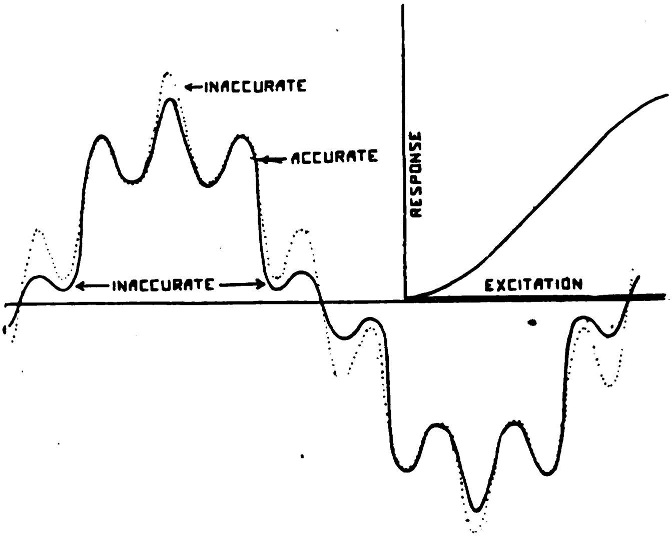

Figure 8.—Complex non-linear distortion

As an illustration of the ease of tapping an ordinary (non-twisted, though regularly transposed) telephone line, it may be mentioned that there is much used abroad a simple secondary coil, which, when placed suitably near the line, picks up ordinary conversation without any visible physical connection, premanent injury, or other trace. Even the effect on the transmission would be practically infinitesimal.

It is to be expected, on the other hand, that when radio telephony becomes commercial and widespread, we shall have stringent laws against "listening-in" on commercial wave-lengths, and these laws will be adequately enforced. By the use of a number of modified waves or by other technical methods under development at present, unauthorized "listening-in" will become exceedingly difficult, and possible of attainment only by persons of expert ability. Such persons, however, are easily known and can be supervised in their activities; much as is now the case with excessively skillful engravers of bank notes. In fact, systems can be imagined whereby "listening-in" would be futile unless the listener had a code combination whereby the peculiar material sent could be automatically re-converted into clear speech. This indicates a possibility of complete secrecy.

In short, while secrecy in radio telephony involves more inspection than for wire telephony, it can be brought to the same or even a greater degree of certainty by technical and legal measures.

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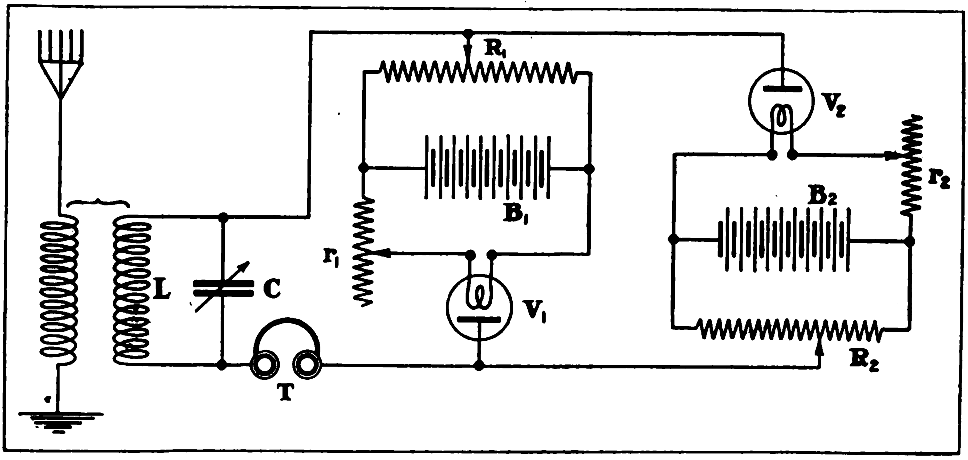

Figure 9.—Marconi Company Round balanced valve receiver

(e) **STRAY INTERFERENCE IN RADIO TELEPHONY.** One of the most serious outstanding problems in radio communication is the elimination of atmospheric disturbances and stray electromagnetic waves. To begin with, under normal summer conditions, particularly in the tropics, the effect of strays is practically to prevent stations from working at all, part of the time. Aside from the six-to-one to ten-to-one ratio of signal strength in favor of winter time, the strays complicate the problem of reliable transmission vastly. As a result, most radio stations work with a "factor of danger" rather than the normal engineering "factor of safety." Whereas an engineer will normally design, for example, a bridge so as to stand five or ten times the maximum load which it will be called on to bear, (that is, with a factor of safety of ten), the radio engineer is unable to guarantee transmission over great distances, particularly in the tropics, without the use of exorbitant and commercially unprofitable amounts of power. The result is that a compromise is always made between absolutely reliable service (and no profits) and moderately reliable service on a financially feasible basis.

If, however, ninety per cent. of the strays could be eliminated in reception, the effect would be virtually to increase by ten times the power of every transmitting station and to render communication entirely reliable even where it had been previously fairly uncertain. It has, indeed, been estimated with probable correctness that in the absence of strays (or their practical elimination) communication from Germany to the United States could be carried on with about ten kilowatts in the antenna, or even less. When it is considered that at present a power of two hundred kilowatts in the antenna at Nauen is really not always sufficient, the importance of stray elimination is made increasingly evident.

Radio telephony has one great advantage over radio telegrapy in the matter of stray elimination. It is well known that speech can be carried on, after a fashion, even under very serious difficulties; for example, in extremely noisy localities. The ease in understanding speech under such conditions is due particularly to our lifelong practice, since it is rather unusual (in cities at least) to carry on speech under conditions of even approximate silence. Then, too, there is what may be termed the "assistance of context." By this is meant the ability of the average listener-in "filling in" lost words in a conversation by judging what word, placed in the gap, would give sense to the entire sentence. This assistance is much greater than is usually

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believed, as can be easily shown by the common experience in listening to names over a telephone. Whereas, ordinary conversation is carried on over normal telephone lines without any particular difficulty, the moment names or figures (that is, material lacking assisting context) are given, great difficulty is experienced and the percentage of errors rises markedly.

There is no doubt, therefore, that understanding a telephone conversation through comparatively heavy strays is a simpler achievement than taking down telegraphic signals under the same conditions.

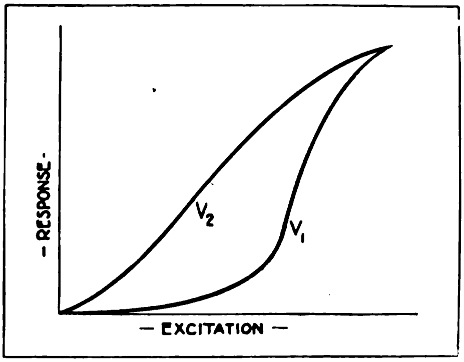

Figure 10.—Valve characteristics with different auxiliary potentials

There are known to-day a number of methods of reducing somewhat the disturbing influence of strays. The chief of these are:

(1) Loose couplings between antenna and receiver.

(2) Sharp tuning with circuits of low damping.

(3) Beat reception (generally not applicable to radio telephony).

(4) Balanced crystal or valve detectors, which prevent excessive crashes of sound reaching the ear.

(5) Dieckmann electrostatic shields around the antenna.

(6) Special methods given under later headings.

The first three of these methods are commonly known. A simple circuit diagram illustrating the balanced valve receiver (as due to H. J. Round of the Marconi Company of England) is given in Figure 9. Here *LC* is the secondary of an ordinary receiver, and *T* a telephone receiver. The two hot-electrode rectifiers (Fleming valves) V_1 and V_2 are connected as shown. The batteries B_1 and B_2 serve not only to light the filaments through the appropriate controlling resistances r_1 and r_2 but also to provide a supplementary potential difference in the plate circuits through the potentiometer control resistances R_1 and R_2. It is well known that the curve connecting excitation (that is, incoming signal currtnt) and response (that is, rectified current) depends, in these valves, on the supplementary potential in the plate circuit. Hence we arrange that one of these valves shall have a favorable value of this potential, giving it high sensitiveness for weak signals. This will be valve V_2, and its sensitiveness curve is shown in Figure 10. The other valve, V_1, is run with a low supplementary potential, so that its sensitiveness for weak signals is very low. For extremely loud signals, however (because of the current saturation effect) its response is no greater than that of V_2. It will be noticed that the valves V_1 and V_2 are connected in opposition or differentially so far as the receiver *T* is concerned. Hence weak signals will be readable, since V_1 will not neutralize V_2

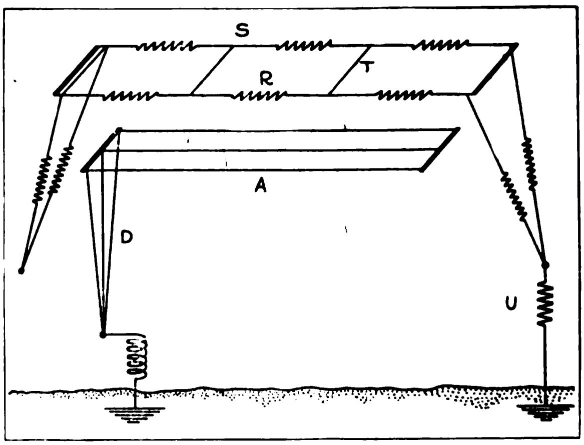

Figure 11.—Dieckmann shielding cage for stray reduction

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in this case. Strong crashes due to strays will affect both valves equally, and hence will not be heard in *T*.

An alternative scheme, proposed by Dr. L. W. Austin, is to connect a silicon-arsenic detector direct between antenna and ground as a shunt to the primary of the inductive receiving coupler. This detector is claimed not to affect weak signals, but to become conductive for extremely powerful disturbances, thus shunting them to ground and protecting the ear sensitiveness of the receiving operator.

A Dieckmann electrostatic shield for a flat top antenna is shown in Figure II. The purpose of such a shield is to prevent the electrostatic field of the earth or of the atmosphere from reaching the antenna, by an action similar to that of a Faraday cage. At the same time, the shield must be so arranged that the incoming electromagnetic waves can pass through readily, as in the case of a Hertzian polarizing parallel-wire screen. In Figure II, *A* is the actual antenna with its down lead *D*. The actual shielding wires are *T* and those parallel to it. The wires *R* and those parallel to it are merely equalizing connections, and include inserted resistances so that the entire shielding system is aperiodic; that is, incapable of being set into resonant oscillation by the incoming energy. This is an obvious necessity. The shielding system is grounded at *U* through a large inductance or resistance. In practice, Dieckman found that the reception was *louder* when the antenna *A* was shielded than when it was not (because of increased capacity when the shield was present). Naturally, this type of shield protects strictly against "static" but not against all strays, since distant electromagnetic waves can pass through it. In practice, however, Dieckmann found it to be of marked asistance very frequently, a fact since verified by other careful investigators. The further developments in this direction will be considered under "reception."

The Author has suggested in the past the use of a completely covered antenna wire, the insulator being smooth and non-hygroscopic, thus preventing charged air and water particles from giving their charges by contact to the antenna, with the resulting disturbance of reception. Such a method should be of assistance at times, though it would naturally not be as efficient a protection as a Dieckmann shield, since it would fail entirely to guard the antenna against aperiodic sudden changes in the earth's electrostatic field.

This is the second of a series of articles on "Radio Telephony" by Dr. Goldsmith, an eminent authority on the subject. Various types of arc generators for radio telephony will be discussed in the third paper, to appear in the March issue.

A Summary of Dr. deGroot's Paper

Additional details regarding the paper on "The Classification and Elimination of Strays," by Dr. C. J. deGroot, head of the Radio Service in Holland, Dutch East Indies, which was presented at a recent meeting of the Institute of Radio Engineers as told in the January issue of THE WIRELESS AGE, are contained in a summary of his remarks. The paper was read by Dr. Alfred N. Goldsmith and discussed by Messrs. Weagant, Armstrong and Alexanderson.

Following a general discussion of radio versus submarine cable telegraphy, Dr. deGroot's paper described the work of the radio division of the Dutch East Indian Service. The wireless chain installed for this service was described in considerable detail, and the failure of the original contractor to provide stations covering the distances (which would have required six to eight times the actual available power) was critically considered. The choice of locations of stations and precautions against earthquakes was also discussed.

The paper gave a description of the origin and nature of strays and their classification as well as a number of methods for their elimination, the Eccles theory of a tropical thunder storm origin of all strays in this connection being disproved. There was a recital also of some special methods of reducing strays.

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Flashes From Five Vessels In Distress

The Powhatan's People Rescued Following a Collision—Three Ships Missing after S O S Calls—The Stranding of the Sumner

WIRELESS calls for aid from the steamship Powhatan following her collision with the British tank steamship Telena early in the evening of December 13th, in Chesapeake Bay, near Norfolk, Va., summoned four vessels to the scene of the crash. In this instance the wireless served not only as a means for rescuing the pasesngers of the Powhatan, but also to provide surgical aid for four firemen on that vessel who were injured when a boiler burst as a result of the crash.

The Powhatan, which was bound for Boston, had only been out of Norfolk a few hours when the collision occurred. Her promenade and boat decks were partly cut away on the starboard side, only a strip about six inches in width being left in front of the wireless room. On the Powhatan were Senior Marconi Operator A. F. Bowers and his assistant, O'Day. Two minutes after the two vessels had crashed together the captain of the Powhatan called Bowers by telephone and directed him to send the S O S, giving the position of the craft as "three miles below Thimble Shoal Lighthouse." The calls were answered by the coast guard cutter Yamacraw and the steamships Jamestown, Jefferson and Nantucket, as well as the Virginia Beach station.

Meanwhile, the Powhatan was racing toward Thimble Shoals, where she sank in twenty-one feet of water. Her upper works were not submerged, however, and those on board found some comfort in this fact. The Yamacraw reached the wrecked ship at about fifteen minutes to twelve o'clock and took off the passengers, conveying them to Norfolk. After the injured firemen had been treated by the surgeon from the Yamacraw they were placed aboard the United States hospital ship Solace and taken to Norfolk.

The collision worked little damage to the wireless set with the exception of the fact that one of the braces was knocked off, the table disjointed and wrenched loose from the wall and the battery box displaced. However, part of the Telena's hull cut off the light from the window of the wireless room and blocked the doorway, so Bowers moved the key and the telephone receivers to the smoking compartment, adjoining.

But the troubles of the Powhatan's company were not yet at an end, for on December 18th a severe northeast storm swept over the Chesapeake, shifting the pumping machinery and large iron pipes on the main deck about so violently that the bulkheads on both sides were broken. Immediately the vessel began to ship water over the main deck, the latter and the lower saloon being flooded. Soon afterward, she sank six feet farther into the sand. As the night wore on the storm increased in fury and Bowers wirelessed the Yamacraw, asking her to come again to the aid of the Powhatan. Thirty minutes after the appeal had been flashed the seas broke into the wireless room, causing the floor to collapse and sweeping away the contents of the cabin with the exception of the charging panel which was screwed to the bulkhead. At half-past two o'clock the next morning the Yamacraw arrived on the scene of the wreck and stood by until those left on the Powhatan had been taken off in lifeboats and transferred to the coast guard cutter.

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"Help. Our position, latitude 39 (north), longitude, 67 (east)." This was the wireless message flashed by A. B. Nickerson, Marconi operator on the steamship Maryland, 150 miles east of Sandy Hook, at fifteen minutes after twelve o'clock on the morning of December 26. The appeal was picked up by stations along the Atlantic coast, among those which received it being the Marconi station at Siasconset. The latter sent out a general call and soon the coast guard cutters Seneca, Acushnet and Gresham were speeding toward the distressed ship.

The peril of the situation on the Maryland was revealed by the following wireless which came from the vessel about an hour after the first appeal had been flashed: "Engine room flooded and ship sinking slowly. Help us." Word was flashed to the sinking vessel that the Gresham was proceeding at full speed to the scene of the wreck.

The coast guard cutters spent many hours in combing the seas in search of the Maryland. They could not find any trace of her, however.

The Buenos Aires, bound from Barcelona and Cadiz for New York, was 700 miles from the Spanish coast on the afternoon of December 4 when she received an S O S call from the Pio IX, a freighter, which was steaming from New Orleans to Valencia, Spain. Another wireless from the Pio IX said, "Have sprung leak. Northwest gale raging. Danger of our sinking." These appeals sent the Buenos Aires speeding toward the position given by the sinking vessel and toward morning those on the rescued ship received this message: "Fires out. Wireless on auxiliary. Ship helpless in trough of sea."

It was sunset when the Buenos Aires sighted the freighter which was fast settling in the seas. The weather was too rough to launch boats and nine of the shipwrecked men made their escape on rafts. At one o'clock in the morning came a wireless from the Pio IX saying, "We are sinking fast. Water over the decks. Goodby," and when daybreak arrived there were no signs of the wrecked craft. In the afternoon the Buenos Aires received a wireless from a French transport that she had picked up a number of men from the Pio IX adrift on a raft. From the information obtained, it is believed that forty persons were lost.

A newspaper report from London says that the American bark Manga Reva, with Marconi Operator George A. Geare on board, sent out a wireless on November 19, while in the Atlantic Ocean off the coast of France, saying, "Come as quickly as possible. Am drifting before the wind with no boats." This message was received by the Dutch steamship Ryndam, which replied that she was hastening to the distressed craft. The Ryndam also wirelessed the American steamship Rockingham, which was the nearest vessel to the disabled craft, to steam to the rescue of the latter. The Rockingham proceeded directly to the position where the Manga Reva was supposed to be and the Ryndam later received a message from the former vessel saying that she could not find any signs of the distressed craft. Both the Rockingham and the Ryndam then proceeded on their voyages. Before departing the Rockingham sent a wireless saying a French auxiliary cruiser was looking for the Manga Reva.

The United States Army transport Sumner, bound from Panama for New York, ran hard aground on the beach at Barnegat, N. J., during a fog on the night of December 11. Wireless messages conveyed the news of the vessel's plight to New York City and the costguard cutters Mohawk and Seneca and several steamers started to her assistance. All of the passengers, principally army officers, their wives and children, and 190 enlisted men, 232 in all, were taken ashore in lifeboats.

Wireless signals of distress from the Swedish steamer Scandinavic, three times repeated, and the last call very faint, were picked up on January 19 by the British freighter Star Point, her officers reported upon arrival in Boston from Liverpool. As the Scandinavic's calls gave no position, and as the Star Point at the time was battling with a gale, no attempt was made to reach the distressed vessel.

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Besting Typhoons in Oriental Waters

How the Wireless, in a Race against Time, Showed That It Was Faster Than the Wind

By D. M. Taylor

WHEN the Pacific Mail liner Korea steamed away from San Francisco on July 3, 1915, I realized that we would reach the island Empire of Japan, pass Formosa, proceed through the China Sea and voyage up and down the Chinese coast at the height of the typhoon season, the bugbear of both seamen and travelers whose business makes it necessary for them to undertake a cruise to this part of the world during the months of July and August.

For the benefit of the uninitiated it should be said that the typhoons, consisting of strong gales of wind traveling at the rate of from eighty-five to 125 miles an hour, usually originate in the mid-Pacific and speed in a westerly or northwesterly direction. The tornadoes are generally accompanied by heavy rains and mountainous seas. Frequently they start off Guam, the Marianas, or in the vicinity of the Philippine Islands, and take a northwesterly path across the China Sea, spending their fury on and along the China coast.

During the typhoon season the weather reports, signals and storm warnings are watched with keen interest and no little anxiety by those voyaging in the storm zones, much of the peril from the typhoons being done away with by the notices broadcasted by the observatories at Guam, Marianas, Manila, Hong Kong, Siccawei, near Shanghai, and Weihaiwei. These observatories make special observation and gather data on the actions of typhoons.

The observatory at Manila, which is the central office of the Philippine Weather Bureau, was founded in 1865 by the Jesuit Order, trained members of which are enrolled in the Civil Service and still conduct the work. It is a long-established meteorological and astronomical institution, being noted for its activities in connection with typhoons and earthuakes. The Siccawei Observatory, at Shanghai, which is also conducted by the Jesuit Fathers, distributes daily weather reports containing special data on typhoons. The new observatory was built in 1890, supplanting the old one, which was built in 1870.

Our voyage across the Pacific was uneventful. We arrived at Yokohama, Japan, on July 20th, and left the next day for Kobe, which port, after a three-day stay, we left for Nagasaki, arriving there on July 26th. Crossing the Inland Sea of Japan, we touched at Nagasaki and then steamed for Manila. After leaving Japan, we received daily weather reports which are sent out by wireless broadcast to ships at sea. This weather service is rendered free by most of the Government wireless stations throughout the Orient, and is practically the same as that maintained by the United States Government stations.

For several days previous to our arrival in the typhoon waters tornadoes had been reported from various weather observatories. These weather warnings were received on the Korea and reported immediately to Captain Nelson, the commander of the vessel.

Leaving Nagasaki, southbound, at half past four o'clock in the morning on July 26th, our first storm warning was received four hours later. It told of a typhoon moving in a northwesterly direction. We were then steaming in a southwesterly direction on our regular course from Nagasaki to Formosa, which would make us skirt the Formosa coast, pass between the Island of Formosa and Northern Luzon and thence proceed southward to Manila. The following morning I received a long typhoon re-

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port, containing explicit information as to the whereabouts of the storm. Captain Nelson, therefore, immediately ordered our course changed somewhat to the Southeastward and away from the Coast of Formosa.

According to our position and course and the position and direction of the typhoon, we were bound to meet and clash if we continued to steam on our route as planned. Therefore we were only saved passing through the typhoon, accompanied by its probabilities of dangers and accidents, by the timely reception of the wirelessed warning.

The change in our course was approximately 220 miles, which was overcome by steaming behind the typhoon, and cutting across to Northern Luzon, thence southward to Manila. The distance our ship traveled was approximately the same, but we steamed 220 miles away from the Formosan Coast, in which direction the typhoon was directly headed, thereby escaping it, although we were compelled to ride heavy seas, resulting from the cyclonic storm which had just passed. This typhoon, which was one of the severest experienced in many years, swept over Shanghai on July 28 and took a course up the Chinese coast, causing widespread death and havoc.

Mention should be made in conclusion of the excellent accomplishments of the wireless. On the Pacific we averaged 3,000 miles every night and while in the typhoon zone, at the height of adverse atmospheric working conditions, the Korea's daylight communications averaged 400 miles with Shanghai (CFS). The night communications averaged 900 miles with Corregidor (WVN), Manila Bay, the Philippines, and we also worked Hong Kong (VPF), 650 miles away, through heavy static.

Such is the recital of my voyage on the Korea through the typhoon zone. Although it is not filled with exciting incidents it exemplifies at least one fact—that wireless travels not only with the speed of a flash of lightning but is also faster than the wind.

The new illuminating system for the Statute of Liberty was inaugurated recently, President Wilson operating a searchlight signal by wireless.

ACKNOWLEDGED WITH THANKS

The Wireless Age is the best magazine on wireless that I have ever seen. There are one or two others which claim to be an authority on this subject, but they do not compare with yours.

L. A. Kern, *Illinois.*

I renewed my subscription to The Wireless Age, because it is so valuable in quality.

L. Baker, *New York.*

Four months' trial have convinced me that I cannot do without it. (The Wireless Age.)

J. Vanderveer, *Michigan.*

It (The Wireless Age) has in it all and more things that go to make a fine magazine.

C. H. Pickett, *Wisconsin.*

It (The Wireless Age) is the last word in wireless.

P. M. Bungart, *New York.*

Purely from an experimental and scientific standpoint, I enjoy the Age very much. The "Queries Answered" columns afford splendid information.

W. T. Gravely, *Virginia.*

The Wireless Age is a dandy magazine.

Lawrence Fitzpatrick, *California.*

I have tried almost every so-called radio magazine published, but none are as complete as The Wireless Age. No amateur should be without it. This is the view of my friends, and I would just as soon stop radio work as stop taking The Wireless Age

Anthony L. Weber, *Illinois.*

I take great interest in The Wireless Age. I have volumes I and II bound, and consider them a valuable addition to my library.

Adolf Seebe, *Texas.*

The National Amateur Wireless Association is a wonderful organization, doing wonderful things. The Monthly Service Bulletin is full of interesting features.

George E. Beecher, *Massachusetts.*

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A Word From a Rip Van Winkle of Wireless

By CLYDE JAMES APPLEGATE

THE original Rip Van Winkle has nothing on me, although I have only been asleep for eleven years.

Wonders upon wonders, what a revelation to a pioneer in the wireless world!

I dare say that nine out of ten readers of this article cannot date their experience back to the year 1902, when I entered this wonderful field. I continued in it until 1905. I have been asleep since that time, so far as advancements are concerned. You, on the other hand, are all familiar with the present, therefore I will deal with the state of art previous to 1905.

My credentials first. Read the accompanying letter from the Chief Signal Officer of the United States Army, and observe the date.

My attention was first attracted to wireless when working for the Postal Telegraph Company in New York City, by a very small article in one of the dailies; it referred to experiments being carried on in a small office located on the roof of a building on State Street, that city. It simply stated that a man was working with a mysterious electrical wave which he would flash out into space; this same signal could be picked up at a great distance through the aid of a wonderful machine which would be affected by the impulse, wire connections being unnecessary between the two points.

The item passed from my mind, along with other seeming impossibilities which had been printed to interest the public; but later the papers printed a flaring announcement that started the entire world thinking: Marconi had flashed the letter S across the Atlantic Ocean! From this date, wireless was current news; but no companies started handling commercial work which was to put the telegraph companies entirely out of business in the near future, as the newspapers had predicted.

I was interested. As a telegrapher, I did not wish to awaken some morning and find myself out of a position. So to keep pace with the times, I went to the State Street address. I found that another station had been erected on Staten Island, and when weather conditions were good, the distance of possibly three miles could be spanned and messages exchanged between the two offices by repeating the same word three or four times. This made it look hopeful for the commercial companies, for a few years anyway.

The headphones were placed to my ears and a sizzling noise greeted me; it sounded like someone dropping water into hot grease. I could not read a letter, yet Staten Island was sending good Morse, I was told. I shook my head skeptically, saying that it sounded like a ham sizzling; I was not accustomed to the single stroke.

After several visits to this glass house way up on the roof I managed to read the signals; and no wonder, for each word was repeated several times!

One day I heard a noise that did not resemble the familiar spark; this one punctuated the air similar to the way a period looks; I was told that this was the Marconi system, and that he used continental code altogether. I was not familiar with this at that time, so what passed through the air was as Greek to me.

But the wireless ether wave had me in its grasp, and when an officer in the Signal Corps informed me that the Government was experimenting with the new communication method, and that the chances for experience and advancement would be excellent, I enlisted, for it was evident that if Uncle Sam took the mat-

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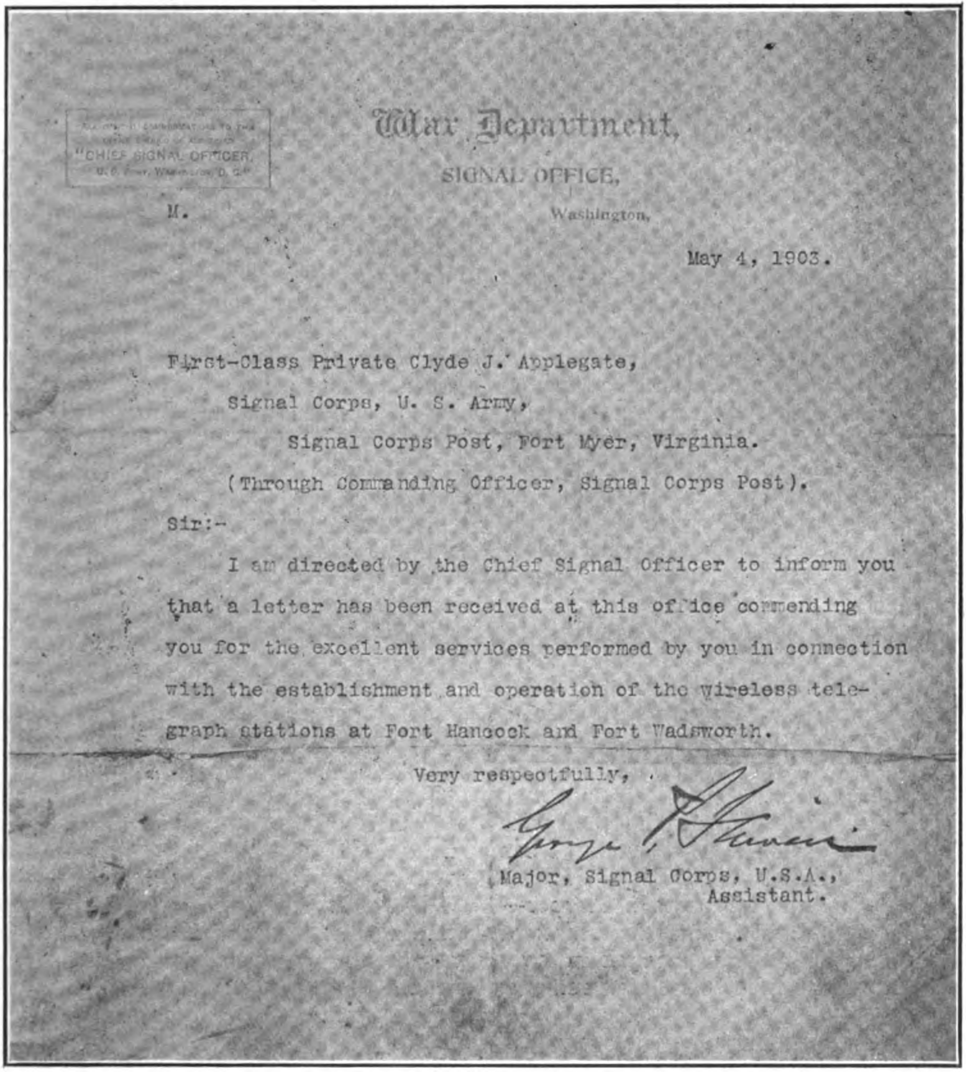
ter up he would not stop this side of success; besides, I would be able to dig into the very heart of those mysterious instruments.

My enlistment took place October 15, 1902; now read the date on that letter again and see if I did any digging! Remember, I said that Staten Island was about three miles distant from State



War Department,

SIGNAL OFFICE,

Washington.

"CHIEF SIGNAL OFFICER,

M.

May 4, 1903.

First-Class Private Clyde J. Applegate,

Signal Corps, U. S. Army,

Signal Corps Post, Fort Myer, Virginia.

(Through Commanding Officer, Signal Corps Post).

Sir:-

I am directed by the Chief Signal Officer to inform you that a letter has been received at this office commending you for the excellent services performed by you in connection with the establishment and operation of the wireless telegraph stations at Fort Hancock and Fort Wadsworth.

Very respectfully,

George P. Scriven

Major, Signal Corps, U.S.A., Assistant.

The letter which the author of this article received, referring to his excellent work as a wireless man

Street; that letter refers to Fort Wadsworth and Fort Hancock, which are twenty-two miles apart. Listen to what instruments this achievement was accomplished with, and you will marvel just as I have, as to how it happened.

A motor-generator of 500-volt capacity, a small oil transformer, four leyden jars, a key with the contact points emersed in oil, and two pieces of brass made into a spark-gap, made up the sending side. A sewing needle drawn by a spring against two pieces of aluminum, two sheets of tinfoil between oil paper two by four inches, an induction coil the size of a sewing machine bobbin, topped off by a pair of head phones—that was the receiver.

The aerial, or "harp," as it was called

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in the early days, was made from two strands of electric light drop cord, separated by short spreaders; it extended from the top of a fifty-foot mast down to the insulator leading into the station. The aerial gave me more trouble than anything else at the Wadsworth test.

L. E. Harper, stationed at Hancock, who, by the way, is still in the Government wireless corps and a master electrician, would call Wadsworth hour after hour; I could not hear a vibration nor could he receive my signals, but both of us could hear a station which had been located at Coney Island, so we used this station as a relay.

Finally, one day I took a pair of strong glasses and went high upon an embankment, back of which the large disappearing guns were located, and looked longingly toward Hancock; as I turned toward my station I discovered that the top of my mast was below where I stood. It gave me an idea; I cannot say what inspired me, but I hooked up the small receiving set described, and ran up a single strand of wire on the flag staff, which was on the high embankment. When the headphones were placed upon my ears I could hear Harper calling!

One mystery was solved, and just by accident too, for we did not think about "in the clear" those days. An additional length of pole was spliced onto the fifty-foot mast, and then—day of all days—communication was established.

A newspaper article stated that two forts were bombarding each other with wireless messages—and we were. I can honestly say that I was the proudest person on earth; and my partner, Harper—well, he just hugged himself. Think of it readers: all of this enthusiasm over a twenty-two mile wireless achievement!

At this time very few steamers had wireless apparatus on them for other than experimental purposes. I well remember the first message I ever read sent for a steamer; she was the Cromo, from New York bound to Havana, and on board were Major Harrison and Miss Alice Roosevelt. The telegram was going to the President from his daughter. Harper and I got it, but the operator at the Coney Island station had lost the pace of the Cromo operator, who seemed nervous and in a hurry to get his business off before he got out too far; in part the missive read: "Going at fifteen knots. Weather beautiful." Another read: "Left my keys on desk, take charge until my return." Right here the real value of wireless presented itself to me.

The United States Government saw in wireless an auxiliary to the cable laid between Port Safety, which is twenty-two miles east of Nome, Alaska, and St. Michaels, which lies 112 miles across a corner of Behring Sea. Each year when the ice would "go out," it would take the cable with it and this would mean months of delay to the telegraph business of Nome, which was becoming a very important point.

So it was decided to give wireless a test across this stretch of unruly telegraph outlet to the outside world. The same location for the station at Port Safety was decided upon, owing to the fact that the engineers thought that a high hill known as Cape Nome, eight miles west of Safety, would interfere with the ether wave in its passage between St. Michaels and Nome. Later, this theory was found to be groundless and the station was moved to Nome. Height of mast was taken into consideration and 212 feet was the altitude decided upon. Three lengths of Oregon pine stepped together gave the desired measurements.

The proposition which presented itself then was, just how these monster sticks could be transported from Seattle to Northland; for there were to be twelve in all, as a double mast was contemplated to overcome the tendency of the aerial wires to wrap themselves around the single pole.

The steamer Tacoma took the contract to tow them, and I recall the captain's remark after his journey: that he had to cut this raft adrift several times during storms, or it would have foundered his vessel.

On account of our success, Harper and I were sent with a detail of five men each to worry out the puzzling question of hurling a signal 112 miles! Remember that this was in 1903.

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I was assigned to Port Safety, and when we six soldiers were landed upon its barren sands the sight was anything but inspiring. It was in September and the masts were partly erected. We could see but one house, the old galvanized cable station which consisted of but two rooms. The six of us with our equipment took possession; we were informed that a house was being unloaded for us. It proved to be a portable one, such as are used at summer resorts!

My heart held misgivings when the engineer, who was erecting the masts, laughingly observed, as he pointed at the pile of sections: "That house will be pleasant. It only gets sixty below up here."

I pictured the man who had ordered this house sent up to Alaska, seated in a deep leather chair enjoying a cigar. He was looking at the photographs of a portable house catalogue, and estimating advantages in quick construction.

Strange to say, though, after this house was lined with building paper throughout, and well banked with sand outside, we were able to keep very comfortable in the coldest weather, so my mental vision of the gentleman in Washington eventually was kindlier.

Our first night in that iron covered cable house was a memorable one. It does not get very cold at this point in September—to those acclimated—but to our little band it was a most miserable experience. We had just about settled for the first night when a dismal howl sounded, quickly followed by others. It was the mournful wail of dogs, and to already sickened hearts it was terrible to hear. One of the boys said that when a dog howled it was a sign that death was in the neighborhood, or would be soon. This being the case, there were enough of these howls to have exterminated hundreds.

After about an hour we could stand it no longer and decided that it was up to us to justify the superstition by action. Several skirmishes were held and daylight revealed nine dogs stiff on the sands. We discovered then that we had to pay the Eskimos in cold cash for them, and this was a very good lesson as to the value of a canine in Alaska.

When the instruments were unpacked, no oil-emersed key could be found. Leyden jars were absent, a spark-gap was also missing. The latter was easy to make, however, and battery jars were substituted for Leyden jars. A telegraph sounder with a long rubber handle made the set complete, adding a file to keep the brass points clean.

This sounds all very simple and easy to the reader, but remember this all took place in Alaska, twenty-two miles from nowhere. Jars, tinfoil, brass and machinery to do the work had to be found. Nome was searched for several days before suitable material was located.

A six-horsepower gasoline engine was belted to a 500-volt generator, the current running through a 20,000-volt transformer, thence into the crude Leyden jars.

The "harp," or aerial, had thirty strands of No. 14 bare copper wire, 180 feet long, swung vertically.

In November navigation closed and the station was ready for the try-out. A certain time each day had been decided upon, when we would call each station. Day after day the chug-chug of the gasoline engine exhaust, which at first caused the natives to dart into their *igloos* in fear, was the only vibration I heard, for weeks and then months. Still no answer came to my calls for St. Michaels.

The first mail which arrived by dog team over the snow trail, informed me that the armature had been burned out at the Michael station; later this was repaired by the men at that point, a feat which cannot be overlooked.

Our tests were made by taking the dog team and going several miles from Safety, the temperature sometimes standing at forty below. A hole would be chiseled through the thick ice and our ground wire dropped into the water, my little home-made receiver (which I will describe later) was used, and an aerial was swung from a short mast fastened to the sled. Tests up to fourteen miles proved successful, but that was as far as we could get until the following summer, when new instruments were sent up to replace the home-made ones.

A beautifully constructed instrument known as a Muirhead responder had

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been sent North with us to try out. This machine registered the dots and dashes upon tape; ink flowed through a small glass syphon which was fastened to a piece of metal that swung backward and forward in a magnetic field. A small wheel turned in a rubber cup which was filled with quicksilver; the wheel revolving caused the de-cohering. The aerial wire was attached to a jack-plug, which fitted into a socket. When ready to receive, the plug was inserted, and when a vibration passed down the aerial it would cause a bell to ring; then a switch would be thrown that would start the tape running. The syphon would make a quick upward movement for a dot. For a dash, the glass tube would dart upwards to the top of the tape, remaining there as long as the wave continued, then drop to its level. This instrument worked perfectly, so perfect was its action in fact, that when the telegraph sounder in an adjoining room would click, the vibration would register on the tape. The slightest electrical disturbance registered, so this machine was a failure in the wireless world, so far as I was concerned.

As I remarked before, my little Wadsworth pet, the sewing machine needle receiver, had been overlooked by the men who packed the instruments. One had to be made. The wire from a buzzer and telegraph sounder magnets furnished the material for the induction coil. Oil paper from a cracker box and tinfoil from the top of beer bottles made a fine condenser. The cover from an aluminum souvenir collapsible drinking cup made the two points against which a needle was sprung. Binding posts were plentiful, so we had a Wadsworth receiver once again.

One evening late in November, as I sat at my table amongst my instruments, after a very hard day's work testing, my head dropped forward and rested upon my arms which were crossed upon a mass of wire, tools and experimental metal. The boys had gone to bed, saying that it was a shame to awaken me. How long I remained asleep I cannot say, but suddenly a shock brought me to my feet. My first thoughts were that the engine had been started and someone had depressed the key. I realized an instant later, though, such was not the case, for all was quiet.

I had received a severe shock, of this I was sure.

I reseated myself, placing my arms as before, and received another jolt that made me flinch. Finally, I discovered that my arms had been between the aerial and ground wires and that static had done the work. Tests made by putting a piece of cardboard between the two wires proved that the impulse was so strong it could drill a hole through the card.

Upon going outdoors a most beautiful sight greeted me. The Northern Lights illuminated the heavens. It seemed that the strips of color were ten feet broad, and so vivid in themselves that it seemed as if I were looking at a painting. The static continued strong for several hours and gradually decreased as the display rapidly disappeared. The record book of the Port Safety station shows data on the wonderful freak, under date of Nov. 15, 1903.

In the consignment of new instruments which arrived the following summer was a helix, in the center of which was a spark-gap and around it the coils of wire upon which the clips for tests were fastened were wound. Many other new improvements were laid before me; they were all pictures.

The aerial was now cut down to about fifty feet and suspended horizontally. A ground made from galvanized iron was buried, and hundreds of feet of chicken netting laid upon the sand.

When the engine was started for the test out, and the key was depressed, high above the crash of the spark-gap came the howls of natives. Looking through the window one could see human figures flying over the level sand. Several Eskimos watching the men at work on the outside had been standing upon the chicken neeting; the bottoms of their skin boots were damp and the current stirred them into wonderful activity—for an Eskimo.

In September, 1904, communication by wireless telegraph was established

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between St. Michaels and Port Safety, Alaska. The achievement was heralded with delight by the Nome business men. The land line which connected Safety with Nome was kept busy. The charges were $7.50 for ten words to Seattle; here the message would be turned over to some commercial company and their additional charge to destination would be added to the Government's toll charge. It was expensive, but that was a minor consideration.

I could relate hundreds of incidents which sorely tried our little band of six soldiers during those long dark days, when we were practically isolated from all white persons; suffice to say, that although fed well and warmly housed, we passed an eight months' nightmare while navigation was closed.

In October, 1904, I left for Caldez, going then to San Francisco on account of an affection of the eyes, which led to my discharge in March, 1905.

At that time I went out of the wireless world altogether.

A few days ago a wireless magazine was read to me. Its contents awed me and the names of up-to-date instruments, the terms and the indications of the developments of the art caused this article to be written. For somehow I feel proud that I was in wireless in its early days, and I like to think at that time I did some little bit toward the beginning of radio, which I feel has only started its wonderful career.

The Camp of The Junior Naval Reserve

By Cadet Francis Scallon

Camp Dewey, illustrated in the accompanying views, was instituted with the purpose of founding a merchant marine school in the vicinity of New London, Conn. Before commencing the camp, it was understood that tents were to be procured from the U. S. Marine Corps and boats for the nautical instruction were promised by the Secretary of the Navy. The latter official was very cordial and seemed to show great interest in the camp; later, however, he was unable to keep his promises as to assistance. The Executive Committee of the Junior Naval Reserve, although discouraged, did not hesitate to procure funds for the necessary equipment. On account of the large expenditure for equipment, tents and arms, the wireless outfit purchased was not all that it should have been.

Receiving wireless messages over the phone at Headquarters, Camp Dewey

When the camp opened, July 15, 1916, cadets who had experienced military training were

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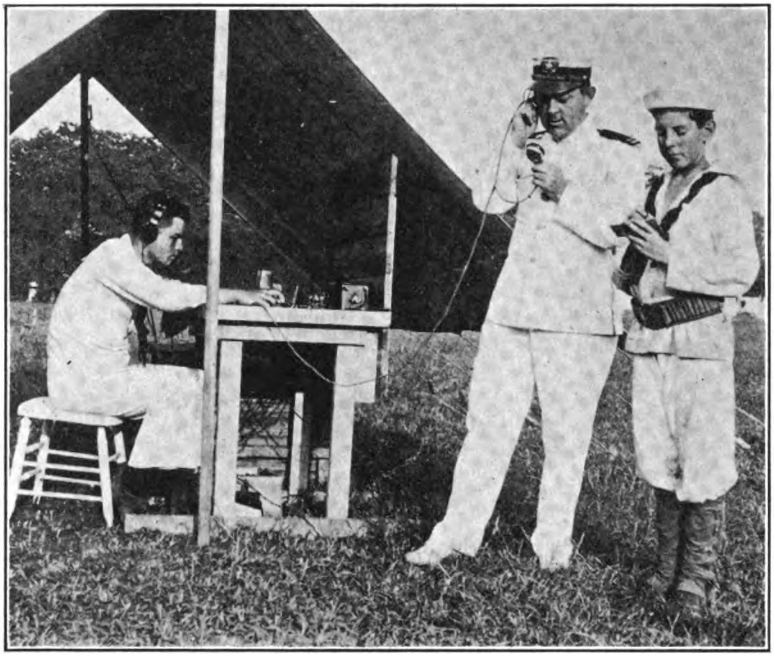

Lieutenant E. N. Cochran, D. R. C., U. S. Navy, telephoning wireless messages to Headquarters, Camp Dewey

designated as acting cadet officers. Owing to the lack of instructors, the courses promised in astronomy, Spanish, history and geography could not be accomplished, so most of the time was employed in laying a good foundation of military instruction.

Three cadets from the office boy staff of the Marconi Wireless Telegraph Company had charge of the wireless situation and with a great deal of labor erected spars for the receiving wires and installed their instruments. These young men also ran the field telephone system around the post of the wireless station. One was installed at the kitchen; one at the Commandant's office and one at the wireless station. All the work at Camp Dewey was done by the poorer cadets, and as a matter of fact was completed by the fatigue work of the boys.

CHIEF SIGNAL OFFICER SCRIVEN RETIRED

Secretary Baker has granted application for retirement of Brigadier General George P. Scriven, chief signal officer of the United States army, to be effective February 14. General Scriven has been in the service since 1874, when he was appointed to the Military Academy from Pennsylvania. He probably will be succeeded by Lieutenant Colonel George O. Squier, acting assistant chief signal officer and now in charge of the aviation service.

Using the SOS In War Stratagem

A despatch from Amsterdam says that German submarines are now sending out S O S wireles signals to lure British vessels to destruction. The Telegraaf declares that it learned from an officer of a large steamer of an important Dutch line that while on a voyage from the Dutch East Indies he received while in the Bay of Biscay an S O S message. The ship immediately rushed to the place indicated, and found a German submarine which was not in distress.

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NEWS OF DEWEY'S DEATH BROADCASTED BY WIRELESS

Admiral George Dewey, the victor of Manila Bay and by priority of grade the ranking naval officer of the world, died at his home in Washington at 5:56 o'clock in the afternoon of January 16th, at the age of 79, after an illness lasting six days.

The President and Secretary Daniels were notified at once, and the news was flashed by wireless to American naval vessels and stations all over the world. The message carried orders that all flags be half-masted.

President Wilson gave out this statement: "The whole nation will mourn the loss of its most distinguished naval officer, a man who has been as faithful, as intelligent, and as successful in the performance of his responsible duties in time of peace as he was gallant and successful in time of war.

"It is such men that give the service distinction, and the nation a just pride in those who serve it."

To pay sufficient tribute to the memory of America's naval hero is a task taxing the resourcefulness of the most talented obituary writer. When we Americans are in a patriotically boastful mood and disposed to claim most for ourselves, we imagine a being supremely capable, competent, resourceful, master of every emergency, quiet, unassuming, before whom difficulties flee in rout, and we call this imaginary character typically American, as one journalist has remarked. Well, George Dewey was that man in real life. He lived to be an octogenarian, and in eight decades he never did anything that was not well and completely done, done quickly, quietly, and consummately; there never was a rough edge work. Whether he dealt with men or things or events, whatever he did was done in the least possible time, with the least possible noise, and without leaving any room for argument about the method or the result.

At twenty-six, taking the crew off the sinking Mississippi at Port Hudson under a hot fire and twenty-five years later in the command of the Asiatic Squadron, with war at hand, with only 60 per cent. of the ammunition with which the Navy Department should have supplied him, with a Secretary of the Navy who was too busy with Cuba to remember that there was anything going on in Asia, he went ahead without orders and made his own arrangements for the conduct of the war on and off that continent. Before Secretary Long had given him any precise information about the probability of war and no orders of any value, he had picked out an unknown spot for a coaling base and had arranged for supplies enough to cover any event.

There were mines in Manila Bay, but useless ones. He did not know whether there were or not, but he went ahead like Farragut, because it was the only thing to do. The Spaniards fired more shots than he did, but they did not shoot as straight. That, too, he could not know in advance. He paraded up and down in front of them and shot them to pieces as if he had been firing at a clay pigeon. "You may fire when you are ready, Gridley," is all that anybody remembers of any speeches he made during the battle. He did not raise his voice; his tone was that in which he would have said, "Give me my hat."

After the battle came the Germans, pro-Spanish, destitute of sea-manners, interfering with his blockade, annoying and provoking him by every means in their power. He set forth his demands to Admiral Von Diederichs, with a clarity and simplicity that seemed intended for the understanding of a six-year-old child. The German disregarded them. Dewey fired a shot across a German bow. Immediately one of Von Diederich's officers, Hintze by name, appeared on the Olympia seeking an explanation. It was what Dewey wanted; he could not use real language to an Admiral in a note, but to a junior and in a dialogue he could. What he said contained the word "war," repeated several times. Hintze went back indignant, reported the conversation faithfully, and Von Diederichs never offended again.

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Commanding Officer Jr. American Guard

Brigadier General George Rathbone Dyer, commanding 1st Brigade, National Guard, N. Y., was placed in command of the Junior American Guard on December 5th. In accepting the presidency of that organization General Dyer announced that he would be very active in promoting the welfare of the movement to create a third line of defense for the nation. Signal Corps units developed along the lines advocated by the National Amateur Wireless Association will receive the full co-operation of the Military Committee and arrangements are now being made to muster in those units which are uniformed and drilling according to army regulations. The General's record of military service appears in the accompanying article

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Brig. Gen. Dyer in Command of Junior American Guard

Commander of First Brigade New York Militia Named as Successor to Late General Zabriskie—The New President's Record and Views

SIGNAL Corps enthusiasts who are drilling or organizing various units for national defense, under the plan advocated by the National Amateur Wireless Association, have signified their intention to vigorously campaign for many more recruits, as a testimonial to their new commanding officer, Brigadier General George R. Dyer.

General Dyer assumed command of the Junior American Guard on December 5th. His first order re-appointed Major William H. Elliott, a vice-president of the N. A. W. A., Adjutant General of the organization. This order added: "I wish to express to the present organization my appreciation of the loyalty and faithfulness to their late Commander, Brigadier General Andrew C. Zabriskie, and to extend my sincerest wishes that the future development will be continued along the same efficient lines. Officers and members are assured hearty co-operation from headquarters, and careful consideration will be given to all communications directed through the proper channels."

That same evening the Junior American Guard's new commanding officer attended a review of St. George's Battalion at the 69th Regiment Armory, New York. Major General Leonard Wood, U. S. Army, the reviewing officer, impressed by the efficiency of this cadet organization, volunteered to address the young men and spoke for fifteen minutes, before a hushed assemblage of seven thousand spectators, telling the members of the battalion that in years to come they would be able to look upon themselves as pioneers in the education of the great American public to the necessity for universal military training. The Commander of the Department of the East expressed full satisfaction with the personnel and spirit of the organization and signified his willingness at all times to assist its expansion.

Commendatory expressions were also given by the various officers of the reviewing staff, among whom was Colonel Lorillard Spencer, Military Secretary to the Governor of the State of New York.

General Dyer's acceptance of the presidency of the Junior American Guard has been heralded as a notable step forward for the nation-wide activities of the organization. Many men prominent in military and civic life are now in communication with the Military Committee of the N. A. W. A., seeking preliminary instruction for the formation of Signal Corps units in nearly every State in the country.

General Dyer has a host of loyal supporters in military circles, having been a prominent figure in militia activities for the greater part of his twenty-eight years of service. His rapid rise to the rank of Brigadier General is looked upon as a record that will not soon be surpassed. In June, 1889, he enlisted as a private in Co. K., 7th Infantry, and within three years became 2nd lieutenant in the 12th, rising then

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successively to the ranks of 1st lieutenant and Captain of Co. G, in less than a year; six years later, shortly after the close of the Spanish-American War, he was commissioned to the rank of Major, and five years ago, on February 28, 1912, became Brigadier-General in command of the First Brigade, N. G. N. Y., which high office he still holds.

"During the recent crisis on the Mexican border," says General Dyer, "it was conclusively proven that the United States has need for a trained citizen soldiery, one that is able to mobilize quickly in emergency and give material support to the regular army establishment. In direct refutation of the criticism leveled at the militia, is the undeniable fact that these men responded promptly to their country's call last Summer, and with their arrival at the border the Mexican attacks ceased. It is obvious that the Guard has its part and place in the economy of the State. It must be maintained with the fullest confidence of the public, and it must continue to be the principal support of the army. All thinking people are striving to bring about universal military training and service, and the Guard will do all in its power to create a condition where the sober, serious minded young man may not be required to bear all the burdens and make all the sacrifices. And in this connection, a worthily patriotic organization such as the Junior American Guard deserves the fullest support of the country at large, for in its cadet companies the spirit of service will be inculcated, and young men brought to a realization of their future obligation as citizens pledged to defend the sanctity of their homes. I intend to be very active in promoting the expansion and welfare of the organization, and see in its rapid growth to date many favorable signs for the creation of a force some day to be reckoned with as a third line of defense for the nation."

General Dyer believes that training in Signal Corps units of the Junior American Guard will be invaluable to those who later contemplate securing militia commissions. In a signed statement, he says:

"During the last thirty years there has been a constantly increasing desire on the part of both officers and enlisted men for opportunity to study the greater questions of military education and instructional training. Steady advancement has been made through field maneuvers, problems in the administration of large camps in connection with the betterment of physical conditions and the promotion of health.

"With few exceptions officers and men of the National Guard have served without remuneration and have derived no pecuniary benefit, except for short periods when on active duty.

"The service of the Guard on the border has been both honorable and efficient.

"The units are gradually being returned home, and all deserve full appreciation for the example they have set to the country at large. These Guardsmen have proved themselves fine, manly men, who at their country's call accepted unhesitatingly the entirely new service conditions imposed by the National Defense Act, a strange and untried piece of legislation

"Before the State troops arrived on the border many lives of both Americans and Mexicans had been taken and much property destroyed, but after the arrival of these troops not a life was lost or a dollar's worth of property destroyed."

Through the Junior American Guard, the General believes, two necessary objects may be attained for the country: Young men trained in early years for the more advanced military instruction to be had later in the National Guard, and the spirit of universal military training and service promoted over the length and breadth of the United States.

The invitation to communicate with N. A. W. A. headquarters is renewed on behalf of General Dyer, and the Military Committee of the Association has announced that it will co-operate fully at all times with those desiring to organize Signal Corps companies.

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From and For those who help themselves

Experimenters' Experiences.

The editor of this department will give preferential attention to contributions containing full constructional details, in addition to drawings.

FIRST PRIZE, TEN DOLLARS

A Transmitter of Compactness at Reasonable Cost

The transmitter described herewith, incorporates at a minimum of expense the unquestionable advantages of an oil immersed condenser, quenched rotary gap, and the neatness and convenience characteristic of a compact assembly. While designed primarily for radio work, it makes a very handy unit for exciting the Tesla coils so popular among amateurs. It may be used for either purpose alternately without extensive changes in the connections. As the design is adaptable to all sizes and powers it is obvious that one set of dimensions throughout would hardly apply to different builders' needs.

The box (Figure 1) is constructed preferably of hard wood and is of sufficient size to accommodate the transformer and oil condenser. Two pieces, ¾ of an inch thick, serve as supports for the transformer and prevent the condenser from shifting.

The spark gap construction is clearly shown in Figure 2. A bicycle sprocket wheel makes an ideal rotating member when fitted with a suitable bushing to the shaft. The hole cut in the main body should leave a ¼-inch clearance from this wheel. Number 8/32 threaded rods form the stationary members, but if more than ¼ k.w. is used it is advisable to tip these with larger sparking surfaces.

These electrodes extend through battery-nuts soldered to brass strips which in turn run down the sides of the gap and by means of spring clips make connection on the bus strips inside the box. A knurled check nut serves to keep each electrode in permanent adjustment. If old motor bearings are not at hand suitable ones are made in the form of a simple flanged bushing. These are fastened to the circular side pieces as shown in Figure 1. When the gap is ready for the final assembling, drill the side pieces for wood screws and fasten one to the main frame permanently; short pieces of fibre tubing or washers slipped on the shaft take up any side play which may develop. The other side is now placed on the shaft, in position against the frame and held temporarily with a clamp. Adjust this side by lightly tapping the edges until the bearings are in alignment and the shaft turns freely without removing the clamp. This side is now screwed to the frame and the gap is complete. A simple sketch of the wooden parts will assist any cabinetmaker or wood-working shop to make these pieces at a slight expense.

The oil condenser is simple yet rugged and does away with the nuisance of creeping oil. A box of sheet tin, with corners soldered oil tight, of suitable size to accommodate the desired condenser is made, allowing ½ inch spacing between the glass plates and the side of the box and about 2 inches from the plates to the rim; this spacing is maintained by wooden spacers as shown in Figure 3. A wooden cover about ¼ of an inch thick, is cut to fit snugly inside, and ⅜ of an

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inch below the rim. Through this cover are passed the conductors which should allow two or three changes of capacity without necessitating the removal of the cover. A ½-inch hole, over which is tacked the screw cap of an old varnish can, serves for the admission or removal of oil. Next in order, a good sealing wax or beeswax and paraffin, equal parts, is poured into the recess at the top after calking with bits of twine any chinks which would permit the wax to run through into the case.

The increased efficiency offered by this type will amply reward the builder. The motor may be belted to the gap, but direct coupling is neater and takes the side thrust from the bearings of both. A short piece of fibre tube with a slot at each end (see Figure 1) will do very nicely; a small pin driven through holes in each shaft fits into the slots and forms a neat and effective drive.

No oscillation transformer is shown owing to the varied opinions of amateurs, but leads for it are brought to suitable bushings as shown. These may be made on a small turning lathe, of maple, and given a coat of clear varnish. Binding posts may be located wherever the builder desires to accommodate the primary of the transformer as well as the motor.

CARL H. BIRON, *Massachusetts.*

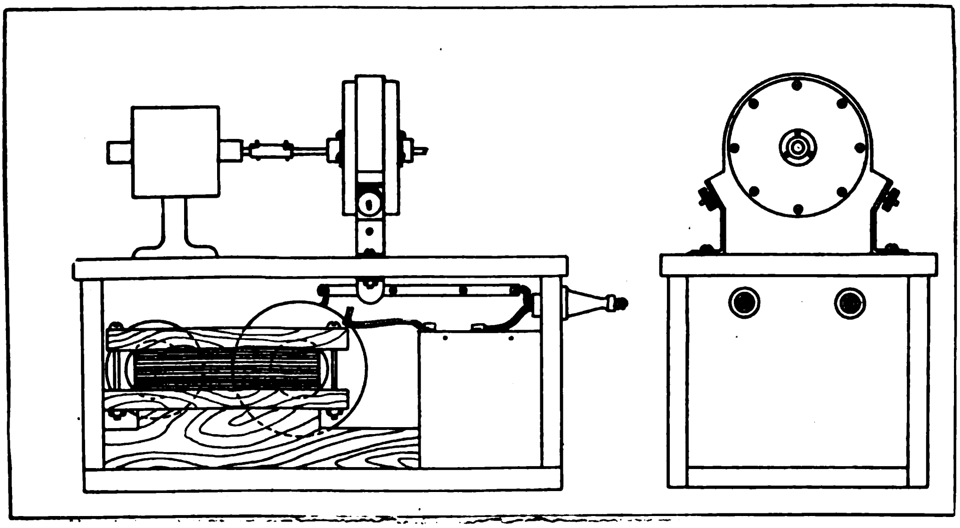

Figure 1, First Prize Article

SECOND PRIZE, FIVE DOLLARS

A Universal Receiving Set for Damped and Undamped Waves

This is a description of a receiving set responsive to both damped and undamped oscillations, having a wide range of wave-lengths. In addition this apparatus is fitted with a one-step vacuum valve amplifier which can be purchased complete or by individual parts.

I wish to make plain at the start that a circuit diagram of connections is not included, because the average reader of THE WIRELESS AGE is already familiar with the circuits of such apparatus. However, a general design for the receiving equipment is given, showing the relative positions of the apparatus and the probable overall dimensions.

For the front of the cabinet, indicated in Figure 1, a piece of hard wood, 36 inches by 8¾ inches by 8¾ inches, is required, which should be drilled for the necessary holes previous to sandpapering and painting. I find the best results are obtained by using No. .00 sandpaper followed by a coating of Johnson's pure black wood dye. If a soft finish is required the operation should end here.

The side pieces are 14 inches by 7¾ inches by ¾ inch and the top and bottom pieces are 36 inches by ½ inch in thickness. I advise the construc-

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tor of this apparatus to assemble it previous to applying the stain to make sure that a snug fit has been obtained.

A description of the lettered parts in Figure 2 follows:

A is a primary loading coil consisting of a tube 16 inches in length, 7 inches in

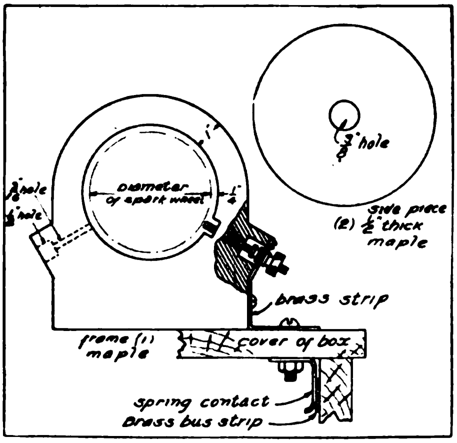

Figure 2, First Prize Article

diameter, wound with 15 inches of No. 26 S. S. C. wire, leaving ½ inch at either end of the winding. After the first 3 inches are wound, taps are taken off every 2 inches until the winding is completed, totaling seven taps. The tube is fastened upright on a piece of wood, 8 inches by 10 inches, by 1 inch, and the front panel of the loader on which is mounted the switch, X, is a piece of wood, 7 inches by 4 inches by 1 inch. More explicitly, switch X is 4 inches in length, the knob 2½ inches in diameter and is made from a round piece of hard wood. The eight switch points are copper nails 2 inches in length, the heads being used for contacts. Two binding posts are mounted on the base for making connections. Coil B is identical with coil A, but is placed in series with the secondary winding.

Detail C is an inductively-coupled receiving transformer of the Murdock type No. 341. This type is not absolutely essential, but I have found it gives marked results with this circuit. The rheostat, D, is for vacuum valve No. 1 and is of the regulation porcelain base type which sells on the amateur market for 60 cents.

The switch, E, is connected to the high potential battery of vacuum valve No. 1. The knob of this switch is 1½ inches in diameter and is constructed of hard rubber. The switch blade is 2 inches in length and is made of a brass strip ⅜ of an inch in width by 1/32 of an inch in thickness. The contacts here are copper nails 2 inches long. Fifteen will be required, because every other one is disconnected from the battery so as not to short-circuit the individual group of cells whenever the switch handle is turned.

The switch, F, is employed to cut in and out the primary loading coil. It is constructed of a strip of the same dimensions as E, but is 2¼ inches in length. The contacts are of copper nails.

G is a variable condenser connected in series with the earth leads. The standard 43-plate type variable is preferred.

H is either a Clapp-Eastham, Arnold or Bunnell rotary condenser of the large type. It is connected across the secondary in the usual manner. While the capacity of this condenser is smaller than that of the small 43-plate type, it is much more rugged and has a greater current between plates.

I is a single pole, single throw switch

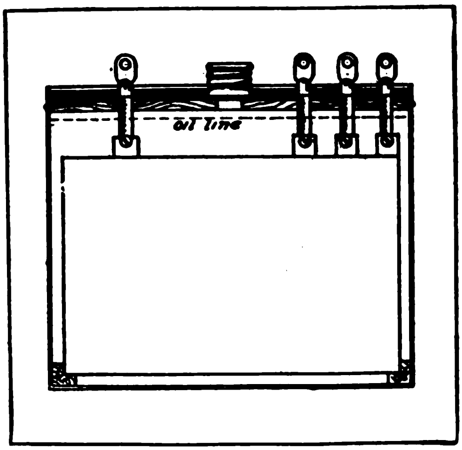

Figure 3, First Prize Article

of the battery type for short-circuiting condenser G when it is not required for the shorter range of wave-lengths.

J is a variable condenser of the same type as G and is connected across the head telephones when the amplifier is not employed.

K is a single pole, single throw switch

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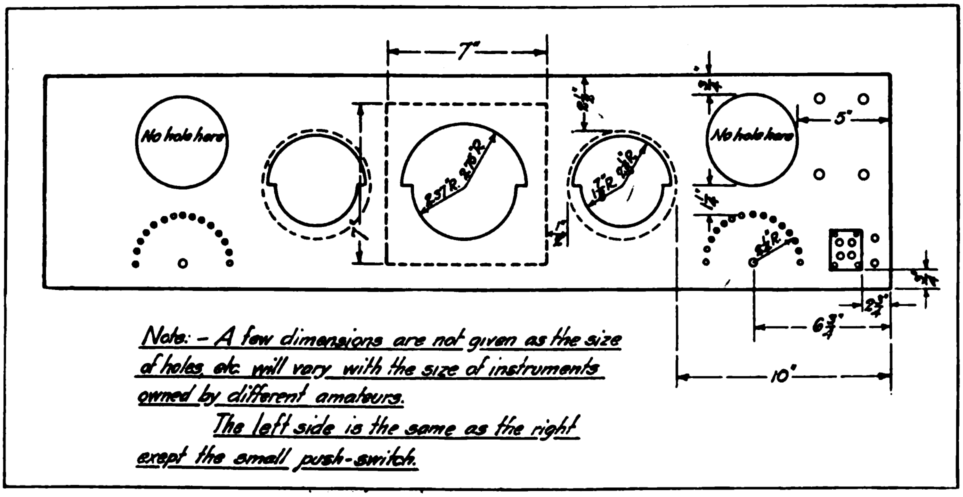

Figure 1, Second Prize Article

of the same type as I, but is used to cut out the impedance coil of the amplifier when the amplifier is not in use.

L is the switch for cutting in and out the loading coil of the secondary and its construction is identical with F.

M is the rheostat for the amplifying vacuum valve.

N controls the high voltage battery in the local circuit and is identical with switch E.

G is the miniature push button switch for turning the current on and off to the vacuum valve bulb. It is of the double type.

The telephone binding posts for the single vacuum valve are indicated at P, while Q is the mounting for the first vacuum valve.

R is the mounting for the second vacuum valve and S, the corresponding telephone post. The terminals for the aerial and ground are indicated at T. The grid condenser is made of two pieces of foil 1½ inches square with a thin sheet of mica as the dielectric.

The impedance coil of the vacuum valve is the primary and secondary of a 1-inch spark coil, which I have found to give good results.

With a set of this type I have performed the following work:

Stations 300 and 400 miles distant, such as 8-AEZ, 8-N-A, 8-YZ, 1-ZL, 1-IL 1-KV, 3-AIN, and stations from Portsmouth, N. H., down to the coast of Florida, are copied. When conditions are favorable, the radio station at Nauen, Germany, has been heard.

STUART SANDREUTER, *Connecticut.*

THIRD PRIZE, THREE DOLLARS

Advantages of an Inductively-Coupled Receiving Tuner

Readers of THE WIRELESS AGE may be interested in a description of an inductively-coupled receiving transformer where the inductance of the primary and secondary circuits is altered on the variometer principle. The advantage of the coupler is the absence of multipoint switches or sliding contacts for variation of the inductance, the elimination of the losses due to dead-ends and the necessity of variable condensers for closeness of adjustment between the contact points of either the primary or secondary windings. The construction of this tuner will not be found difficult and if the details are followed closely, a first-class instrument will result.

A general idea of the construction is given in Figure 1 and an end view in Figure 2. First let it be observed that there are four inductance coils, the primary having two coils sliding within each other as also has the secondary. These are mounted on two ⅜-inch brass tubes which are attached to the end block

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as usual. Coil No. 2 is permanently fastened to the base of the instrument, but coil No. 1 slides within it for variation of the self-induction. Coil No. 4 slides within No. 3 and No. 3 telescopes into the stationary primary winding No. 2. The winding of coil No. 2 is made on a paper or cardboard tube 5 inches in diameter, 5½ inches in length, wound for 4½ inches with No. 22 S. S. C. wire. A space of ½ inch is left at each end of coil No. 2 in order that it may fit in the end pieces of the containing box.

Coil No. 1 slides on two brass rods and has a supporting block on one end which is 1¼ inches in thickness. This block is screwed tightly in place within the cardboard tube after boring the necessary holes for the sliders and the handles. It will be observed from the drawing that this block serves as a support for the coil and the sliders, as well as for a handle. It is made on a tube 5½ inches in length, 4½ inches in diameter and is wound for 5 inches with No. 22 S. S. C. wire. It should be thoroughly taken into account that the coils 1 and 2 are wound in the opposite direction and so connected that when they are completely concentric, the inductance is at its minimum value, but when, for instance, coil 1 is withdrawn, the inductance is at a maximum value.

Coil No. 3 is 4 inches in diameter, and 4¾ inches in length, wound for 3½ inches with No. 24 S. S. C. wire. The supporting block for this coil is 1 inch in thickness and is constructed so that it may be moved in and out of coil No. 2. This winding should begin ¼ of an inch from the open end of the tube and stop 1¼ inches from the closed end so that the supporting block will not interfere with close coupling of the primary and secondary turns.

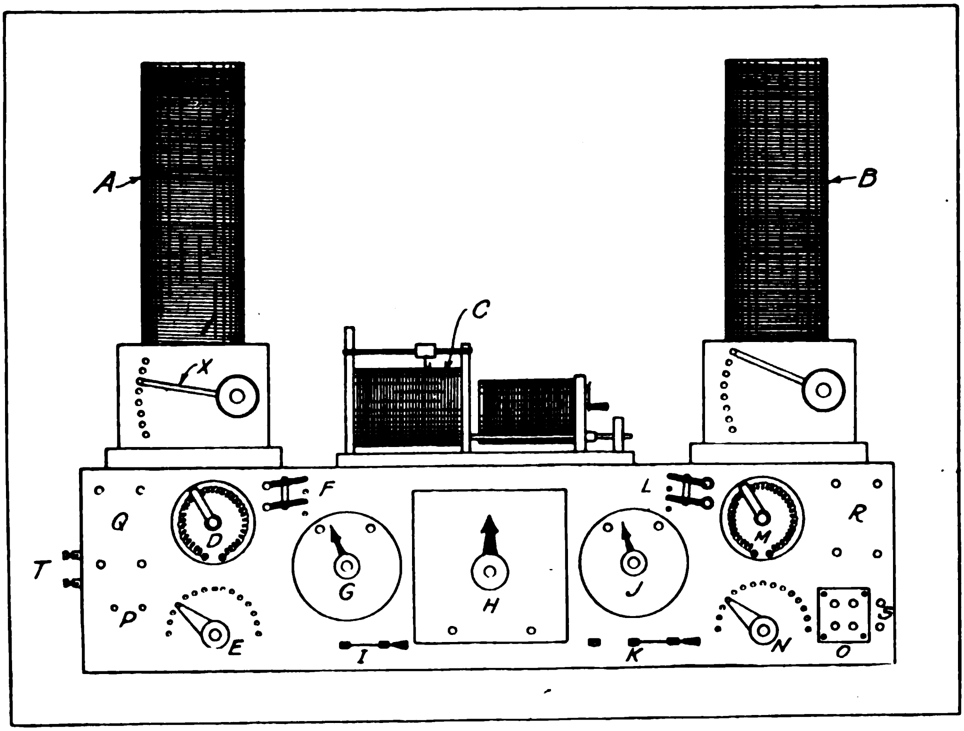

Figure 2, Second Prize Article

Coil No. 4 is 4½ inches in length and 3½ inches in diameter, wound for 4 inches with No. 24 S. S. C. wire. A space of ¼ inch is left at each end. The supporting block for this coil is 1¼ inch in thickness and is placed in the end furthest away from the box. These coils are also wound in opposite directions and

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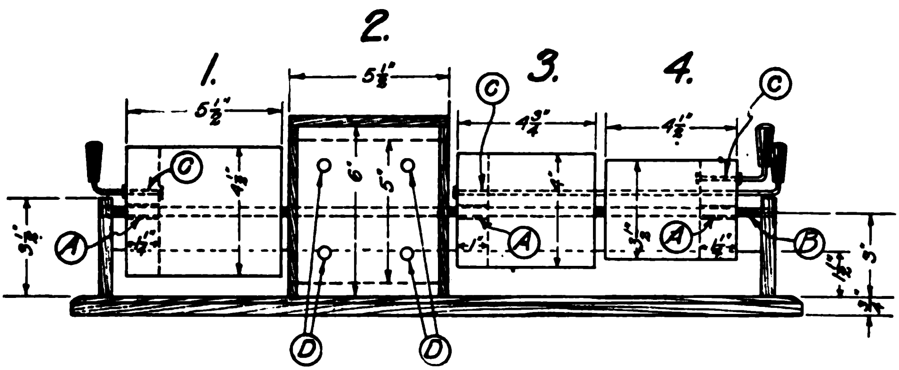
are connected in series. All the wooden supporting blocks should be fitted with brass tube bearings, 3/8 of an inch inside diameter, to facilitate adjustment and prevent swelling of the wood with consequent sticking of the tube.

The handles for changing the relative position of the coils are made from an ordinary 110-volt switch handle which may be purchased from any supply house and will be found to serve the purpose excellently. The handles are mounted on mounted be made of polished hard rubber. The details for the base of this apparatus are included in the drawings, although they may be changed if desired.

The best appearance will be obtained if oak or cherry wood is employed, as it will take a good finish and amply repays the energy expended. The total cost of the instrument I have described should not exceed $5 and the result will be a highly efficient tuner that any operator will be proud of.

F. Schuyler White, *Massachusetts.*



Tubular bearings at (A) on sliders (B) - 3/8 inch brass.
Handle fixtures at (C)
Binding posts at (D).
Coils 1 and 2 = Primary; 3 and 4 = Secondary.

— Effective Windings —

Coil	Distance	Size Wire	Kind
Coil No. 1	5 inches	22	Enamel or Silk Cov'd.
" " 2	4½ "	22	" " " "
" " 3	3½ "	24	" " " "
" " 4	4 "	24	" " " "

Figure 1, Third Prize Article

3/16-inch brass rods of convenient length as at C, Figure 2, and are threaded for nuts at the other end to make secure connection with the supporting blocks. The connections to the coil may either be made of flexible conductor or by means of the brass bands on the two long rods. The box enclosing coil No. 2 should be made of ½-inch stock, but its appearance would be improved if the side upon which the binding posts are

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

Good Advice Regarding the Construction of an Electrolytic Interrupter

Many of the electrolytic interrupters supplied to the amateur market at this date are notably freakish in action and after days of experimenting, the amateur is apt to discard them as a nuisance. I found after a number of trial experi-

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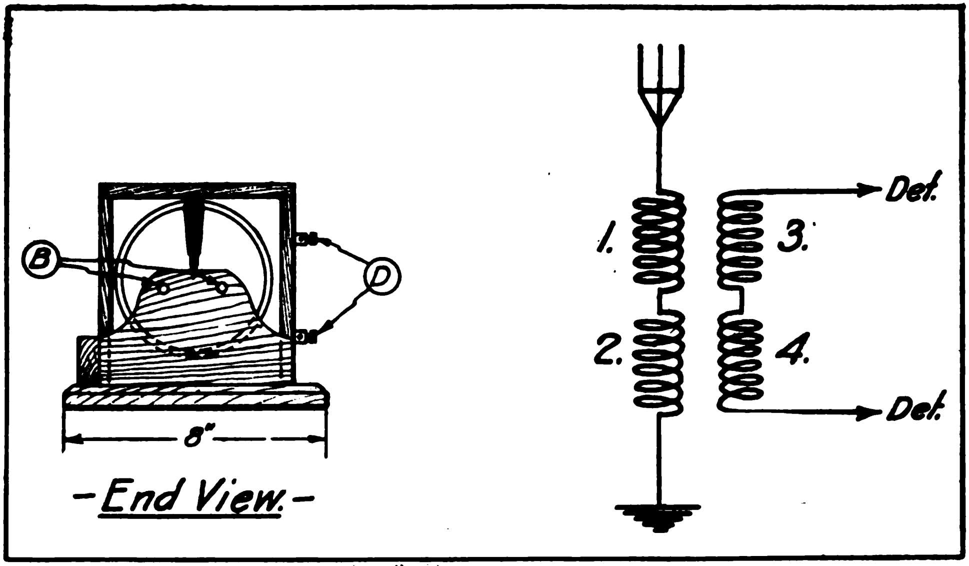

Figure 2, Third Prize Article

ments that a satisfactory interrupter could be constructed along the following lines as shown in Figures 1 and 2. A receptacle for the electrolyte can be made by breaking off the top of several General Electric Company's 100-watt carbon filament lamps. The tops of these bulbs may be broken off by first scratching a circle with a file, the tip having been cut off with a pair of pliers. The top part of the lamp is then heated with an alcohol flame and while still hot, a few drops of water are allowed to trickle on the part to be broken. If the scratch is filed deeply enough, a fairly uniform hole should result.

The sharp edges of the break can be eliminated by heating them over a gas flame until the glass runs. After this process has been gone through, the carbon filament should be detached, leaving both of the platinum wires exposed to the action of the electrolyte.

If the reader wishes to construct a single interrupter to experiment with, the lamp bulb, after having been detached, should be mounted in a regular lamp receptacle and attached to a wooden base with binding posts protruding for connection. A strip of sheet lead, ½ inch in width and about 6 inches in length, is bent in the shape shown in Figure 1 and hung over the top edge. The electrolyte, which is made of one part of sulphuric acid to ten parts of water, should come within ½ inch of the top. One good method for making the preliminary adjustment is to partly fill the bulb with water and add acid to the water until the desired volume of spark is obtained at the spark gap. Care should be taken to connect the positive wire to the platinum electrodes at the base of the bulb. Either of these may be used, depending upon the amount of current required for the operation of the induction coil.

Owing to the fact that quite a bit of heat is given off when this interrupter is in continuous use, the bulb had best be placed in a jar or container, surrounded by water for cooling purposes, but care should be taken that the water level does not exceed the top of the bulb, otherwise the action of the interrupter will be destroyed.

I find that the better arrangement is to construct several water-cooled interrupters and use them alternately so that when one heats up the other is thrown into the circuit. An arrangement of this kind is shown in Figure 2. Here the interrupters are grouped in an oblong tank of water, but they could be grouped on a circular base and lowered into a battery jar as well. Two insulated leads are

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brought from each receptacle and connected to a switch whose contact arm is broad enough to bridge two contact points.

The lead strips are mounted on a paraffine coated piece of wood and connected in parallel. For lower values of power the switch is placed on the first contact, thus using but one bulb, but by moving the switch to bridge the first two contacts, two electrodes are in use. If still greater power is desired, two interrupters may be connected in parallel, but I have found that when a single interrupter with two electrodes ⅛ of an inch in

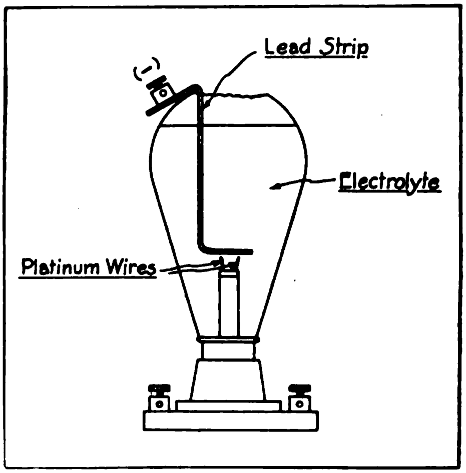

Figure 1, Fourth Prize Article

length is connected in parallel, the current consumption of a small coil is 6 amperes at 110 volts.

The second interrupter shown in Figure 2 is an auxiliary and the third one has its platinum wires shortened to give a spark note of a different pitch.

The tone of the spark increases as the amount of the platinum exposed to the electrolyte diminishes and the note also depends, to a certain extent, on the concentration of the electrolyte. The adjustable resistance indicated in the drawing aids considerably in obtaining a pleasing spark note.

It is a well-known fact that two electrolytic interrupters connected in series practically double the spark length of a given coil. If this experiment is tried the two solutions should, of course, be of the same concentration and the same size electrodes should be employed.

When the apparatus is arranged, as in Figure 2, the operator can, while sending, vary the tone of the spark, change the amount of power, or change from one interrupter to another without interruption of transmission. This interrupter can also be employed for use in connection with alternating current, but the results obtained are inferior to those possible with a direct current source of supply.

A. F. Murray, *Massachusetts.*

HONORARY MENTION

The Work of the Amateurs in the West

Judging from the scarcity of articles on the subject, the wireless situation in the Pacific Northwest is a rather hazy affair to your readers in the East and Middle West. Therefore I trust that a few words on this subject will not be out of place.

I have had a wireless station in Seattle for the last three years and it was certainly a revelation to me to find the interest displayed by amateurs throughout this section. I have owned and operated several amateur stations for the last seven years, three of which were spent in the state of New Jersey, but I have never noticed such a remarkable growth of amateur stations in so short a period as in this district.

During the winter of 1913 I spent six evenings a week at my apparatus continuously for a period of three months and my log book shows an average of three new stations opening per week. Of course, many of these were of the kind that work a few nights signing any call letter which came easy, but it showed a desire on the part of many to break in with the "7" fellows. At present however, we seldom hear an amateur sign anything but an occasional "7-?" which shows the willingness to obtain a license and obey the law.

As to the commercial end of the game, we are also pretty well advanced. Eighteen miles from Seattle is the Bremerton Navy Yard station with a 5-kw. set. The call letters are NPC. Then at the head of the Straight of Juan de Fuga is the government station, located on Tatoosh Island (call letters NPD), approximately

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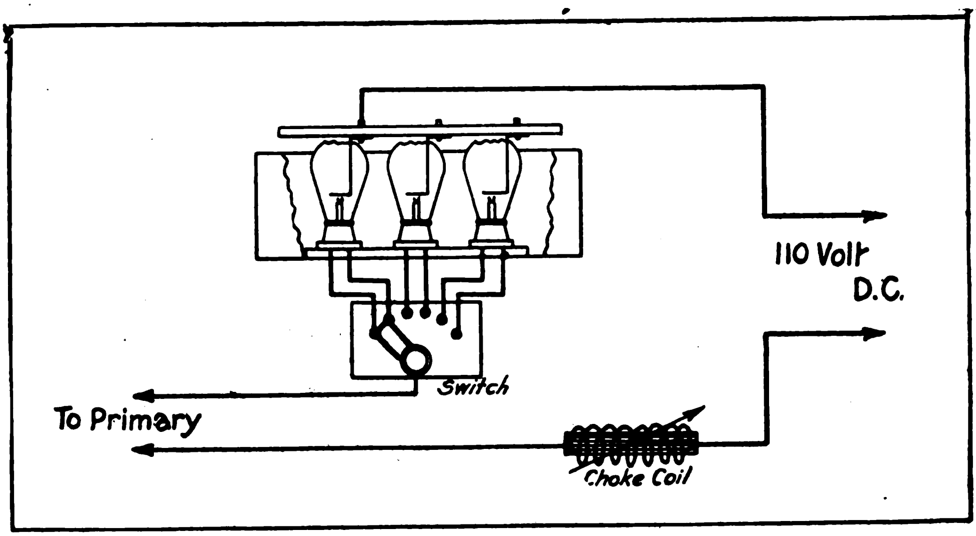

Figure 2, Fourth Prize Article

110 miles distant. There is another station located at North Head at practically the same distance, its call letters being NPE.

We also have the Marconi station in the forty-two story L. C. Smith Building at Seattle, which is fitted with a 1-k. w. and a 5-k. w. set, while Astoria, Ore., has a high-power Marconi station located practically 300 miles southwest of this point.

Seattle also has two factories manufacturing wireless telegraph apparatus and the Y. M. C. A. conducts a school with complete Marconi equipment.

The radio inspector for the Seventh District has his headquarters in Seattle and there are numerous steamships equipped with radio, sailing and docking every day. The conditions for employment are also very good and none of the graduates of the Marconi school have had trouble in obtaining positions.

As for distance work, there are several amateurs in this vicinity who think nothing of picking up the radio stations more than 2,000 miles away, while the reception of signals from San Francisco is a regular occurrence.

One station here has repeatedly copied OUI (Hanover, Germany), Colon, Panama and other far distant stations.

With all these facts before us, it will readily be seen that the western part of the United States is quite as up-to-date as the eastern part.

HOWARD S. PYLE, *Washington.*

UNSOLICITED BUT WELCOME

I have found the MONTHLY SERVICE BULLETIN (of the National Amateur Wireless Association), of great value in locating new stations.

Many weeks ago my N. A. W. A. equipment arrived. I had hoped to write you sooner about it, but I can truthfully borrow this remark: "I started in reading immediately and have been reading more or less ever since." Indeed, I am not only very much pleased with, but also very proud of the equipment to say nothing of being a charter member of the N. A. W. A.

IAN CAMPBELL, *Oregon.*

The N. A. W. A. is just the thing.

VERGIL SULLIVAN, *Illinois.*

The organization (The National Amateur Wireless Associatiton) is splendid and every amateur should be a member.

FRED. SWAIN, *Nebraska.*

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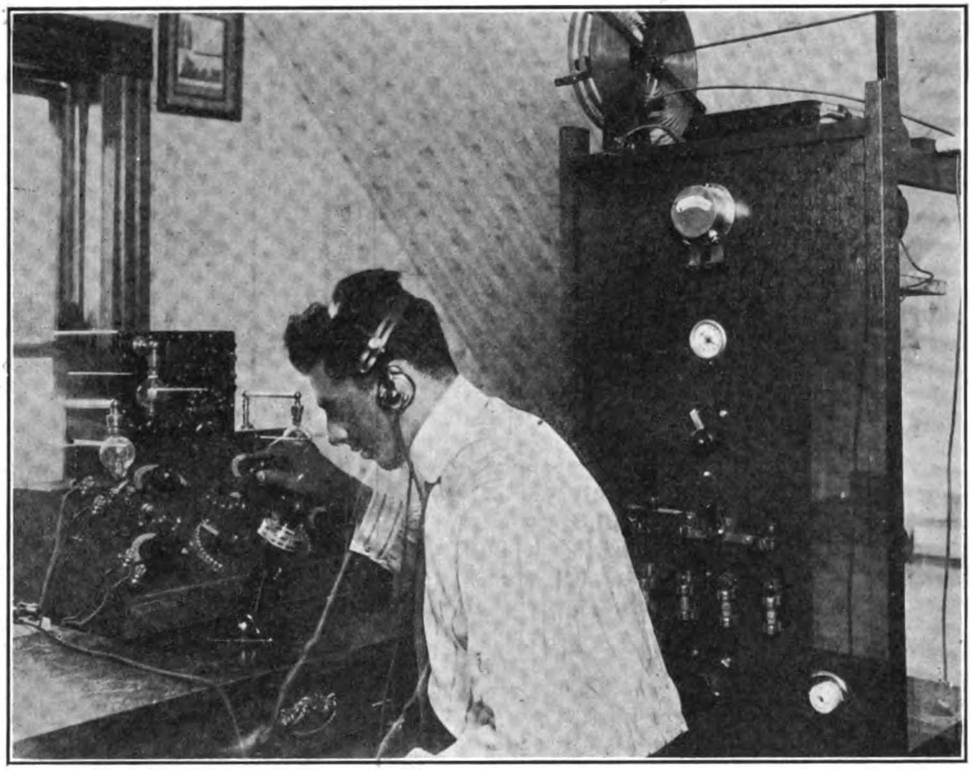
With the Amateurs



Clarence D. Tuska, of Hartford, Conn., who is interested in wireless telephony. By making his victrola a part of his transmitter circuit he has been giving wireless concerts for the benefit of amateurs in and about Hartford. This photograph shows Mr. Tuska at his telephone

The Baltimore Radio Association has been formed, its membership being limited to those sixteen years old or more who hold a first-class amateur operator's license. Meetings are held every other Saturday night at the rooms of the Southern Wireless Institute, 22 St. Paul Street. The officers are: President, D. L. Primrose; vice-president, E. B. Duvall; secretary, C. E. King; treasurer, R. M. Hart; board of governors, N. B. Falconer, William Bernhard, J. Holloway and C. R. Lamdin. A Relay Committee is developing trunk lines with the West, North and South.

The meetings are devoted to discussions and lectures. At a recent meeting, O. H. Curtis, senior operator on the steamship Kershaw, lectured on the reception and recording of wireless waves through a mineral detector by means of the "Ionic Relay," an invention of his own. This instrument was demonstrated as a call bell and also reported time and weather from NAA on a recorder. The Association has been granted a charter by the National Amateur Wireless Association.

A debate was conducted by the San Francisco Radio Club at its club room,

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350 Frederick Street, on the evening of November 25. The subject of the debate was: "Resolved, The Audion Is Superior To The Crystal Detector."

D. B. McGown was the chairman of the affirmative side, with E. W. Radford, and H. R. Lee as speakers. P. R. Fenner upheld the negative side with S. S. Foster and H. C. Brown as speakers.

Excellent arguments were presented by the negative side but the decision was awarded to the affirmative side by the judges, Sergeant T. J. Ryan, W. M. Griffith and E. G. Mahn.

A paper on Motor Fields was read by C. P. Altland of the Pacific Gas and Electric Company. The club room was filled to capacity, almost 100 radio enthusiasts being present.

The radio exhibit at the Kansas Electrical Show at Wichita on December 6, 7 and 8, attracted considerable attention. The exhibit was in charge of The Cosradio Company of Wichita. A complete sending and receiving station was in operation, the receiving set being arranged for both damped and undamped waves. Messages were received and read to patrons of the Electrical Show.

A wireless club made up of students of the Phillips Academy, Andover, Mass., has been formed. The Club has installed a 1-k.w. transmitting set and a vacuum valve receiving set is under construction.

The Radio Association of Western New York has elected these officers: President, John G. Rieger; secretary, Edgar C. Steel; board of supervisors, Herbert I. Goodale, John Haderer and Norman Badina. The Club name has been changed from Radio Association of Buffalo to Radio Association of Western New York, owning to the large out-of-town membership. A review of the year's work was given by the retiring president, Albert J. Carver, who predicted a still more prosperous new year. The Club expects in a short time to have apparatus and rooms of its own.

The Radio Club of Tacoma has been formed with the following officers: President, Howard Reikhardt; vice-president, Dwight Mason; secretary, Edwin Moe; treasurer, Alvin Stenso.

Business meetings are held every Thursday evening at eight o'clock. The Club would like to hear from amateurs and any relay message will be handled. Address all communications to the secretary, Edwin Moe, 4118 No. 16th Street,, Tacoma, Wash.

The Fowler Radio Club of Cleveland, O., recently elected the following officers:

President, John Sokutis; vice-president, Edward Werner; chief advisor, Charles H. Bell; secretary and treasurer, Frederick R. Franklin; chief operator, Carl F. Paul.

The Club is carrying on a campaign to obtain more members. There are 420 wireless amateurs in Cleveland, but only a part of these are licensed. An attempt is being made to get in touch with these amateurs.

A meeting of the Union County Radio Association was held recently at the home of Warren J. Mayer, 157 Elm Street, Elizabeth, N. J. The election of officers for 1917 resulted as follows: President, Frank Broome; vice-president, Carl Mueller; secretary, Elson Timbrook; recording secretary, Warren J. Mayer; treasurer, Earl Adams; press agent, Willis Allin; chief operator, Robert Horning; assistant operator, in Elizabeth, Warren Mayer; assistant operator, in Roselle, Harry Sutton. The next meeting was scheduled to be held at the home of Harry Sutton, in Roselle Park.

A radio club formed in Newark, N. J., under the leadership of Milton Dryfus, is known as the Essex Radio Club. New members are wanted, it has been announced. Prospective members should communicate with the corresponding secretary, G. Taub, 482 Twelfth Avenue, Newark, N. J.

At a meeting of the wireless club of Bayonne, N. J., the election of officers was held. Louis Macchi was elected president; George Oliver, vice-president; Ernest Ruhlmann, secretary-treasurer, and Paul Gallien, press agent.

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At a meeting of the St. Paul's Amateur Radio Association of Rochester, N. Y., it was decided to send out the weather report every night at half past ten o'clock. The report will be received from Arlington, Va., and sent out for the benefit of amateurs unable to receive from stations as far away as Arlington. Only the high-power stations of the Club will send out the report. They are: 8-RL, 8-AQK, 8-VUBF.

Plans are being made to relay a message from Rochester to Scranton, Pa.

The new officers of the Club are: President, F. Alexander; vice-president and treasurer, R. VanDeCarr; secretary, A. Frankel; chief operator, William Kane. The chairmen of committees are: Membership, C. Oliver; purchasing, G. Whitley; finances, C. Swanton; publicity, E. L. Alexander. Communications should be addressed to A. Frankel, No. 289 Barrington Street.

A wireless club has been formed at the University of Kentucky. The officers are: President, Horace Miller Clay of Louisville; secretary, Thompson Guthrie of Mt. Sterling; treasurer, John Campbell.

Apparatus for the wireless station will be furnished by the College of Mechanical and Electrical Engineering. Students in the College of Mechanical and Electrical Engineering will become members of the Club.

The Rockaway and Queens (L. I.) Wireles Association has organized with fifteen members. The officers are: President, H. Conway; vice-president, Seth Kelley; secretary, William Fisk; treasurer, A. Gay.

The Hoosier-Scout Radio Club, Indianapolis, Ind., has been reorganized, incorporating into the old Hoosier Radio Club the Scout Radio Club.

The club meets every Saturday night in the Chamber of Commerce building. The officers are: President, Noble C. Hilgenberg; vice-president, Fred Finehout; secretary, Carl Dean, and treasurer, James M. Sommer.

The following is a list of the members of the Club: Verne K. Reeder, Laurence Neidlinger, Marcel Pittes, Edward Talbot, Clinton Hanna, Fred Finehout, Hans F. Geiger, Leo J. Munchof, Wert O'Donnell, Fred Meyer, Meada Cringle, Preston Sargent, Earl Swain, Paul Huston, James M. Sommer, Frank M. Malott, Russell Tilton, Theodore Carnes, Alban Adams, Harold Barton, Harold E. Day, Edward Churchman, C. W. Dean, J. B. Baker, F. F. Hamilton, R. H. Vehling, Raymond Forbes, Myron Newlin, Albert Copenhaver, Ralph Johnson, M. Pettit, N. Hilgenberg, John Taylor, W. Brown, M. Belzer, James F. Sargent, Hilton Crouch, Melville F. Strebe, Samuel Dinnen, Clifford Burwine, Walter Honecker, Evans E. Plummer, William J. Koethe and Eugene Clark.

The Marlboro (Mass.) Radio Club has established permanent quarters in Manning Street. The Club has installed a set in its new home.

Waterbury, N. Y., has a wireless club. The meetings are held every Friday evening at eight o'clock in the Boys' club. E. F. Glavin is the honorary president of the organization; Robert W. Culbert, chairman, and Clinton A. Finch, secretary and treasurer. King Sam, a Chinese operator, is in charge of the press work.

The Club has a modern amateur set consisting of the following: 1-k.w. Thordarson rotary gap, oscillation transformer, condenser, hot-wire ammeter, wave-meter and heavy key. The receiving set is made up of perikon and galena detectors, large coupler, two variables load, and necessary switches; a vacuum valve detector is used in conjunction with a larger coupler for long distance work. The Club call is 1-ABF.

The wireless enthusiasts of Martinsburg, W. Va., met recently and formed what in the future will be known as the Eastern Panhandle Radio Association of West Virginia. The work of the Association will be the advancement of wireless telegraphy. There are now four stations in this city and three in course of construction, with a few more to be added after the holidays.

The two largest stations are owned by W. W. Trout, and H. E. Burns, who holds a government license.

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The station installed by Dr. L. K. Rossa and C. A. Allen has a sending radius of twenty miles or more with a receiving range of 300 to 1,500 miles.

The following officers were elected:

President, H. E. Burns, call 8-AGH; vice-president, Roy Frankenberry; treasurer, Hunter Matthews; secretary, Dr. L. K. Rossa.

The Radio Club of New Britain, Conn., which was organized two years ago, holds its meetings regularly at the New Britain, Conn., Y. M. C. A., every Tuesday evening. The Club has a 1-kw. set for sending purposes. For receiving it has a 4,000-meter loose coupler and two vacuum valves which are operated by storage batteries. It also has six pairs of 2,000 ohm phones. The Club has no official call, but has adopted the letters MO.

Walter J. Doyle, vice-president of the Radio Club of New Britain, Conn.

A recent radio display in New Britain held to further the interest in the work of the Club included a replica of Marconi's first set, which sent the first message across the Atlantic; old and modern receivers, transformers, coils, detectors, sending keys and many other parts of apparatus constituting a modern wireless set. Most of the members of the Club are members of various wireless associations and nearly all hold government licenses. The officers of the Club follow: President, Francis A. Mulvihill; vice-president, Walter J. Doyle; secretary and treasurer, George E. McCarthy.

The Club would be pleased to hear from radio organizations and will arrange for tests with them if desirable. Information concerning the Club can be obtained by writing to the vice-president, Walter J. Doyle, 29 Washington Street, New Britain, Conn., or George E. McCarthy, secretary, Belden Street, New Britain, Conn.

At the first meeting of the Y. M. C. A. Boys' Department Club of Lynn, Mass., seventeen charter members were present. The meeting was in charge of Leland L. Stacy, who was assisted by William Bailey of Lowell Textile school.

The following were chosen as officers: President, Clayton Thompson; vice-president, Paul Bauer; secretary, Leonard Folsom; assistant secretary, Harold Hunter; treasurer, Leland Stacy.

It was decided to hold regular classes in mastering the continental code. The dues were also decided upon. The meetings will be held every Tuesday evening at fifteen minutes to eight o'clock.

The following are enrolled as charter members: Albert Allen, Arnold Bailey, William Bailey, Paul Bauer, Vernon Chase, Leo Comtois, Horace Cormack, Harold Fall, Leonard Folsom, Irving Harlow, Harold Hunter, Harold Johnson, Owen Kasparlan, Frank Lindley, Kenneth Miller, Donald Moss, Willis Quimby and Clayton Thompson.

Presidential election bulletins by wireless attracted considerable attention in Bellevue, Pa., on Election Day.

Walter Protzman of 426 Forest Avenue, Bellevue, and Robert Devinney, of 1224 Boyle Street, North Side, members of the Aero Club of Bellevue, installed wireless apparatus on top of the old Episcopal church, at Rogers and Lincoln Avenues and received election bulletins from a New York newspaper and other news sources. The bulletins were shown to a crowd outside the church. The boys were assisted by one of the wireless operators of the U. S. S. Tennessee, who was home on leave of absence.

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The World's News Distributed by Wireless

How the Events of the Day Are Flashed to Ocean Travelers by the Marconi Company

ALL ocean travellers know this morning that Greece has accepted the ultimatum of the Allies demanding the surrender of arms and ammunition, that Mr. Lloyd George is improving, that Francisco Villa promises to cease depredations on American property, and that snow covers New York, said the New York Herald of December 15. In short, they know briefly of the same world events that the reader of this morning's Herald has gleaned.

Last night the New York Herald service was flashed to all ships at sea by the Marconi Wireless Telegraph Company under a new arrangement. So, whether the traveller is sunning himself on board the Maracaibo, which left Puerto Rico yesterday and is this morning wending her way through tropical seas, or on board the Oscar II., which is just about nosing into the ice fields hundreds of miles off the Banks, he is just as much informed on world events as the Long Island communter or the bank clerk who travels downtown in the subway.

This news will be literally scattered "to the four winds" from the high powe1 Marconi station at South Wellfleet, Mass. It was picked up last night by all vessels equipped with Marconi wireless. Last night's news was published this morning in the Marconi bulletins on board the passenger steamships and the service will hereafter be published daily.

Although necessarily in an abbreviated form the news sent out covers a wide variety of interesting topics. To travellers about the world world topics would seem to be the most interesting, but the steamship passengers will also be informed of a fire in Broadway if the interest justifies it.

The first news sent last night was of the weather—always interesting to any traveller. Other items were:

London.—Greece accepted Allies' ultimatum demanding surrender arms, control telegraph and postal systems by allied officials and the guarantee of Grecian neutrality. This acceptance followed a meeting of the Cabinet and Crown Council, King Constantine presiding.

Premier Lloyd George is improving. His physician said his condition indicated he would be able to speak in the House of Commons on Tuesday.

Count Tarnow Tarnowski, Austro-Hungarian Ambassador designated to Washington, has been granted a safe conduct by the Allies at the request of the United States government.

Berlin.—Teutonic forces in Roumania captured Buzen, seventy miles northeast of Bucharest, the last important railroad junction held by the Roumanians in Wallachia.

Washington.—President Wilson and Secretary of State Lansing conferred on course to be followed in reference to peace proposals by Germany. Officials expect President to seek opportunity at early date to participate in peace negotiations.

New York City.—First real snowstorm of the season. Almost foot of snow; trolley lines blocked and steamships delayed.

Halifax.—Torpedo boat Grilse, reported lost, has arrived at Shelburn, N. S. All officers and crew safe except six lost in storm.

Chicago.—Wheat dropped nine cents when news was received that Germany was willing to consider proposals to limit armament.

Then followed long quotations of the closing prices in Wall street.

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This and other news was on board the steamships last night by midnight, and many of the Marconi men flashed back "Thanks." The wireless apparatus seemed to be a sort of electric newsboy 'way out in the Atlantic, between four hundred and seven hundred miles east of Sandy Hook, where there was a "flock" of steamships around the time the news was flashed.

The New York, of the American Line, due Sunday morning and about 500 miles east of the Hook, got the word, as did the Cameronia, of the Anchor line, 200 miles behind the New York. The passengers on board the Noordam, of the Holland-America line, are reading it this morning, about 400 miles east of Sandy Hook, as are those on board the Adriatic, 500 miles away. The Caracas, of the Red D line, 145 miles north of Curacao, got the word, and the passengers on the Morro Castle, of the Ward line, off the Florida coast, know that there is snow waiting for them in New York city. Even the Californian, a freighter, 730 miles southeast of Cape Henry, bound from Rio Janiero to New York, got the word and was grateful.

The news sent out by the South Wellfleet station may also be sent out on a lower wave-length, reaching many of the coastwise vessels, such as those of the Old Dominion, Savannah and Morgan lines.

A similar service was established on January 17 to distribute news to ships on the Pacific. The dispatches are transmitted from the Herald office by land line to the Marconi station at Hillcrest, San Francisco. Along the trade routes to Honolulu, down the steamship lanes to Australia, along the watery highways that skirt the Pacific coast, on board mail packet and coaster, to Coast Guard cutter and cruiser, to bulky freighter and graceful yacht, the news goes flashing in the early hours, through the agency of the Marconi station. Relayed by those who picked it up to others less fortunate, the service is scattered along the Pacific, in ever widening circles, until its echoes reach across the ocean depths.

Some of the big vessels that received the news on the day the service was opened were the Great Northern, of the Great Northern Pacific line, which left Honolulu January 15; the Northern Pacific of the same line; the Hawaii Maru, of the Osaka Shosen Kaisha, from Hong Kong, Kobe and Yokohama, bound for Victoria, B. C.; the Venezuela, of the Pacific Mail line, which steamed from San Francisco for Honolulu, Yokohama and Hong Kong, and the great fleet of coastwise steamships plying on the California, Oregon, Washington and Alaska coast and to Puget Sound ports.

In addition the long chain of United States army wireless stations along the Alaskan coasts picked up the news and flashed it from one to the other, so that army officers in their lonely posts at snowbound stations read the news of Admiral Dewey's death at the same time as did naval officers on board cruisers on Pacific stations.

Members of the New Haven, Conn., Radio Club have erected a two-strand aerial, 450 feet long reaching from the Hotel Taft to the Y. M. C. A. building. Six members of the Club have successfully applied for licenses as wireless operators and there is a total membership of twenty-five.

The wireless station at St. Elizabeth's Convent, Convent Station, in northern New Jersey, has a radius of 3,000 miles. The plant was presented to the college by friends as a memorial to Sister Mary Frederica McElligott, a teacher for twenty-four years at St. Bridget's Parochial School, Newark. The station was installed under the supervision of Professor Perley Hyde, of the department of physics of Newark Academy, and the funds for the memorial were raised through the efforts of Chief of Police Michael T. Long, of Newark, and others.

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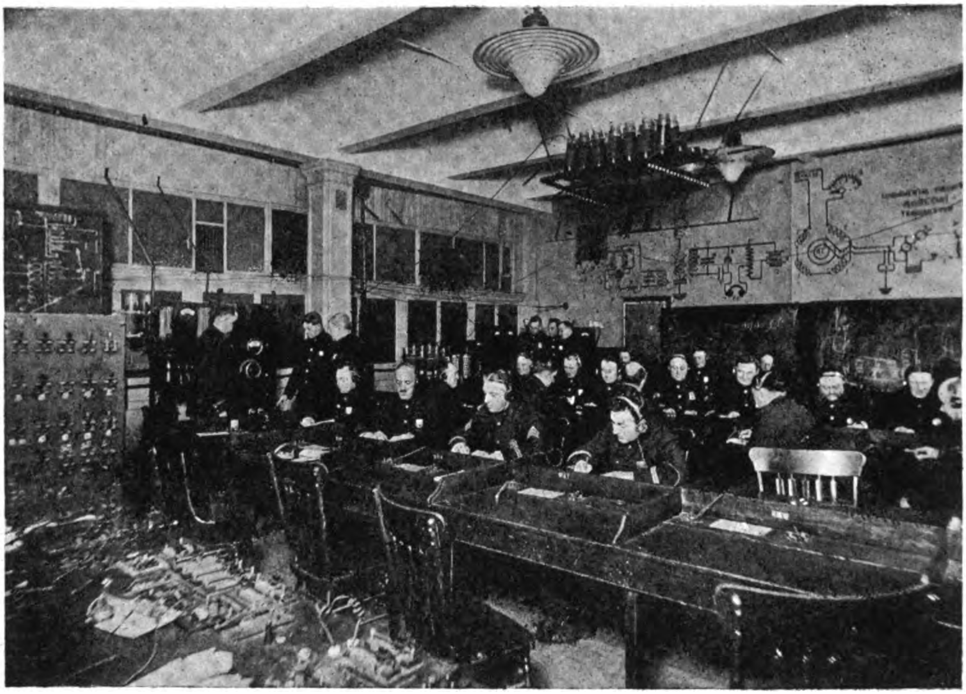

The wireless class of the New York Police Department

Police Test of Wireless

Flashing a Message from Headquarters, New York, to the Various Precincts

TESTS of wireless telegraphy as a practical means of communication for use in the New York City Police Department were made on December 11, 12 and 14. The results of the demonstration showed that excellent speed was made in obtaining answers to the test message sent from Police Headquarters, notwithstanding the fact that in many instances the station houses were a considerable distance from the wireless equipments in the precincts. Members of the class in wireless instruction in the Police Department, which is in charge of Sergeant Charles E. Pearce, served as operators at the different stations employed in the demonstration.

The test message was transmitted from the station on the Police Headquarters building to the commanders of the various precincts in Manhattan, Brooklyn, the Bronx, Richmond and Queens. The communication follows:

Deliver to bearer forthwith for transmission by wireless to Police Headquarters, Manhattan, the names and shield numbers of six patrolmen now on patrol in your precinct.

Commanding Officer.

This message was flashed to the amateur and commercial stations which had been designated for use in the test. Here it was copied and placed in the hands of policemen who conveyed it to

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the commander of the precinct to which it was addressed. The replies to this communication were rushed to the different wireless stations and wirelessed back to Police Headquarters. A gratifying result of the test was found in the lack of inaccuracy in sending and receiving.

Marconi apparatus played an important part in the trial. The Marconi School of Instruction forwarded the first message from Headquarters and also acted as relay.

Besides the installation at Police Headquarters the following stations were employed:

		Call Letters
	MANHATTAN	
Marconi School,	Elm and Duane Street	2-XR
Wanamaker Store,	Broadway and Ninth Street	WHI
Y. M. C. A.,	153 East Eighty-sixth Street	2-YM
W. H. Reuman,	480 Ninth Avenue	2-RB
	BROOKLYN	
Marconi Co.,	Seagate Station	WSE
David Fozetti,	7421 Narrows Avenue	2-WB
Y. M. C. A.	Broadway and Marcy Avenue	2-AV
	BRONX	
A. R. Boeder,	3430 Duncomb Avenue	2-JD
W. H. Richardson,	Westchester and Bergen Avenues	2-AIO
	RICHMOND	
A. F. Pendelton,	New Brighton, S. I.	2-PH
	QUEENS	
Justus J. Agnoli,	16 Purvis Street, Long Island City	2-VQ
A. H. Grede,	10 Van Wyck Avenue, Jamaica	2-ZV

Interest in wireless in the Police Department has been considerable since the class in wireless was organized on May 29, 1916. Sixty members of the Department now hold first grade licenses. Their names follow:

Lieutenant Altenback, Lieutenant Van Keuren, Lieutenant Quackenbos; Sergeant Kahl, Sergeant Pearce, Sergeant Vosburgh; Patrolman Black, Patrolman Driscoll, Patrolman Ferrick, Patrolman Gaffney, Patrolman Gaul, Patrolman Hanley, Patrolman Hughes, Patrolman Jewett, Patrolman Kepko, Patrolman Lovett, Patrolman Madden, Patrolman Mahoney, Patrolman Moroney, Patrolman Murphy, Patrolman McKee, Patrolman Northrop, Patrolman Ray, Patrolman Seymour, Patrolman Schwartz, Patrolman Upham, Patrolman Valentine, Patrolman James J. Ward, Patrolman John F. Ward, and Patrolman Wolf.

Ship Afire in Mid-Pacific

Marconi Operator W. C. Thompson of the steamship Standard Arrow, while in mid-Pacific, bound from the Orient for San Francisco, picked up distress calls flashed by the Japanese steamship Tsushima Manu at eleven o'clock in the morning on January 3. The Japanese vessel, which was also bound from the Orient for San Francisco, reported that the ship was afire and in need of immediate assistance. The Standard Arrow was at that time approximately 180 miles away and she immediately headed for the distressed craft, and stood by her until the flames were under control.

Girl Operators in Commerical Field

The English Marconi Company has initiated the plan of training girls with the object of employing them as wireless operators, this action being due to the fact that its operating staff has been reduced to a minimum and its traffic is constantly increasing. A training school was established and a course of instruction lasting about eight months was introduced. The curriculum included slip reading, punching, record reading, sending on long land lines and the general work of a wireless operator.

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The Coast Guards' Wireless Achievements

INTERESTING illustrations of the manner in which wireless is used in the United States Coast Guard service are contained in the annual report, just issued, of that branch of the Government for the fiscal year ended June 30, 1916. It tells of how the art was employed to convey information that poachers were violating the sealing laws in the Far North; of the invoking of the aid of revenue cutters for ships in distress; of the use of radio on a cruise in search of derelicts, and of the summoning of medical and surgical aid by aerial messenger.

H. G. Hamlet, commanding the cutter Unalga, reported that during the voyage of that vessel to Unalaska, in the Behring Sea, a wireless message from the deputy collector of customs at that island, summoned the cutter to Lost Harbor, Ankun Island. "The cutter proceeded to Lost Harbor," says the report of the commander of the Unalga, "where the American codfishing schooner Maweena of San Francisco was boarded and examined and mendical treatment afforded two members of her crew."

When the cutter arrived at St. Paul Island, relates the report, Surgeon Keating went ashore, in accordance with an arrangement previously made by wireless, and assisted in an operation upon a native woman. After the Unalga had left St. Paul Island and was on her way to Unimak Pass to take up the patrol she stopped and took on board from the American ship Bohemia, a fisherman who had been adrift in a dory for ten days. The fisherman, who was suffering from cold and exposure, was placed in charge of the surgeon on the cutter and the incident was "reported to headquarters by radiogram as a matter of human interest."

The next afternoon a wireless message was received from the master of the American sailing ship W. B. Flint saying that near Cape Lutke he had seen the sailing ship Star of Zealand standing inshore and he feared she was in danger as he had not seen her since. Investigation by the cutter, however, proved that the Zealand was in no danger.

No incidents of note marked the cruise of the Unalga until five days later when the following wireless message was received from the deputy collector of customs and United States Commissioner at Unalaska:

"Polar Bear arrived with six shipwrecked Japs that were picked up on Nunivak Island, unable to learn details, no interpreter. When will you be here?"

Captain Hamlet wirelessed that he expected to arrive at Unalaska in nine days and "will go there at once if you need our interpreter before that. Suggest careful inquiry . . . regarding conditions . . . found on schooner wrecked at Nunivak with view to cutter visiting the scene if circumstances warrant."

In this manner was the transaction of official business facilitated by wireless.

The Unalga was about eighty miles from Attu when the following wireless message from Governor Fassett at St. Paul Island was received:

" . . . continuing irregular intervals . . . occasional reports firearms have been heard close St. Paul Island. Weather thick and sea quiet. Nothing seen, but (sealing) poachers believed vicinity."

In response to this message the following was flashed:

"Message regarding supposed poachers acknowledged. Will touch at Attu to land mail and then proceed Pribilofs direct. Keep me advised."

Additional information regarding the supposed poachers continued to reach the cutter by means of wireless from Governor Fassett. One message read:

"Shooting off Northeast Point and English Bay continues with increasing frequency. Strangers recently landed Zapadni and seal harems disturbed.

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Have doubled guards Northeast Point and Zapadni. Weather continues thick and nothing seen. . . . Two vessels believed off island. St. George reports nothing seen or heard."

In view of the probability that a modern seal raider would be equipped with a receiving wireless set with which to ascertain the movements of vessels of the Coast Guard, the following message was sent by Captain Hamlet in radio code to the St. Paul station:

"Inform agent advisable to code all messages to me relative vessels vicinity your station."

The cutter arrived at St. Paul Island three days later and an officer was sent to shore with instructions to have the agent come to the landing to deliver a letter arranging for ruse messages if they should be found necessary. The Unalga then left St. Paul and cruised about for several days, but no further developments occurred in the case of the poachers.

The cutter Tampa had been away from Key West, Fla., only a few days, bound on a cruise in search of derelicts, when she received a Marconi wireless from the steamer Alabama that the latter had just passed a dangerous obstruction to navigation in the shape of a dismasted waterlogged hulk. The cutter immediately steamed toward the reported position of the derelict which was eventually sighted and towed to port.

Another instance of the humanitarian use to which the wireless is put by the Coast Guard service developed when the cutter Ossipee, on a winter cruise, received a wireless to the effect that a schooner was at anchor in a dangerous position off the Hunniwells Beach Coast Guard station, Me., and was flying a signal of distress. Within an hour the Ossipee was near the schooner, the Irene Meservey, and the latter was towed into Boothbay Harbor.

VESSELS RECENTLY EQUIPPED WITH MARCONI APPARATUS

Names of Ships	Owners	Call Letters
M. S. Pennant	Pierce Navigation Co.	KME
Tito Speri	Italian State Railways.	(Not assigned)
Tug Paul Jones	James W. Elwell & Co.	KVU
Carl D. Bradley	Bradley Transportation Co.	WGN
W. F. White	Limestone Transportation Co.	WGC
Vigo	Transoceanic Steamship Corporation	KMC
Eagle	Standard Transportation Co.	KIR
Tiger	Standard Transportation Co.	KIT
S. Y. Nokomis	H. E. Dodge.	(Not assigned)
Ranenfjord		(Not assigned)
M. S. Selene		(Not assigned)
s. s. Rijswijk		PIT

DIVIDEND DECLARED

The Marconi Wireless Company, Ltd., has declared a dividend of seven per cent on the preferred stock and five per cent interim dividend on the ordinary stock. The Marconi International Marine Communication Company has declared a five per cent interim dividend.

The Auckland wireless station, which has been closed since May, 1915, has been re-opened.

MARCONI ON WILSON'S PEACE NOTE

Guglielmo Marconi, is quoted as follows regarding President Wilson's peace note regarding which there has been so much discussion:

"I sympathize with the attitude of the President. I understand the feelings of the American people, but I think the Central Empires should be the first to make definite proposals. Thus far they have not done so."

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AMERICAN MARCONI EQUIPMENT BEST IN WORLD, SAYS CHIEF RADIO INSPECTOR

Interesting sidelights on shipping conditions and a high tribute to the supremacy of American wireless apparatus, are among the distinctive features of the annual report of the Chief Radio Inspector at New York. The following extracts from this document appear in the report of the Commissioner of Navigation:

"The European war has changed to a great extent the character of the vessels entering this port. Practically all of the great liners formerly making trips here have been taken from their routes by their controlling governments for various purposes. A considerable number of them have been lost during the war. Most of these vessels were of a class which brought them under the radio laws. In their place ships have been substituted which formerly ran to less important ports and in less important trade. It so happens that the monthly record of vessells coming under the radio laws has been started only since the commencement of the European war, so that it is hard to tell exactly what effect the war has had on the work of the Radio Service—that is, whether the large number of small boats require more supervision than under normal conditions with the great liners entering into this port where one vessel would carry as much cargo as several of the present class. I am of the opinion that the number of sailings of vessels coming under the radio laws is considerably less than in normal times. However, the poor radio equipment found on the small tramp steamers that now come in and the unfamiliarity of the owners and officers of these vessels with our radio laws necessitate as much work on the part of the Radio Service as the larger number of vessels which would come here in normal times.

"Several vessels came into this port for the first time and were entirely unequipped with the necessary apparatus to enable them to comply with the law, but immediately installed the required equipment upon notification. In cases where the Radio Service was assured that this would be attended to no other notice was left for the master, but the case was followed up and the ship inspected before her departure after being equipped.

"The record also shows an increase in the number of amateur station licenses, but this really represents more clerical work accomplished rather than any technical radio work in connection with these stations, as it is regularly reported to you the radio service in this office as now constituted is absolutely unable to give any effective attention to the amateur stations.

"There has been a vast improvement in equipment on American vessels leaving this port. The Marconi company during the past fiscal year has installed 189 new equipments. Owing to the patent situation there have been very few installations in this district by other companies, but the standard of maintenance and operators has been constantly improved as the shipping companies have become accustomed to higher-grade equipment, so that the situation may be summed up by stating that the radio equipments installed on American vessels now represent a higher and later development of the radio art than those of any other nation trading into this port at this time."

THE SHARE MARKET

NEW YORK, January 12.

Bid and asked quotations in Marconi shares today:

American, 2⅞-3⅛; Canadian, 1¾-2¼; English, Common, 12-16; English, preferred, 10-14.

BOSTON WOMEN WANT COMMERCIAL LICENSES

Three Boston women have passed the examination for amateur first grade licenses and are aiming to secure commercial licenses. Miss Charlotte Bayliss, of Commonwealth Avenue, Miss Edith Sigourney of Beacon Street, both Vincent Club members, and Miss Ruth Morton of Arlington are the young women who have obtained the amateur licenses.

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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.

Positively no Questions Answered by Mail.

G. L. W., Jr., Schenectady, N. Y.:

It makes no difference whether the primary and secondary of an inductively-coupled oscillation transformer are wound in the opposite or in the same direction. There would, however, be a different effect if these two windings were connected in series, because with one connection they would be mutually inductive and with the opposite connection in opposition.

* * *

J. B. Q., New Orleans, La.:

Answers to all questions concerning the natural wave-lengths of four-wire aerials of various dimensions can be obtained by examining the set of curves appearing in the November, 1916, issue of THE WIRELESS AGE.

* * *

S. W. Y., Montclair, N. J., writes:

Ques.—(1) Is there any advantage in spacing the wires of an aerial more than four feet?

Ans.—(1) No advantage is derived in further spacing except in cases where the length of the flat top portion of the antenna is limited. Take, for example, an aerial where the length of the flat top portion is no more than 30 or 40 feet. In this case, in order to increase the capacity of the antenna, it may be of value to spread the wires just as far as possible.

* * *

A. X. G. inquires:

Ques.—(1) Which is preferable, a potentiometer made of carbon resistance rods or one of German silver wires?

Ans.—(1) Provided the necessary fineness of adjustment can be obtained, equal results will be secured from either type.

* * *

D. J. R., Hackensack, N. J., inquires:

Ques.—(1) What becomes of a graduate after he has finished his course of instruction in the Marconi School of Instruction?

Ans.—(1) He is assigned as a junior operator in the marine service of the Marconi Company.

Ques.—(2) Can a graduate select the ship to which he is assigned?

Ans.—(2) This matter is left to the discretion of the superintendent of the particular division in which he is employed. Ordinarily operators are required to take an assignment on any ship to which they may be ordered.

* * *

E. M. W., Auburn, N. Y.:

With the sensitive types of receiving apparatus now in use, such as the regenerative vacuum valve and multi-step amplifiers, it has been found possible to load aerials with a natural wave-length of even 300 meters, up to 10,000 and 15,000 meters, with fair results. Of course, stronger signals are obtained with larger aerials, but experiments reveal that there is no particular advantage, even when receiving waves of 10,000 meters, in making the flat top portion more than 3,000 feet in length.

The actual value of capacity of a variable condenser, connected in shunt to a secondary winding depends upon the type of receiving detector in use. Such detectors as the tikker, the Goldschmidt tone wheel, etc., can have large values of capacity in shunt to the secondary winding, but the average crystal detector and the vacuum valve require exceedingly small values of capacity at this point, not over .0002 microfarad.

Full information concerning the Marconi School of Instruction can be obtained from the Instructing Engineer, 25 Elm Street, New York City. We understand that there is a considerable demand for radio operators and that graduates of this school are placed promptly in the marine service of the Marconi Company.

Full particulars concerning the Naval Radio School can be obtained from the Commandant at the Navy Yard in question.

* * *

A. B. R., St. Louis, Mo., inquires:

Ques.—(1) Is there any precedent for believing that there is any difference in the effects of the transmitting or receiving aerial with the high potential ends connected together or left open?

Ans.—(1) In our opinion there is no difference.

* * *

E. N., Milwaukee, Wis., inquires:

Ques.—(1) Would you recommend an oil immersed condenser or one of the regulation glass plate type for use in connection with a 1-inch spark coil?

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Ans.—(1) Either type will suffice for the purpose. Increased insulation is obtained from oil-immersed condensers and the brushing of the plates is reduced.

Ques.—(2) Please give directions for the construction and the dimensions of a condenser suitable for this coil.

Ans.—(2) The capacity of this condenser varies widely according to the speed of the vibrator and the general overall construction of the coil. The correct value is best determined by experiment; generally two plates of glass, 6 inches by 8 inches, held with tinfoil, 4 inches by 6 inches, will give the correct value of capacity. These plates need not necessarily be immersed in oil, but to do so may reduce the strain on them. If this does not prove to be of correct value for a good spark discharge try increased or decreased values of capacity or a series in parallel connection until the best possible spark is obtained. A spark coil of recent design having a normal 1-inch spark discharge without condenser required six plates, 6 inches by 8 inches in parallel, for the spark discharge of greatest volume and purity of note.

* * *

W. L. G., East Oakland, Cal., inquires:

Ques.—(1) There has been a good deal of arguing and debating in my district over the international "keep out" signal; some say it is QRM, others BK, and still others QRD. Which is correct?

Ans.—(1) The international "keep out" signal is QRX.

* * *

E. H. S., Rochester, N. Y., inquires:

Ques.—(1) What is the fundamental wave-length of a four-wire aerial, 80 feet in length with an average height of 37 feet, the wires being spaced about 1½ feet apart, as per the accompanying diagram?

Ans.—(1) The natural wave-length of this system is approximately 145 meters.

Ques.—(2) Where can I obtain formulae for calculating the wave-length of an aerial from its dimensions?

Ans.—(2) This calculation was described in a series of articles by Professor G. O. Howe appearing in the December, 1915, and the January, 1916, issues of The Wireless World, of London, England.

Ques.—(2) Which is considered the most efficient type of transmitting oscillation transformers for a ½ k.w. set, an ordinary helix or an inductively coupled oscillation transformer. Is a pancake type as efficient as a comercial type oscillation transformer?

Ans.—(2) Practically equal results can be obtained with all types of oscillation transformers provided they are thoroughly understood. The inductively-coupled type permits the mutual inductance between the primary and secondary circuits to be regulated with less difficulty, but the same regulation can be obtained on a simple helix by the use of three contact clips. There is practically no difference in the efficiency of a pancake transformer as compared to the ordinary barrel type.

Ques.—(3) Please give the directions and diagram of the construction of a reactance coil of suitable design for use with a ½ k.w. Packard transformer.

Ans.—(3) Lacking data as to windings of this transformer, we cannot give the desired advice. You had better communicate direct with the manufacturers.

Ques.—(4) Is asbestos wood or asbestos board as good or better than marble for use as a switchboard panel for high frequency current?

Ans.—(4) Marble by all means should not be employed where the high frequency circuits come in direct contact with the surface of the panel board. Such insulating materials as bakelite, micarta, etc., are to be preferred.

* * *

C. A. M., Atlanta, Ga., inquires:

Ques.—(1) Can the receiving navy set designed by Dr. Cohen having coils 18 inches in length, 6 inches in diameter, wound with No. 28 SSC wire, be used on amateur wave-lengths?

Ans.—(1) It will respond to the lower range of wave-length if the inductance coils are fitted with multipoint switches, permitting small values of inductance to be used in the primary and secondary windings.

Ques.—(2) How may the inductance of the coils be varied and if it is accomplished by a multipoint switch, how many turns of inductance should be included between the taps on the switch?

Ans.—(2) The inductance value may be varied either by a multipoint switch or by a sliding contact. The maker of the set can add just as many taps to the multipoint switch as he desires; the greater the number the closer will be the adjustment to any particular value of wave-lengths.

Ques.—(3) Are all variable condensers used in this set necessary?

Ans.—(3) Yes.

Ques.—(4) Can you give a diagram connection whereby either a carborundum detector, a galena detector or a three element vacuum valve can be connected to the secondary terminals of this circuit?

Ans.—(4) You should be able to answer this question with little difficultv. For example: The terminals of the secondary winding should be disconnected from the grid and filament of the vacuum valve detector and connected to the binding post of the carborundum crystal. Also the receiving telephones should be disconnected from the local circuit of the vacuum valve and connected in the potentiometer and crystal circuits of the carborundum set. For the galena detector the head telephones should be connected in shunt to the fixed stopping condenser. By means of three double pole double throw switches the necessary changes can be readily obtained.

* * *

H. B. S., New Hartford, Conn., inquires:

Ques.—(1) My receiving aerial consists of two No. 14 copper clad iron wires, each 350 feet in length, spaced six feet apart,

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being 35 feet in height at one end and 50 feet at the other end. The lead-in is 60 feet in length from the spreaders and the ground is 10 feet in length. Please give the approximate wave-length.

Ans.—(1) The fundamental wave-length of this antenna is approximately 540 meters.

Ques.—(2) The lead-in of the aerial described in my query is supported by and lies parallel to an iron pipe mast. I wish to erect a small transmitting aerial suspending it at one end from the same mast. I can make the latter aerial perpendicular or nearly horizontal, or I can erect it at an angle of 90 or 180 degrees to the larger aerial if it is placed in a horizontal position. If this aerial lies parallel to the lead-ins of the first named aerial, I fear that considerable energy loss will be occasioned. Would you advise, therefore, that it be placed at an angle or what direction do you consider best?

Ans.—(2) We advise that the second aerial be placed at a right angle to the first aerial and that a parallel position of the lead-ins be avoided.

Ques.—(3) I constructed a high potential battery for a vacuum valve detector after the design presented in a prize article in THE WIRELESS AGE. The results obtained were not satisfactory, and the zinc became heavily coated with black slime, due, I should say, to local action. I used a ten per cent. solution of commercial sulphuric acid. What do you believe to be the trouble? Is it caused by impure zinc or by impure acid? Would amalgamating the zinc with mercury help matters?

Ans.—(3) Judging from the coating of slime obtained, it is quite likely that the acid solution was too strong and we advise you to soak up a new set of blotters with a weaker solution. Amalgamation of the zinc would help, but it is not absolutely necessary in view of the fact that the local circuit of the vacuum valve requires but a very small amount of current.

Ques.—(4) Are the old type vacuum valve bulbs more sensitive than the new tubular type having a single straight filament? Can the tubular type of bulb be used for amplification purposes?

Ans.—(4) For the reception of undamped oscillations by the "beat" method the tubular bulb is preferred, but for the reception of signals from spark stations, the old time round bulb seems to give the best results.

Ques.—(5) I recently purchased a type RJ9 vacuum valve detector and at the first test a blue glow would be obtained with 54 volts at the high potential battery and with the filament only moderately bright. Within a week after it had been put into use it became impossible to make the blue glow appear with seventy-two volts at the same battery and a very bright degree of incandescence at the filament. In fact the bulb became practically useless as a detector. I have tried the usual methods of heating the bulb, but have been unable to make this bulb respond.

Ans.—(5) In view of the fact that you have heated the bulb, we have no additional advice to offer, but it is a fact that certain grades of these bulbs recently furnished the amateur market possess a notable degree of insensibility and with a corresponding constant change of vacuum. Heating the bulb is generally a cure for this difficulty, but inasmuch as it did not help matters in your case we have no additional advice to offer. You might find that by the application of 100 or 150 volts to the local circuit that the characteristic blue glow will be obtained. We advise you to return this bulb to the manufacturer.

* * *

W. M. N., Kernersville, N. C., inquires:

Ques.—(1) I am constructing an inductively-coupled receiving tuner for a medium range of wave-length. The primary winding is 4½ inches in diameter, wound for 5⅛ inches with No. 22 enameled copper wire. I use a sliding contact for variation of the primary inductance. Please give dimensions for a secondary winding for this tuner, that is, the size of the wire and the number of taps to be brought from it, etc.

Ans.—(1) Wind up the secondary tube 4 inches in diameter with 550 turns of No. 30 enameled wire and divide them equally between the taps of a multipoint switch employing about fifteen turns to each tap. Your set will then respond approximately to wave-lengths of 3,000 meters and will be particularly applicable for the reception of the time signals from Arlington up to 2,500 meters.

* * *

J. J. C., Brooklyn, N. Y.:

So many queries have been received regarding the number of tap-offs to be taken from the loading coils and primary and secondary inductances of the "beat" receiver described in the book called "How to Conduct a Radio Club" that an answer will be given covering all inquiries. The amateur experimenter of course understands that in any receiving set it is preferable to have just as many taps on a given winding as are feasible from a mechanical standpoint because the closer the adjustment the more accurate is the tuning of a given set. In consequence you can add just as many taps to the windings as you desire, but for the range of wave-lengths between 6,000 and 10,000 meters the coils described on page 82 of the first edition of the book called "How to Conduct a Radio Club" are of such value that the wave-lengths of the secondary circuit and the local telephone circuit of the vacuum valve can be varied by means of the variable condensers alone. Similarly, a smaller value of inductance could be selected in the antenna circuit and if the complete primary circuit is then shunted by a condenser of variable capacity, the necessary change of wave-lengths in that circuit can be obtained by the condenser alone. In other words, the complete tuning is done by means of variable condensers and not by the coils. Of course, for the lower range of wave-lengths a multipoint must be fitted to all coils of the windings.

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R. A., Danville, Pa., inquires:

Ques.—(1) Of late the amateurs in and about Danville have been annoyed by a peculiar buzz. This interfering sound is heard continuously except late at night and particularly in wet weather. The interference is so severe that no stations are heard except Arlington and in one instance the time receiving station of a jeweler was completely put out of business. Can you give me any particular advice on this subject and how this interference can be averted?

Ans.—(1) This interference is probably due to leakage on the power lines in your neighborhood and can only be stopped by locating the leak. This is often caused by sparking from a 2,200-volt power line to a tree. To say the least, there is leakage on the power circuits of some sort causing sparking which in turn sets up a highly damped interfering wireless telegraph wave.

* * *

D. W. D., Colorado Springs, Colo., inquires:

Ques.—(1) What is the natural wave-length, capacity and inductance of an inverted L aerial 60 feet in length, 50 feet in height, comprising six wires spaced 2 feet apart?

Ans.—(1) A natural wave-length is 163 meters, the capacity approximately .000267 microfarad and the inductance 41,000 centimeters.

We cannot calculate the possible range of wave-length of your receiving set because you failed to give the dimensions of the tuning coil, the number of turns, the size of the wire, etc., which are essential in order to make the calculation.

* * *

A. B. L., Kansas City, Mo., inquires:

Ques.—(1) Of what value are the data in the set of curves shown in Figure 13, page 110 of the November, 1916, issue of The Wireless Age?

Ans.—(1) These data should be of considerable value to the amateur experimenter because they show the natural wave-length of an aerial circuit with 10,000 centimeters or 10 microhenries of inductance inserted at the base. This inductance may conveniently represent the secondary winding of a transmitter oscillation transformer at any given station. A secondary winding having this value can be calculated by means of the formula given on page 106 of the November, 1916, issue, and use of these data is recommended to the amateur experimenter. Having constructed a secondary inductance with this value, the experimenter may then erect an aerial of the correct dimensions to emit, let us say, the wave-length of 200 meters or any other wave-length desired within the limits of the data given in Figure 11.

* * *

A. B. R., Jersey City, N. J., inquires:

Ques.—(1) How do the operators in the marine service of the Marconi Company keep track of the conditions of the storage cells furnished for the auxiliary radio transmitters?

Ans.—(1) An instrument known as an ampere hour meter is inserted in both the charge and discharge circuits of the battery. When the battery is fully charged the pointer of this instrument rests at the zero position on the scale, but as current is taken out of the battery the pointer moves from the zero position in the direction of the hands of the clock and the scale reading corresponding to any particular position of the pointer indicates the number of ampere hours of energy taken from the battery. The additional care required is merely to keep the cells well filled with water, that is to say, the plates should be covered with electrolyte to a depth of ½ or ¾ of an inch. Lacking an ampere hour meter, the condition of storage cells is noted by taking normal current from the cells and at the same time measuring the voltage. If the total voltage is less than 1.81 per cell, they are said to be discharged and must be immediately placed on charge.

* * *

D. L. I., Curwensville, Pa., inquires:

Ques.—(1) I wish to construct an open rack condenser with glass plates, 30 inches by 11 inches, covered with tinfoil, 28 inches by 8 inches. How many plates would I require? This condenser is to be used with a 20,000-volt transformer varying in capacity from ½ k.w. to 2½ k.w.

Ans.—(1) You, of course, understand that you cannot consume the full input of this transformer at the wave-length of 200 meters and should you desire to use a greater wave-length, the condenser may have the capacity of .02 microfarad. You will require twenty-eight plates of glass, fourteen plates being connected in parallel in one bank and the second set of fourteen plates in another bank. The two banks should then be connected in series and to the terminals of the transformer.

Ques.—(2) My aerial is 170 feet in length, mean height 55 feet, comprising four wires spaced 2½ feet apart. What is the wave-length?

Ans.—(2) About 300 meters.

Ques.—(3) How can it be reduced by means of a series condenser?

Ans.—(3) A condenser comprising three plates of glass, 12 inches by 12 inches, covered with tinfoil, 10 inches by 10 inches, the plates being connected in series, will reduce the wave-length of your antenna to nearly 200 meters, but if you intend to operate this set on 200 meters, the value of capacity for the closed circuit which we advised in answer to your first query should be reduced by one-half, or in other words, the capacity should not exceed .008 or .01 microfarad.

* * *

J. H. D., Greenwich, Conn.:

You experience the same difficulty as many other amateurs who have not looked thoroughly into the matter of electrostatic induction before erection of their transmitting apparatus. A wireless telegraph aerial should

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by all means not lie parallel to a power circuit and there is only one solution of your problem, namely, that if you desire to prevent the lights in your neighbor's house from burning out, you must remove your aerial completely from a parallel position to the power line, or, as an alternative, you might have the lighting circuit leading to the house placed in an iron conduit under the earth. Of course the latter plan would be rather expensive.

* * *

F. H. U., Weyauwega:

Without making actual tests on your receiving apparatus it is difficult to advise concerning your troubles, but it may be that the enameled wire winding on your tuning coil has a considerable value of distributed capacity and acts in such a manner as to upset the tuning. The action of the equipment, as you describe it, also points to an earth connection of high resistance which may have a considerable damping effect upon the oscillations. The receiving tuner is apparently well proportioned and should give fairly sharp tuning in the reception of the time signals from Arlington.

The use of slate as an insulating material for apparatus of radio frequency is not recommended, particularly in the case of the lighting switch.

It is difficult to say why you do not receive stations operating at the wave-length of 600 meters, but if your tuner has multipoint switches fitted to both the primary and secondary windings and they permit the necessary values of inductance in either circuit for resonance, there is no reason why you should not be able to tune to waves of 600 meters.

* * *

W. S. G., San Rafael, Cal., inquires:

Ques.—(1) I have a ½ k.w. transformer with a 13,200-volt secondary and would like to know the correct number of condenser plates covered with foil, 6 inches by 8 inches, to operate at the wave-length of 200 meters.

Ans.—(1) Twelve plates of glass, 8 inches by 10 inches, with a thickness of ⅛ of an inch should be employed. Each plate will have a capacity of approximately .00066 microfarad and twelve in parallel will give about .008 microfarad, the correct value for the wave-length of 200 meters. If the glass is not able to withstand the potential of your transformer, you would require eighteen such plates, put into two banks of twenty-four plates in parallel in each bank, the two banks being connected in series.

Ques.—(2) Having a motor revolving at a speed of 3,000 R.P.M., what would be the correct number of points for the disc to be used in connection with this set?

Ans.—(2) A disc 8 inches in diameter, fitted with eight sparking points, will give good results.

Ques.—(3) Please publish the correct number of gaps to be used in a quenched spark discharger like that described in the book "How to Conduct a Radio Club."

Ans.—(3) Approximately 1,200 volts are allowed for each gap and consequently ten gaps or about eleven plates would be required.

Ques.—(4) How can I determine the correct value of capacity for the quenched gap?

Ans.—(4) It should not exceed .008 microfarad and the value for the best spark note is preferably obtained by experiment.

Ques.—(5) What is the meaning of the letters "S. V. C." as used in the sending of radio messages?

Ans.—(5) This is an abbreviation for the word service. A service message pertains to the business of the Marconi Company and refers to the tracing down of the delivery of a message or some important point concerning the rates, etc.

* * *

M. S., Swarthmore, Pa., inquires:

Ques.—(1) My experience with an oscillating vacuum valve detector in connection with a small inductively-coupled receiving tuner has been that when the primary and secondary windings were loaded with external inductance coils, a change in the coupling was not required for adjusting to different stations. I intend to construct a panel type receiving apparatus for the reception of undamped stations and I should like to know whether I could use a fixed degree of coupling between the primary and secondary windings without sacrificing its efficiency.

Ans.—(1) To obtain the maximum degree of efficiency from stations operating at various wave-lengths a variable coupling between the primary and secondary windings is necessary, but if you are willing to sacrifice the last degree of efficiency, a fixed coupling will give good results.

* * *

R. C. G., Iowa City, Iowa, inquires:

Ques.—(1) Where can I obtain reliable data and an explanation of the theory and operation of the "regenerative audion"?

Ans.—(1) The operation of this circuit is fully described in the Proceedings of the Institute of Radio Engineers, issued in September, 1915. Back copies can be obtained from the secretary, 111 Broadway, New York City, at a price of $1 each.

* * *

H. I. S., Monticello, N. Y., inquires:

Ques.—(1) What is the wave-length of an aerial 75 feet in length, 100 feet in height at one end, and 75 feet in height at the other? It consists of four wires spaced 2½ feet apart.

Ans.—(1) The fundamental wave-length is about 225 meters.

Ques.—(2) I hear a station that has a peculiar low note, immediately after ten o'clock each evening. Do you know what station this is?

Ans.—(2) It is undoubtedly a station on the Atlantic coast sending messages and press matter to ships at sea.

Ques.—(3) What should be the dimensions of a condenser to reduce the wave-length of

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the aerial described in the first query to a value of 200 meters?

Ans.—(3) Two plates of glass, 8 inches by 10 inches, covered with tinfoil, 6 inches by 8 inches, both plates being connected in series, will reduce the wave-length to the required value, provided proper variation is made of the inductance of the secondary winding of the oscillation transformer.

Ques.—(4) If unable to get the hot wire ammeter connected in series with the antenna circuit to indicate, where would you look for the trouble in the transmitting set?

Ans.—(4) It may be that there is insufficient current flowing in the antenna circuit to effect the mechanism of the meter. Perhaps the closed and open oscillation circuits are out of resonance.

Ques.—(5) What is the wave-length of the Cape Cod naval station?

Ans.—(5) The standard waves of 600 and 1,000 meters are in use.

* * *

A. D., Louisville, Ky., inquires:

Ques.—(1) What is the longest possible length for the flat top portion of an antenna operated at the wave-length of 200 meters with the secondary winding of an oscillation transformer connected in series?

Ans.—(1) The longest permissible length for the flat top portion is about 105 feet with a vertical height of approximately 30 feet, in the case of the inverted L type; for the T type, the flat top portion may be increased to 160 feet with a vertical height of 30 feet.

* * *

F. J. R., Chicago, Ill., inquires:

Ques.—(1) Referring to the diagram of the heterodyne receiver described in a previous issue of the Monthly Service Bulletin of the National Amateur Wireless Association, where one oscillating vacuum valve is used to generate local oscillations and the other employed to detect the beats so produced in the antenna circuit, please give the necessary dimensions for the coil so that this circuit may be operated at wave-lengths between 600 and 3,000 meters.

Ans.—(1) It is not always possible to keep the vacuum valve detector in a stable state of oscillation at wave-lengths below 3,000 meters, except in the case of a highly exhausted valve. You should have no difficulty in calculating the dimensions of the secondary winding, or the coils of inductance interposed in the wing circuit, if you make use of the Lorenz formula, appearing in the second edition of the book "How to Conduct a Radio Club." To illustrate: The frequency of oscillation in the oscillating vacuum valve circuit is, in the majority of cases, governed by the oscillating period of the secondary circuit of the receiving tuner. Hence, you may assume a value of .0001 microfarad, as the capacity of the condenser to be connected in shunt to the secondary winding, and continue to calculate the necessary secondary inductance for the required wave-length. For example: If the wave-length of the closed circuit is to have a maximum value of 3,000 meters, you may determine the required value of inductance in centimeters by squaring the wave-length ($3,000^2$) and divide this by ($3,552 \times .0001$). Having thus determined the necessary value of inductance in centimeters, you can make use of the formula in the book "How to Conduct a Radio Club" and determine the exact dimensions of the secondary winding for this wave-length. The loading inductance in the wing circuit of the vacuum valve can have approximately the same dimensions as the secondary winding.

Ques.—(2) In the same description and diagram of the heterodyne receiving set, no mention was made of the use of multipoint switches for variation of the inductance of the large loading coil. Approximately, how many taps are required?

Ans.—(2) For wave-lengths between 6,000 and 10,000 meters, no taps are required, the necessary tuning being effected by the variable condensers alone, but for wave-lengths below 6,000 meters, taps may be placed at various points along the coils, according to the desires of the constructor.

Ques.—(3) Which do you consider superior, the three step vacuum valve amplifier or a single bulb employing the regenerative vacuum valve circuit?

Ans.—(3) The regenerative circuit gives good results, but we have no exact data at hand showing the relative strength of signals to be obtained from either circuit. Offhand we should say that a three step amplifier will give the best signals.

* * *

A. R. D., Boston, Mass., inquires:

Ques.—(1) I note from time to time in the columns of your Queries Answered Department inquiries from amateurs regarding the construction of a receiving tuner responsive to wave-lengths including 10,000 meters which are to be fitted with a crystalline detector. Should I take the pains to construct a set of this type, from what stations could I receive?

Ans.—(1) This is an important query and one which many of our readers should take note of. A receiving tuner responsive to this range of wave-lengths and fitted with a crystalline detector, is only applicable to the reception of damped oscillations, and since there are only three or four stations in the entire United States operating at such a wave-length with damped apparatus, this equipment would only be of value to those amateurs situated in the immediate vicinity. The best known of the high-power stations fitted with damped wave apparatus employ directional aerials and it is difficult to receive these signals with ordinary crystalline detectors, unless the receiving station lies in the direct path of the radiation or is located nearby to the station itself.

Many high-power stations employ undamped transmitters, and in consequence either a tikker detector must be employed or

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some form of an oscillating vacuum valve circuit, the latter having been fully described in previous issues of The Wireless Age.

* * *

J. B. L., St. Louis, Mo., inquires:

Ques.—(1) Can I construct a transmitter emitting undamped waves that will operate at the wave-length of 200 meters?

Ans.—(1) We know of no undamped wave generator within the amateurs' means that will function at a wave-length of this value.

Ques.—(2) Will the United States authorities permit an amateur to employ an undamped wave transmitter of any type?

Ans.—(2) This query should be sent to the Commissioner of Navigation, Department of Commerce, Washington, D. C., for direct ruling. Since undamped transmitters operate at wave-lengths in excess of 3,000 meters, a special license, we believe, would be required.

Ques.—(3) Is a license required for the operation of a radio telephone station, experimental or otherwise?

Ans.—(3) Yes.

* * *

B. W., San Francisco, Cal., inquires:

Ques.—(1) What is the wave-length of an antenna 64 feet in length, 50 feet in height and 35 feet at the other, with a lead-in 40 feet in length?

Ans.—(1) Approximately 160 meters.

Ques.—(2) Where can I obtain instructions for constructing an amplifier coil to amplify signals from a galena detector?

Ans.—(2) Assuming that they are to be amplified by a vacuum valve, we refer you to the diagram of connections published in the book "How to Conduct a Radio Club," Second Revised Edition.

The apparatus described in your third query is responsive to wave-lengths inclusive of 7,000 meters, but will not give the maximum efficiency at this wave-length if used in connection with a vacuum valve detector. The maximum efficient adjustment with the vacuum valve is about 4,800 meters.

Regarding your fourth query: A condenser in shunt to the primary winding is not necessary as the loading coil already possesses sufficient value of inductance to place this circuit in resonance with the secondary or receiving detector circuit.

Ques.—(5) Would it help matters if I erected an aerial 400 feet in length, instead of the present one, and would it increase the wave-length to any considerable extent.

Ans.—(5) An aerial 400 feet in length would possess a natural wave-length of about 525 meters and of course would permit the antenna circuit to be adjusted to greater wave-length. Complete dimensions of long distance receiving sets are contained in the book "How to Conduct a Radio Club."

* * *

G. M., Dallas, Tex.:

A complete answer to your queries appears in the book "How to Conduct a Radio Club." The grid condenser for a vacuum valve may be constructed of two very small test tubes or of a piece of lamp cord about 8 or 10 inches in length. One terminal of the twisted cord is connected to the grid of the vacuum valve and the other terminal to the secondary winding of the receiving coupler. The two opposite ends of the cord are of course left open. This makes a condenser of small capacity which can be varied by clipping off the length of the cord until the required value is obtained.

For the fixed condenser cut out twenty-four sheets of tinfoil, 4 inches by 6 inches, and separate them with thin paraffin paper. Connect alternate sheets to opposite terminals. This will give a condenser of about the correct capacity to be used in shunt to the head telephones.

You cannot calculate the possible increase of wave-length to be obtained from a given loading coil, unless you know the inductance and capacity of the antenna circuit in which it is to be employed. These data known, it is comparatively easy to estimate the upper range of wave-lengths. All this is completely described in the book "How to Conduct a Radio Club."

* * *

W. R. G., Newburgh, N. Y.:

Ordinarily a power transformer having a secondary potential of 5,000 volts requires a condenser of at least .02 microfarad capacity for the maximum efficiency, but in order that the set may be operated at the wave-length of 200 meters the maximum allowable capacity is .01 microfarad and a still better value is .008 microfarad. Twelve of your 8 by 10 plates, covered with tin-foil, 6 inches by 8 inches, will give a resultant capacity of about .008 microfarad, but your transformer will not consume ½ k.w. with this value of capacity.

* * *

G. W., Oakland, Cal., inquires:

Ques.—(1) Can you give me the dimensions for a reactance coil so that I can operate a 110-volt sixty-cycle Thordarson transformer on a 220-volt sixty-cycle alternating current power circuit. The secondary potential of this transformer is 20,000 volts and the input 1 k.w.

Ans.—(1) It is difficult to give the exact dimensions of the reactance coil lacking knowledge of the design of the primary winding of your transformer. You should communicate with the manufacturers and inquire concerning the impedance of the primary winding of this transformer and construct a reactance coil of the same dimensions. This will approximately permit your transformer to operate on 110 volts a. c. A better method still would be to construct a step-down transformer, the secondary potential of which is 110 volts. The Thordarson Manufacturing

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Company can undoubtedly make up on special order a step-down transformer of the required dimensions.

Ques.—(2) Please give the dimensions for a transmitting condenser to be used in connection with this transformer.

Ans.—(2) Assuming that this is to be operated on the wave-length of 200 meters, the condenser should have a capacitance of .008 microfarad. Sixteen plates of glass, 14 by 14 inches, covered with tin-foil, 12 by 12 inches, eight plates being connected in parallel in a bank and two banks of eight plates in series, will give a capacity of .008 microfarad.

Ques.—(3) Can the tubular vacuum valve bulb be used successfully in the vacuum valve circuits described in the Monthly Service Bulletin of the N. A. W. A.? Is this bulb more sensitive than the former type?

Ans.—(3) The tubular bulb will function in any of the circuits described in previous issues of THE WIRELESS AGE and in the Monthly Service Bulletin. The tubular bulb gives better response and is more stable in operation for the reception of undamped oscillations than the former type supplied to the amateur market, but for the reception of ordinary spark signals the old type bulb is to be preferred.

Ques.—(4) What is the approximate wave-length of a two-wire aerial, 65 feet in height, 160 feet in length, with a lead-in of 75 feet? The ground wire is 25 feet in length.

Ans.—(4) Approximately 325 meters.

Ques.—(5) Must an operator be eighteen years old to become an employee of the Marconi Marine Service?

Ans.—(5) Yes.

* * *

R. B., Fort Worden, Wash., inquires:

Ques.—(1) How do you calculate the fundamental wave-length of an umbrella aerial?

Ans.—(1) We have no formula by which the fundamental wave-length of an umbrella aerial can be calculated, that is, a simple formula by which the calculation could be easily carried out. Considerable data covering the subject in general appeared in the December, 1915, and January, 1916, issues of The Wireless World, published in London, England.

Ques.—(2) Why is an umbrella aerial most efficient for receiving?

Ans.—(2) We are not aware that this is the case, nor do we know that any definite experiments have been carried out along this line. The inverted L aerial is generally favored for both transmitting and receiving purposes.

Ques.—(3) I have an induction coil with ten turns of wire in the primary and 200 turns in the secondary. If I receive ten volts in the primary, how many volts will I obtain in the secondary?

Ans.—(3) It will be necessary to have more data to make an accurate calculation, but in a well designed transformer the secondary voltage is very nearly a direct ratio of the turns in the primary to those of the secondary; in your particular case there should be approximately twenty times the potential in the secondary circuit that there is in the primary circuit.

* * *

F. W. S., Jefferson, O., inquires:

Ques.—(1) I have a two-wire aerial, 100 feet in length, 30 feet in height at one end and 25 feet at the other. In connection with this aerial I use a two-slide receiving tuner, 12 inches in length, 6 inches in diameter, wound with No. 22 wire and connected as shown in the accompanying drawing. With this equipment I am unable to receive the Arlington time signals and weather reports, although other stations near-by receive these signals with a much smaller tuner and an aerial of approximately the same dimensions. What is my difficulty?

Ans.—(1) Your tuning coil has sufficient dimensions to be placed in resonance with the Arlington station provided you place a small variable condenser in shunt to the leads extending to the detector circuit. Possibly your crystal detector is not sensitive and this may account for the non-reception of signals.

Ques.—(2) Will a buzzer connected as per the sketch in accompanying diagram, where the earth is connected to one side of the vibrator and the antenna to the opposite side, transmit to a distance of sixty rods?

Ans.—(2) Yes, provided the receiving detector is sensitive.

Ques.—(3) Would a two-wire aerial composed of No. 22 wire, 10 feet in length, have sufficient capacity for transmitting with this buzzer?

Ans.—(3) We do not believe the range of the buzzer with this serial would be more than forty or fifty feet. You had better connect the buzzer to an aerial of ordinary dimensions—for example, your 100-foot aerial would make a better radiator for the buzzer system than one of the dimensions you have suggested.

* * *

H. B. G., Kinderhook, N. Y., inquires:

Ques.—(1) What is the best method for connecting up the following instruments: two variometers, one loading coil, three variable condensers, a de Forest vacuum valve detector, telephone receivers and a fixed condenser if required?

Ans.—(1) We presume that this apparatus is to be used for the shorter range of wave-lengths. One of the variometers should be connected in series with the antenna and ground and a lead from the antenna-connected end of the variometer extended through the second variometer, and from there on through a variable condenser to the grid of the vacuum valve. The second variable condenser may be connected in shunt to the variometer, connected in series with the antenna circuit, while the third variable condenser may be connected across the head telephones and battery of the wing circuit of the vacuum valve.

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Ques.—(2) Would you consider a set composed of a loose coupler, a variable condenser, fixed condenser, a vacuum valve detector and telephone receiver more efficient than the one described in my first query?

Ans.—(2) The answer depends upon the range of wave-lengths over which you desire to work and your requirements in general. Offhand we would say that the apparatus described in your second query would permit a wider range of wave-lengths adjustment, give closer tuning and louder signals because the variometer does not deliver a high value of secondary potential. Please keep in mind that variometers of ordinary construction do not permit a large change in the wave-length of a given oscillatory system.

* * *

N. M., Bronx, N. Y., inquires:

Ques.—(1) Do the coils in Figures 1 and 3 in the article "How to Conduct a Radio Club," in the January, 1916, issue of THE WIRELESS AGE, overlap each other, or are they placed side by side?

Ans.—(1) These coils are in inductive relation and concentric, one sliding within the other.

* * *

N. J. A., Tacoma, Wash., inquires:

Ques.—(1) Please give the approximate dimensions for loading coils to raise the wave-length of the following described tuner to 3,000 meters: The primary winding is 4 inches in diameter by 4½ inches in length, wound with No. 24 wire, and the secondary is 3½ inches in diameter by 4 inches in length, wound with No. 28 wire. The aerial has five strands, is 65 feet in height and about 50 feet in length. What is the approximate wave-length of the aerial?

Ans.—(1) The approximate wave-length of the antenna is about 170 meters and a loading coil, 4 inches in diameter by about 5 inches in length, wound with No. 24 wire, will raise the wave-length to approximately 2,500 meters. Similarly the secondary winding may be loaded to this value by another coil having the same dimensions as the present secondary winding and connected in series therewith.

Ques.—(2) Does it matter if the loading coils are placed close to the receiving transformer?

Ans.—(2) They should be placed at right angles if possible.

* * *

R. C., Toronto, Ont., inquires:

Ques.—(1) Where can I purchase graphite resistance rods of 10,000 ohms of the type described in the November issue of THE WIRELESS AGE?

Ans.—(1) Communicate with the Joseph Dixon Crucible Company, Jersey City, N. J.

* * *

C. H. B., Savannah, Ga.:

The most accurate formulæ for the computation of the wave-lengths of a transmitting aerial will give an inaccurate result for the reason that these formulæ do not take into account the presence of near-by conductors to the antenna, such as smokestacks, steel structures, etc. The natural wave-length of a four-wire aerial, the wires being spaced about 2½ feet apart, varies from 4.4 to 4.7 times the total length of the flat top and the lead-in.

* * *

H. W. C., Dassel, Minn., inquires:

Ques.—(1) What is the approximate wave-length of an aerial 600 feet in length, 150 feet in height?

Ans.—(1) Approximately 1,000 meters.

Ques.—(2) What should be the capacity of a variable condenser to reduce the wave-length of this aerial to 200 meters?

Ans.—(2) It cannot be reduced to 200 meters. The minimum possible wave-length adjustment is about 525 meters. The flat top must be reduced to about 100 feet to obtain the wave-length of 200 meters.

Ques.—(3) Is it necessary to own a complete wireless set in order to become a member of the National Amateur Wireless Association?

Ans.—(3) Not absolutely necessary. The applicant is merely required to signify his intention to become an amateur experimenter at an early date and must also indicate that he is interested in the art.

* * *

J. D. S., Chicago, Ill., inquires:

Ques.—(1) My aerial is 64 feet in length, composed of three wires spaced 2 feet apart and has a lead-in taken 20 feet from one end. This is 34 feet in length and the ground connection is 20 feet in length. What is the approximate wave-length?

Ans.—(1) Approximately 115 meters.

Ques.—(2) What is the upper wave-length adjustment of an inductively-coupled receiving tuner having a primary 4½ inches by 6½ inches, with No. 24 enameled wire and a secondary winding, 4 inches by 6½ inches, wound with No. 28 enameled wire.

Ans.—(2) Approximately 3,000 meters.

Ques.—(3) With proper loading coils and tikker detector could I receive signals from Lake Bluff, Ill., or Arlington, Va., using the undamped wave transmitter?

Ans.—(3) Yes.

Ques.—(4) Are visitors admitted to the Marconi station in Chicago, Ill.?

Ans.—(4) Yes, provided they possess proper credentials.

* * *

R. D., Milwaukee, Wis., writes as follows:

Ques.—I constructed a vacuum valve detector receiving set as described in the article on "How to Conduct a Radio Club" in the January, 1916, issue of THE WIRELESS AGE and have obtained excellent results, with the exception that I experienced considerable interference from an arc light system, the wires of which run within five feet of my receiving aerial.

I have picked up numerous amateur stations within a radius of 600 miles and none of them use more than 1 k.w. input for transmitting purposes. The night the famous relay message was sent from Rock Island Ill.,

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I heard it being sent from the original station and then heard 9 HX, which is located in North Dakota, relay it on to another point. Among the stations that I heard relaying this message were 9 NN, 5 VC, 8 AEZ, and many others.

This, however, is not the most interesting feature of my set. By causing the vacuum valve to oscillate I can easily receive signals from the undamped wave station at Lake Bluff, Ill. I would like an explanation of this in view of the fact that the undamped stations transmit a wave-length of 6,000 meters, whereas I am sure my set is not responsive to this wave-length.

In view of the results I have obtained I am looking forward to more articles on the vacuum valve and I trust that I will not be disappointed because I have found in this device one of the most interesting fields of experiment.

Ans.—We know no method by which the interference from the arc light system can be completely reduced except by removing the antenna to a greater distance from the arc light system or vice versa. Our correspondent should know that undamped stations using the arc generator emit in addition to the fundamentol frequency of oscillations several harmonic frequencies which may set practically any oscillating vacuum valve detector circuit into a state of response and the signals will thereby be made audible. Also, our correspondent's station is so close to that of the Government station at Lake Bluff, Ill., that the signals may be received by reason of forced oscillation.

* * *

J. J. W., Brooklyn, N. Y., inquires:

Ques.—(1) What is the approximate wave-length of an aerial 130 feet in length with an average height of 60 feet, composed of four wires spaced 4 feet apart?

Ans.—(1) About 255 meters.

Ques.—(2) Please publish complete specifications for the construction of an inductively-coupled receiving tuner to have a range of from 200 to 3,000 meters.

Ans.—(2) The primary winding may be 4 inches in diameter, 6 inches in length, wound closely with No. 24 SSC wire. The secondary winding is 3½ inches in diameter, 6 inches in length, wound with 600 turns of No. 32 SSC wire. The secondary winding should be shunted by a condenser of .0002 microfarad for the upper range of wave-lengths. The same wave-length can be obtained in the primary winding by the addition of a loading coil 4 inches in length, 4 inches in diameter, wound with 222 turns of No. 22 SSC wire, or the primary inductance can be shunted by a variable condenser of .001 microfarad capacity.

Ques.—(3) Please publish the dimensions of a loading coil that will raise the primary and secondary circuits to wave-lengths of 10,000 meters.

Ans.—(3) For the primary loading coil, wind up a tube 5½ inches in diameter, 26 inches in length, with No 22 or No. 24 SSC wire. For the secondary circuit wind up a similar tube with No. 28 or No. 30 SSC wire.

Ques.—(4) Does the placing of the loading coil in inductive relation to the primary winding of the receiving transformer produce ill effects? Should it lie parallel or at right angles, or should it be placed in an upright position?

Ans.—(4) The loading coil may be placed in an upright position and at right angles to the primary winding.

* * *

N. J. B., Quimper (Finisterre), France, inquires:

Ques.—(1) Are the stations at San Francisco and Funabashi, Japan, able to maintain trans-Pacific communication continuously without relaying at Honolulu throughout the entire year?

Ans.—(1) Communication has been established between San Francisco and Funabashi directly at various times, but no effort so far has been made to maintain continuous communication. For the present, messages are relayed at Honolulu, but at a later date direct communication may be established.

Ques.—(2) Is the station at Funabashi the property of the Marconi Company or is it the Japanese Teisheinsho system? Does the Japanese station employ damped or undamped waves?

Ans.—(2) This station is the property of the Japanese Government equipped with a composite system of wireless telegraphy and employs damped waves.

* * *

F. S. M., Oakland, Cal.:

The reciprocal formula for the calculation of the capacity of condenser jars in series and parallel appearing in previous issues of THE WIRELESS AGE are correct and you should have no difficulty in locating someone in your immediate vicinity that could show you how to calculate and obtain a result for the addition of reciprocals. For example: When we have a number of reciprocals to be added together as in the form contained in your communication, we simply find a least common denominator for all fractions and then add them together. Now when a whole number is to be divided by a fraction, we simply invert the fraction and multiply it by the whole number and thus obtain the required result. The method is discussed in practically all text books on arithmetic and should not require a detailed explanation in the columns of this magazine.

* * *

G. O. F., Liberal, Kas.:

You and other readers of THE WIRELESS AGE are specifically referred to the article by A. S. Blatterman in the November, 1916, issue of THE WIRELESS AGE, wherein curves are given indicating the wave-lengths of inverted L and T types of aerials of the usual amateur dimensions. With these data before you you can easily determine the wave-lengths of your antenna system.

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