THE WIRELESS AGE

JUNE

1915

THE RADIO DEVELOPMENT ASSOCIATION OF HAMSVILLE

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Incorporating the Marconigraph

J. ANDREW WHITE, Editor — WHEELER N. SOPER, Asst. Editor

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THE WIRELESS AGE

Owing to the fact that certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future, and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

JUNE, 1915

The Ownership of Wireless Equipment

Some Replies to the Invitation to Comment on an Earlier Article

In the March issue appeared an article which discussed the question of the proper ownership of steamship wireless equipment — whether it should be acquired by outright purchase and operated by steamship owners, or whether it was best to have it remain the property of the Marconi Company, leased to the steamships but operated as part of the Marconi system. The article also considered some phases of the Government Ownership question. Shipowners, commercial wireless men and those in government service, scientists and economists, were asked to contribute affirmative or negative arguments—particularly the latter were wanted—and assurances were given that the best of these would be published. This invitation was prominently displayed at the end of the article and supplemented by personal letters from the Editor.

Some replies have been received. Whatever inferences may be drawn from them are overwhelmingly in favor of this magazine's particular viewpoint. We did not look for support; we hoped for and would have welcomed opposition. It appears, however, that the choice has been taken out of our hands, and so, as constituting part of the symposium of national significance, they are printed here without comment.

In a leading editorial the Philadelphia Record said on April 29:

Leased Wireless Equipment

Should steamships own or rent their wireless equipment? At first sight this seems a trivial question. However, a comparison with conditions as they exist in another service for long-distance communication will show that there is something in it. When a Parisian decides that he can no longer do without a telephone in his office or residence he first goes to a manufacturer to buy an instrument that suits his fancy; next, he files an application in the Department of Posts and Telegraphs to have the instrument installed and connected. Within a week or two somebody will come along to hook him up with "Central." When the job is done he will find that he has incurred an expense of about 12 cents a yard for a larger or smaller fraction of a mile of wiring, from $20 to $50 for his instrument, and is also required to pay $20 or so in advance for three months' service, besides a deposit for possible long-distance calls.

Subscribers to a telephone exchange in the United States have no such trouble. A notice given in the morning may result in the installation of a leased instrument in the afternoon, and thereafter the subscriber has nothing to do but to pay his monthly rental and the tolls for extra calls. He does not incur any expense for repairs, and his equipment will be kept up to date with the march of improvement. This care-free condition would be the lot also of a shipowner who hires his wireless equipment. When worn out it would be renewed without additional cost, and the lessee, unlike

the owner, would not be haunted by the fear that his costly receivers and transmitters were going out of date.

A wireless installation, like a telephone instrument, is only a part of a system of communication. Standing by itself, an individual wireless equipment is valueless; it becomes a thing of worth only when it is connected with a base. Such a base is the shore station of an aerial telegraphic system. It is true that no wireless telegraph company can refuse to receive at its shore stations or to transmit messages sent from ships at sea; but this rule established by international agreement applies only in case of distress. It is true also that any ship can communicate with any other ship in a given radius, according to the power of the equipment used. Shore connections, however, may be frequently desired on occasions that could not be defined as emergencies under the international rule. The owner of a freighter may desire to communicate with the master of the vessel so that he can direct the cargo to another port than the one for which it was cleared, because of a more favorable market for the goods. This is only one of many instances that could be cited. Such service could be obtained only by renting a wireless installation from a commercial telegraph company which has licensed shore connections. The question put above is thus answered. No monopoly or restraint of trade is involved. The renter of wireless equipment has his choice between competing companies. The choice is determined by considerations of convenience and the relative efficiency of the service given by competitors.

The S O S and Ownership

The opinion of the newspaper and that of the interested individual sometimes present wide contrasts. To widen the gap geographically ordinarily assures or accentuates a difference of opinion. But not in this instance. The following was received from London, over the signature of an official high in commercial wireless service:

"The subject has been so exhaustively treated that there appears nothing to add. There is no doubt that centralization is of the utmost importance and efficient working is quite impossible without it. If all shipping companies owned their installations there would be constant friction among the operators and we should find shipping companies supporting their operators one against the other when disputes had to be settled, whereas at the present moment when the Marconi Company employs all men, justice and control can be maintained. The efficiency of the S O S arrangement also might be considerably lessened in the case of individual ownership, because a shipping company would not be able to decide if an operator should or should not have received signals, and where the interest of rival companies is concerned it might happen . . . that it would be considered better to ignore the call and not delay the steamer. As it is, the operator being a Marconi employee would have no interest in doing so and would always be a witness against anything of the kind."

The Article of Great Value

The following appeared in the response of another British official:

"I have read the article through with the greatest interest and I think it will be of great value to American readers.

"After many years of experience only to the extent of some one per cent. of the total British mercantile vessels fitted with wireless have the owners gone in for outright purchase."

This was received from Canada:

"Personally, I have always been impressed with the superficial disregard by shipowners of the immense value from every point of view of the Marconi organization placed at their disposal under the rental system. While recognizing in the abstract and in definite concrete cases the unquestionable value of wireless equipment, shipowners appear to cherish an inherent resentment against the comparatively small cost entailed as an unwarranted imposition upon them by designing corporations, or by a government paternalism which they regard as interference with the liberty of the subject!

They shut their eyes to the point so ably brought out in your article, proving the worthlessness of ship equipments without corresponding shore stations and the maintenance of a surplus staff capable of supplying qualified men to take charge of vessels at a moment's notice, both of which necessary adjuncts to the ship stations can only be carried out and maintained at enormous expense to the operating company. Your point with regard to the necessity of thorough acquaintance with the international jurisprudence now underlying and governing world-wide wireless, including proper forms of accounting and distribution of tolls is also well brought out.

"You have asked for my opinion of this first installment of a series of similar articles which you propose to publish. The matter is excellent, if only the shipowners can be induced to devote the time and attention to the article which it deserves."

Another, and perhaps the most interesting communication, came from Canada. It read:

"The matter has been dealt with very thoroughly by the author, so that it is hardly possible to make further comment.

The Problems of Operation

"To anyone familiar with the intricacies and difficulties encountered in the operation of a wireless telegraph system, in supervision, in the supply of spare parts and repairs, in the compliance with government regulations in all countries, in accounting, and in the handling of complaints, it is not necessary to give the matter much consideration to appreciate how hopeless it would be for the majority of steamship companies' organizations to endeavor to cope satisfactorily with these problems.

"Possibly the larger steamship companies who would have fifty or more wireless installations could afford to establish an organization to run their own wireless service, but even with such a large fleet as this, the steamship company would be under a serious handicap when the necessity arose for furnishing parts or renewals at distant ports.

"With regard to the question of government vs. private operation, the undesirability of government operation of any public utility has also been very thoroughly dealt with by the author. In taking the British Post Office Telegraph Service as an example of government operation of a telegraph system the author has taken what is probably the most successful of all public utilities operated by government, and even this, as the author has shown, has been commercially a gigantic failure.

"To come nearer home and to consider government operation of wireless telegraph stations as compared with company operation of wireless telegraph stations, it might be pointed out that in Canada there are two systems of wireless telegraph stations, one on the British Columbia coast and one on the Great Lakes. There is the same number of stations in each of these systems, the power and range of the stations is practically the same, the service maintained by the stations is excellent in each case. The West Coast System is operated direct by the Canadian Government, the Great Lakes System is operated by the Marconi Company under contract with the Canadian Government. The cost of operation of the West Coast System as given by the Government Blue Book for 1914 averaged $4,890 per station, whereas in the case of the Great Lakes the Government pays a subsidy of $3,500 per station, out of which the operating company must make a profit. Furthermore, in the case of government operation there is a considerable amount of overhead expense not charged to the stations.

Cannot Improve on Marconi System

"It seems to me that there is no likelihood of any government entering into the operation of Wireless Telegraph Apparatus on board ship. The governments will confine their attention to the regulations of wireless operation and to the insistence on more powerful and more efficient equipments as scientific progress renders such improvements possible. With these increasingly stringent regulations it would seem that the only possible means of carrying on the operation of wireless

equipments on board ship is the present system as organized by the Marconi companies throughout the world."

An American wire telegraph official commented thus:

"Most of the trouble in handling the telegraph lies in the proposition expounded by the Nazarine: 'Ye cannot serve two masters,' and no one knows more than you about the trials and tribulations of the telegraph companies with the conditions surrounding private wire and railroad operators.

"I like the phrase 'Marconi men have never failed'—it lines up with Richelieu's 'There is no such word as fail,' and Lord Nelson's 'England expects every man to do his duty.' As I read it, it means: Marconi men are trained to do the right thing in all emergencies—and that is a wonderful boast.

"The Government Ownership article has a punch and is unanswerable."

What They Think of Us

I was formerly one of your subscribers but when circumstances compelled me to cease taking your magazine it was almost as if I had lost a valuable piece of my radio apparatus. THE WIRELESS AGE should have a place on every up-to-date radio set. I have been getting copies from the newsstands, often having to wait until another supply can be obtained, so eagerly they are snapped up by our amateurs of this town.—W. S. P., *Massachusetts.*

* * *

By way of appreciatiton I would like to say that of all my electrical magazines, of which I have over 150 copies, THE WIRELESS AGE holds first place. I only wish that there was twice as much in them.—E. R. G., *Ohio.*

* * *

I am glad to see this publication again, as I think it is one of the best on the subject of radio work.—G. T. D., *New York.*

* * *

I think THE WIRELESS AGE the best paper for radio fans to read, as everything is dealt with clearly, and the Question and Answer Department alone is worth the price of subscription.—H. G. M., *Pennsylvania.*

* * *

Your "Between the Log Lines" is appreciated. We amateurs are always interested in the doings of commercial operators.—K. H., *Ohio.*

* * *

I have been a constant reader of THE WIRELESS AGE for some time, and find many valuable hints, besides the fine stories, especially "The Eye of the Wireless" in the November issue, and "The Long Arm" in the December issue, and think it is well worth the price.—H. G., *Rhode Island.*

* * *

The magazine is not new to me, for I have been a regular reader of it ever since I started buying it at a newsstand last July, and although I have to go to Omaha to get it each month I would not miss it for several times the price. To speak plainly and to express the opinion of the other boys around here, it is worth about ten of the so called numbers of "The World's Advance," as far as radio work is concerned—and that is what we are looking for.—I. K., *Iowa.*

* * *

Our club has a subscription to THE WIRELESS AGE as a part of its library. It is the only wireless magazine which the club has thought worth while taking.—R. S. M., *Ohio.*

* * *

THE WIRELESS AGE and the 'phones are the two important things in a wireless station. I couldn't be without either.—C. M., *Massachusetts.*

Marconi Men Cool in Sea Tragedy

The Story of the Devotion to Duty of Operators McCormick and Leith as the Lusitania Sank

Operator McCormick, who was rescued. He took the last photographs of the sinking of the Lusitania, but his films were spoiled by the water

IN the biggest sea tragedy of the European war, which occurred on May 7 ten miles off Old Head of Kinsale, Ireland, when the steamship Lusitania was torpedoed and sunk by a German submarine, Marconi Operators Leith and McCormick acquitted themselves with credit, remaining on the vessel to send the S O S even as the ship was being drawn down into the waters. The wireless appeal spurred those on land and sea to render aid, the number of saved being estimated at seven hundred and sixty-four. It is estimated that 1,157 persons lost their lives. No definite news regarding the fate of Leith has been received, but it is known that McCormick was rescued.

The Lusitania left New York on May 1, reaching the point where she was destroyed early in the afternoon. The sea was smooth and the vessel, it is estimated by passengers, was proceeding at the rate of about fifteen knots an hour. It was about fifteen minutes after two o'clock when some among the passengers who had finished luncheon went on deck. Their attention was attracted by an object in the water at a distance of approximately 150 yards from the bow of the vessel. At first they believed that it was the tail of a fish. Then they saw that the water was seething around it and some suspected that it might be the periscope of a submarine. Immediately afterward they saw the torpedo start toward the vessel.

Captain W. T. Turner, commander of the Lusitania, was on the bridge. He saw the torpedo and tried to change the course of the vessel. The torpedo kept steadily on, traveling, as it seemed to those who were watching it, at the rate of about five knots an hour. It was fired just as the Lusitania came abreast of the submarine, striking the big vessel under the forward cabins and the bridge. The impact was ter-

rific, the ship quivering and shaking under the blow. A tremendous explosion followed, hurling a great quantity of water and debris into the air.

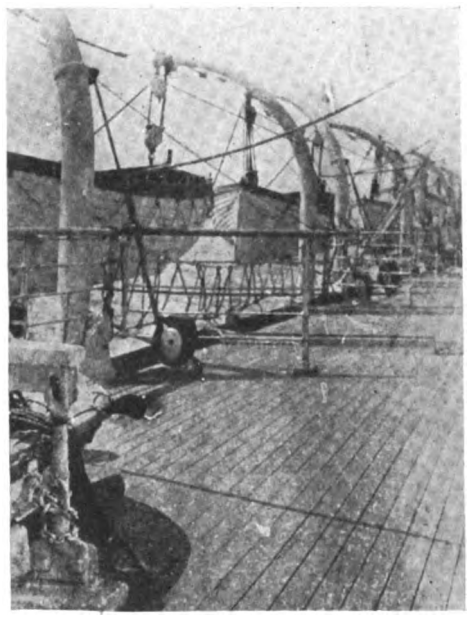
The Lusitania sank twenty minutes after she had been torpedoed, leaving only a brief time for those who had not been killed by the explosion to seek means of safety. Many persons did not have an opportunity to make an attempt to save their lives, being carried down with the liner when she plunged beneath the waters. Others jumped overboard and met death.

In charge of the wireless were two Marconi men—Robert Leith, the first operator, and David McCormick, his assistant. They sent the S O S call broadcast, the appeal being received by both ship and shore stations. When word of the disaster reached Queenstown, Admiral Coke, in command of the naval station, dispatched all the assistance available to the scene. Among the vessels which were sent speeding to the rescue were the tugs Warrior, Stormcock and Julia, as well as five trawlers and a lifeboat towed by a tug. These craft effected many rescues, picking up victims of the wreck as they found them in the water or lifeboats.

Oliver P. Barnard, a survivor, told a story which well illustrates the way in which the Marconi operators on the Lusitania acquitted themselves. Barnard made his way to the boat deck after the explosion, climbing up a ladder in order to reach what he thought would be the safest place in the foundering vessel. He encountered the operators in the wireless room and found them coolness personified. He learned from them, he said, that the explosion had put the main wireless set out of commission and that all the electric lights on the ship had been extinguished, leaving the Lusitania's inside compartments in complete darkness.

The vessel was listing heavily to starboard, but Leith and McCormick continued to send the S O S by means of the emergency apparatus. One of the operators took up a kneeling position on the deck, which was listing at an angle of thirty-five degrees, in order to take photographs of the sinking vessel. A sudden lurch of the ship spoiled his plan, however, and Barnard last saw him astride of a chair in which he said that he intended to "sit down and swim."

The British tank steamship Narragansett, bound from Liverpool to Bayonne, N. J., was thirty-four miles from the scene of the wreck when Marconi Operator Thomson Smith picked up the S O S from the Lusitania. The appeal was followed by the words "Big list. Come at once." Captain Charles Harwood, commander of the Narragansett, ordered the vessel to increase her speed and proceed to the rescue.



This photograph was taken by Operator McCormick as the Lusitania approached the Head of Kinsale. It shows the lifeboats of the vessel swung out in readiness for any emergency

She was nine miles from the Lusitania when a submarine appeared about 200 yards away from the tanker. A torpedo was fired but it passed astern of the Narragansett, missing her by about thirty feet. Captain Harwood then suspected that the S O S from the Lusitania was a hoax and made haste to steam out of the submarine zone.

The Leyland Line steamship Etonian also received the S O S from the Lusitania, being about forty-two miles

away from the sinking ship at the time. Captain Wood, her commander, said that soon afterward the steamship City of Exeter was sighted and then he caught sight of the periscope of a submarine between the two craft. He ordered full speed ahead and the submarine was outdistanced. No sooner had he eluded the under-water craft than another appeared and the Etonian was compelled to show her heels to the latter also. While the steamship was dodging the submarines she received a wireless message from the Narragansett, conveying a warning not to go to the rescue of the Lusitania.

Guglielmo Marconi said that the Lusitania had been chased by a submarine on her previous west-bound voyage when he was a passenger. Only a few persons were informed of the occurrence. The periscope of a submarine was sighted off Fastnet, near Cape Clear, on April 18, but the liner sped away before the under-water craft could get near enough to launch a torpedo at her.

Leith and McCormick boarded the Lusitania when she left England on her last voyage to New York. Operator W. C. Ryan had expected to be detailed as first operator, but he was replaced by Leith a short time before the vessel left. Both Leith and McCormick were in the service of the English Marconi Company, the former acting as traveling inspector. Leith was in the service for approximately eight years. McCormick has been in the service for about two years.

The Death of Operator Short in the Attack on the Gulflight

Other Occurrences of the European War in Which Wireless and Wireless Men Figured

CHARLES C. SHORT, Marconi operator on the American steamship Gulflight, and a number of the crew lost their lives when the vessel was damaged by an explosion on May 1st, off the Scilly Islands, as the result of an attack by a German submarine. Captain Gunter, the commander of the Gulflight, died of heart failure from shock.

The Gulflight left Port Arthur, Tex., on April 10th for Rouen, France, with a cargo of gasolene and oil. Short joined the vessel at New Orleans. It was his first voyage on the Gulflight.

Nothing out of the ordinary marked the early part of the voyage of the Gulflight. When about half way across the Atlantic, Short informed Chief Officer Smith that there was a British cruiser in the vicinity of the American ship. He said that he had been overhearing messages from the cruiser since the beginning of the Gulflight's voyage. The cruiser did not communicate directly with the Gulflight, but apparently kept at the same distance from the American ship until about three days before the latter reached the mouth of the English Channel.

The Gulflight spoke two British patrol vessels—the Iago and the Filey—about 11 o'clock in the morning of May 1st. Their commanders were informed that she was bound for Rouen, after which they were ordered to follow the patrol vessels to Bishop lighthouse. The Filey steamed along about half a mile off the port bow of the Gulflight and the Iago remained close off the American ship's starboard quarter. About an hour and a half afterward the second officer of the Gulflight sighted a submarine steam-

ing at right angles to the course of the American vessel. The submarine was in sight for about five minutes and submerged right ahead of the Gulflight. Those on the latter could not see any flag flying on the submarine.

The explosion occurred at about 10 minutes to 1 o'clock on the bluff of the starboard bow, hurling vast quantities of water high into the air. The survivors immediately lowered the boats and were taken on board the patrol vessels. The Gulflight was afterward towed to St. Mary's Roads.

Short, who was twenty-two years old, was a son of Mrs. Lottie E. Short, a widow, of 708 West 103rd street, Chicago. He was ambitious, even when he was a youth, to become a wireless operator, eventually enlisting in the signal corps of the United States army. He was sent to the Philippines and a short time after he came out of the army he obtained a detail on the Gulflight. He was the eldest of three sisters and two brothers.

A San Francisco newspaper says that William Sidney, a wireless operator who has been detailed in the station at Vladivostok since last December, arrived from China recently, on his way to his home in New York. He said that there are 25,000 German prisoners quartered just outside of Vladivostok and that 100,000 Russian soldiers were waiting for winter to break up so that they could take part in the fighting in the East. Snow three feet deep covered the entire territory, and supplies were stored for many miles around Vladivostok, awaiting the opening of the railroads.

A powerful wireless station is being built by Great Britain on the Highlands of the Island of Jamaica, 3,000 feet above the level of the sea, according to the Rev. George B. Stallworthy, a Unitarian clergyman who made a five months' visit to the island. The opinion prevails in the West Indies, he said, that Admiral Sir Christopher Craddock and his British fleet would not have been lost in the engagement with the German war vessels off Chili last November if there had been such a wireless station as is now planned in the service of the Allies in the West Indies. Defeat could have been avoided, it is believed, by warning the British admiral of the strength of the Germans by wireless or by sending other warships to aid him.

THE COLON RUNS ON A BAR

Reports received regarding the stranding of the steamship Colon, which recently arrived in San Francisco, show that wireless telegraphy was employed to good purpose in bringing aid. The Colon left San Francisco for Mexican ports on January 16 last and, after touching at Guaymas, steamed for Topolobampa. She became stranded on the bar off the latter port at twenty-five minutes after ten o'clock in the morning of February 4. W. R. Lindsay, Marconi operator, sent a distress signal which was answered by the U. S. S. Maryland, that vessel arriving at the scene of the wreck about six o'clock in the evening. The steamships Cetrianna and Korigan III also arrived late in the afternoon and the U. S. S. Annapolis appeared the next morning.

The passengers and crew of the Colon were transferred to the Maryland and Annapolis, Lindsay and the wireless set being taken aboard the Cetrianna. The apparatus was installed on the last-named vessel, enabling the commander of the Colon to communicate with the owners of the latter ship at their offices in San Francisco. The Colon was floated on February 10, and accordingly Lindsay removed the wireless set from the Cetrianna, reinstalling it on the former vessel.

SETS FOR LIGHTHOUSE TENDERS

Under the supervision of the United States Bureau of Standards wireless sets are being manufactured for the lighthouse tenders Columine, Cypress, Orchid, Sequoia and Manzanita. The range of the apparatus will vary from 300 to 100 miles.

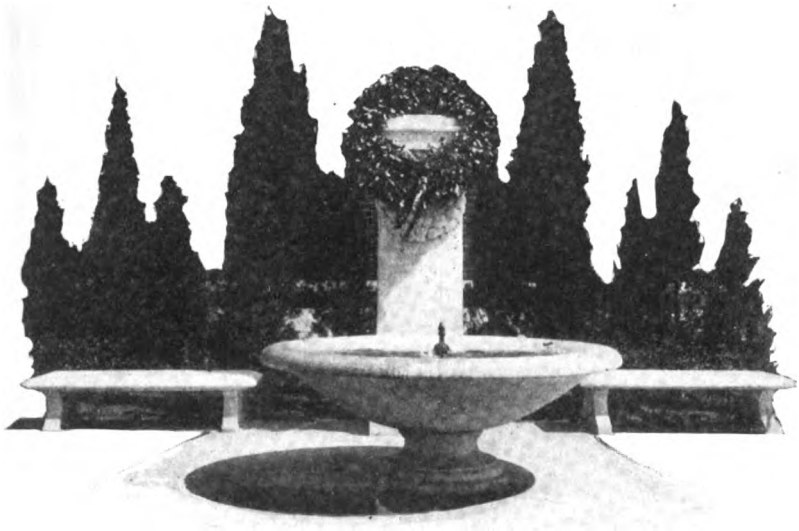
Wireless Heroes

From the Rochester (N. Y.) Evening Times

The wireless operators on the Lusitania . . . stuck to their posts until their outfit was dumb and rendered useless by the encroaching waters . . . the operator had left the room, but he dashed back and brought out a kodak. He knelt on the deck, listing at an angle of 35 degrees, and took a photograph. The assistant, a big cheerful chap, lugged out the operator's swivel chair and offered it to another, saying, with a laugh: "Take a seat and make yourself comfortable." He let go of the chair and it careened down the deck and over into the sea. The one who tells of the incident was washed into the waters and afterward picked up and saved. The wireless men went down with the ship.

This story of the heroism of the wireless operators is not an uncommon one in the history of recent great ocean disasters. It demonstrates what a high conception of duty men have, and how they respond to the call of humanity when the lives of others, including women and little children, are at stake. Following the line of duty their whole mission was to save. While there was a frenzy of fear and panic everywhere, with passengers and crew rushing here and there with the horror of impending doom upon them, these men calmly remained at their keys, sending out calls and hoping for an answer that would mean hope.

Under the waters of the ocean just a few moments before there were men who let loose the bomb which sent more than a thousand human beings into eternity. They were engaged in the business of war. And when, a little later, these wireless operators accepted the issues of war, it was theirs to lay down their lives in a supreme effort to save others. They were engaged in one of the ordinary occupations of peace. What a mighty contrast in motives!



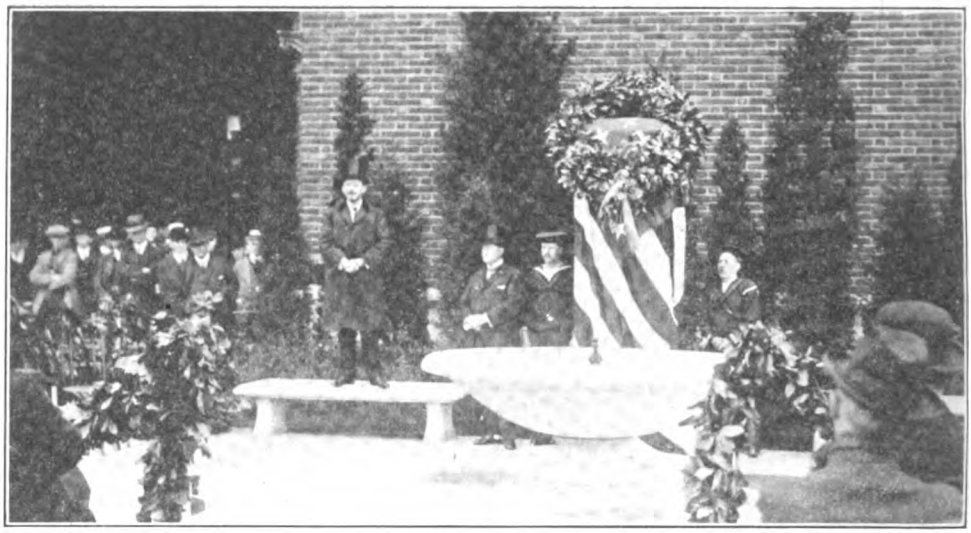
The Dedication of the Memorial Fountain

"IT is particularly fitting that monuments such as this should be dedicated here in Battery Park," said the Honorable George McAneny, "and I as the acting head of the New York City government, take pride in registering an official tribute to the memory of these brave men."

"TAPS"

Two uniformed man-o'-war's men who had been standing at attention, one at each side of the granite shaft erected "In Memory of Wireless Operators Lost at Sea at the Post of Duty," turned then, and lifting a huge wreath from the cenotaph, reverently put aside the American flag which draped it in voluminous folds. The plaintive notes of bugles sounded "taps"; a tiny sparrow fluttered down from the background of stately poplars and poised for an instant on the edge of the huge white basin; a whistle blew out in the bay and a patter of raindrops fell on the bowed heads of the assembled crowd. Thus was commemorated a new chapter in the imperishable annals of the sea, a lasting tribute to those who voluntarily accepted a tradition which will live as long as romance lives.

And because "most of us are creatures of the land, and the dangers of the sea have in our minds the added terror that attaches to things unknown and mysterious"—to quote the principal speaker at the unveiling on May 12—this simple and beautiful form of testimonial to manly courage and noble self-sacrifice in the face of tremendous odds will stand an elevating influence to the thousands which daily pass along the seawall of the great city which centers the maritime commerce of the world. At the extreme southern end of Battery Park, at the



Acting Mayor McAneny of New York accepting the memorial on behalf of the city

base of the Barge Office tower and against a screen of stately green cedars and poplars, the memorial to wireless operators marks the spot where New York's two great rivers of commerce join, carrying great ships steadily outward to the remorseless wastes of the sea.

Below and beside the garland, which, although of classic form, is composed of sea shells, sea weed and sea creatures, are the following inscriptions:

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

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

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

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

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

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

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

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

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

In the invocation Rev. Nehemiah Boynton, vice-president American Seamen's Friend Society, paid a fine tribute to the bravery which had governed the conduct of these men who had gone down with their ships and characterized them as cast in a mould different from those who go through life without having occasion to rise to an emergency that has its inevitable end in self-sacrificial death. His words had a powerful effect upon the assemblage gathered within the enclosure, for among those present were James Coffin Perkins, father of Donald Campbell Perkins, and Mr. and Mrs. Kuehn, whose son Ferdinand had contributed largely to the support of the little family. Present also were those whose ties had been the bond of friendship, the entire working force from the headquarters of the Marconi Company in New York being in attendance through an order which closed the company's offices for the occasion. There were also present many of the passengers who had voluntarily contributed to the memorial fund collected by operators on coastwise ships, as well as the officials of the Maritime Association of the Port of New York, in whose hands the administration of the fund had rested.

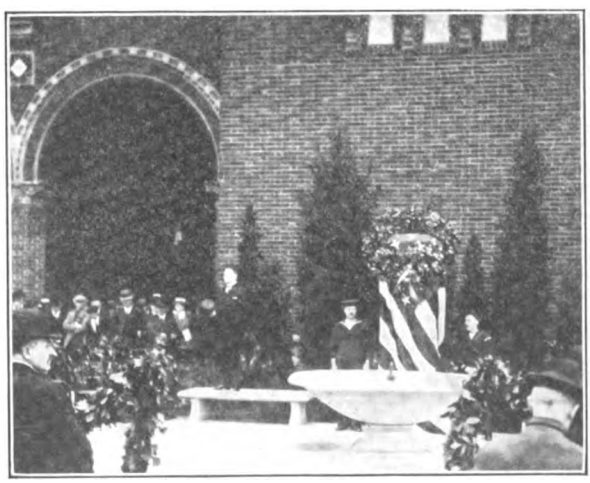
The monument, it will be remembered, has been erected by popular subscription and was conceived during the time when the world was recovering from the shock of the great tragedy of the Titanic. It was then proposed to call it the Philips Memorial, but subsequent developments broadened its scope and it stands today as a perpetuation of heroism equally great, if not so conspicuous. The first contribution came from the New York Times and amounted to $100; this was followed by one of $25 from Harold Bride, Philips' assistant on the Titanic, and $500 from the Marconi Company; the balance of the subscriptions were made by private individuals in small amounts. Under the direction of C. C. Galbraith the committee planned not only to erect a memorial, but to establish a permanent fund for the relief of the widows and families of wireless men who died in the performance of duty. A number of appropriations have been made from the accumulating fund of the past two years for such purposes, and when the expenses of the memorial shall have been paid in full, it is estimated that there will still be remaining about $1,400, which it is expected will be utilized for some such relief work.

In the course of the unveiling ceremonies many references were made to the humanitarian aspects of wireless telegraphy. Acting Mayor McAneny called attention to the fact that when the wireless telegraph was first invented we looked upon it as a great boon to commerce and, of course, as an additional safeguard to human life on the sea. But few of us, he contended, saw to what extent it offered an opportunity for a new and peculiarly appealing kind of heroism. He expressed the gratitude of the assemblage that there should have been spared, and was present, Jack Binns, the hero of the first spectacular instance which called our attention to these values.

Eulogizing those less fortunate whose names have been inscribed on the shaft, he termed the blank space remaining "a melancholy reminder that perhaps other names will have to be added."

"The picture we form of a man on a sinking vessel, sitting calmly at his post ticking off the calls for help—calls which may or may not be answered—stirs our deepest admiration," said Mr. McAneny. "Could any sort of courage and sacrifice be more impressive than that of Jack Philips and the coolness with which he stuck to his post on the Titanic on that awful spring morning in mid-Atlantic, three years ago? It was a story that went round the world and won for this monument the respect and gratitude of millions. It is indeed fitting that the gentlemen of the Maritime Association should perpetuate the names of Philips and other wireless heroes in lasting granite, for in the rush of our affairs we are all too prone to forget the great deeds they performed. And, though we remember Philips most clearly because of the extent of the disaster in which he figured, we should not forget the other nine operators who are just as deserving of immortality."

Park Commissioner H. Cabot Ward, upon whom rests the responsibility of keeping the monument for the public, pledged the resources of his department to the end that the task would not remain a duty, but an honor. Accepting the key which turned on the water from William Lawrence Bottomley, of the firm of Hewitt & Bottomley, architects, whose design had been presented gratuitously and selected after a competition, the



Commodore Fred B. Dalzell of the Maritime Association reviewing the events which led to the memorial's erection

Commissioner coupled the new class of heroes with those set apart by their association with a new invention. "But these wireless heroes are not in fact separated in any way from all the world heroes. It is a wonderful quality of the human soul that new conditions always bring new manifestations of heroism," he said.

The monument stood for the progress of the world, Mr. Ward believed, showing conclusively that the complex conditions of modern society have not spoiled us. Each form of danger had brought its corresponding heroism, and so humanity steadily climbs up in the scale of civilization. He characterized as inspiring the thought that the inscriptions on the granite shaft reminded each passer-by that in every tragic incident which thrills the world, men in all walks of life, to whom life is most dear, give it up most cheerfully and face death as a "beautiful adventure." The mere sight of the memorial, he believed, should inspire consideration for others, for sacrifice, for unselfishness, for devotion to duty, for moral courage in daily life.

Commodore Fred B. Dalzell then introduced the Rev. Raymond Meagher, O. P., who pronounced the benediction.

In commemorating the glorious deeds which the memorial perpetuated, he said we were awakening a new realization of the meaning of fidelity and heroism; by reason of the stirring events of the immediate past, the present circumstances of our nation, of our international difficulties and the almost war-like aspect of our relations with foreign nations, the occasion was most important and significant. "Mark where we stand," he declared in ringing tones. "It is in view of a mass of uplifted stone, in the presence of a small number of wireless operators; and yet from that cold stone, from these unostentatious personalities there arises a mystic potency which bears the mind over the whole world, up and down the broad Atlantic and the Pacific, from the Arctics to the Tropics; and everywhere with a sense of personal concern we come across the numerous kindred of those whose memory we honor, some sleeping the sleep from which no

Rev. Raymond Meagher, O.P., pronouncing the benediction and saying: "The recollection of the wireless operators whose monument we have unveiled is a benediction which makes us recognize our inability to appreciate the sublime heights and the immeasurable capacity that poor human nature can be raised to"

earthly morning call will rouse them, others living useful, energetic, scientific lives, whose names indeed are not all emblazoned on this scroll of the great and mighty, but who again and again have gone through the highest test of fidelity to duty for their fellow man. By that same mystic power what a flood of memory comes o'er the mind!—of sorrow not forgotten but consecrated in its sublimity; of heroic men who by their sacrifices preserved our faith in humanity and its brotherhood; of deeds of unheard-of valor and heroism which made glorious the pages of history."

That the deeds commemorated by the memorial would quicken the capacity of Americans in the service of humanity was noted in the observation that, in admiring the heroism of the chosen few whose great deeds make them commanding figures of history, our own motives are changed for the performance of duties more humble.

"Today in the person of Marconi we extol science because science is truth," was the thought he gave to man's greatest benefactor. "We now admire the potency of scientific achievements, the unfolding facts of which are accepted, but whose miracles yet in their infancy direct us to the infinite and eternal. To consecrate oneself to scientific achievements, where service is demanded and where one must freely and continuously hold out his very life with every supreme effort of which he is capable—and that until the very last moment when service is possible—should elicit from us all the wealth of commendation that human gratitude can accumulate and bestow. The recollection of the wireless operators whose monument we have unveiled is a benediction which makes us recognize our inability to appreciate the sublime heights and the immeasurable capacity that poor human nature can be raised to and developed by an all-wise Providence.

The unveiling by United States sailors

Jack Binns, the hero of the Republic disaster

"In the history of humanity no crisis has been above the heroes and the heroines God has raised up. These heroes and martyrs made their posts of duty sacrificial altars where they were at once the victims of holocausts, and the officiating ministers. Eternal rest is theirs. Shall we doubt it? Shall I, a priest of Him who said 'Greater love than this no man hath, that he lay down his life for his fellow man,' doubt for one instant that the well-merited reward of eternal happiness was given to each and every one of them? We read of the martyrs of old, the martyrs of the colosseum and the arena, and we fondly and truly believe that by that one supreme act of

self-sacrifice, of public profession of faith, the imperfections of their life were wiped away and straightforth they entered into the companionship of Him for whom they so bravely and willingly shed their blood. Shall we doubt that these our heroes, who so freely and fearlessly gave up their lives that their fellow men might live, receive the same reward? Martyrs they were to their calling and their duty, martyrs under the most extraordinary and trying circumstances. Martyrs worthy of the highest praise and reward.

"If there is one point on which I would insist, it is that the heroism which these heroes exhibited in the hour of need was not the fortuitous outcome of an accidental occasion. These men were heroes at heart, the foundation of their great courage was well laid long before the emergency demanded its manifestation! It is possible that a man may raise himself above the weaknesses and deficiencies of his character by some extraordinary incentive, but this is accidental and seldom happens. Ah, no! They came from the rank and file of those loyal followers of Marconi, the love of their profession in their hearts, the spirit of America in their blood, the love of God and their fellow men in their motives. And it is this fact that brings us to the great consolation of knowing that what these dead heroes have done in their great hour of trial will be again enacted by their loyal successors when the hour of imminent distress and call to duty shall be theirs."

The wireless operators in the assemblage were reminded of the great heritage which was theirs, the still greater opportunities. They were told that, faithful to the example of the honored heroes and co-members, they were the inspiration of fidelity and heroism—the consolation of the families of those who embark on the ocean, for these people counted on their devotion and felt secure in the knowledge that whatever evil befall the operator would give the aid necessary. Wireless men as a class were pointed out a living sermon, a force of proselytism, the spectacle of heroic devotion enforcing esteem and respect for the faith which it inspired.

It was added:

"Let us rejoice that such noble souls have lived. May we be grateful for our own privilege of admiring and receiving the benediction of their lives. Their deaths have exploded forces that will not spend themselves until the end of time: forces that will encourage and stimulate and chasten and spiritualize their fellow men throughout the ages.

"May the God of Justice reward their splendid deeds of heroism with the crown of martyrdom.

"May the God of Omniscience enlarge our vision and enfold our gratitude.

"May the God of Mercy in His infinite generosity allow their kinsfolk and their countrymen, and citizens of the whole world to be led to paths of higher, nobler lives by the constancy, the example and the sacrifices of the faithful ones whose last distress message brought life to many, but death to themselves."

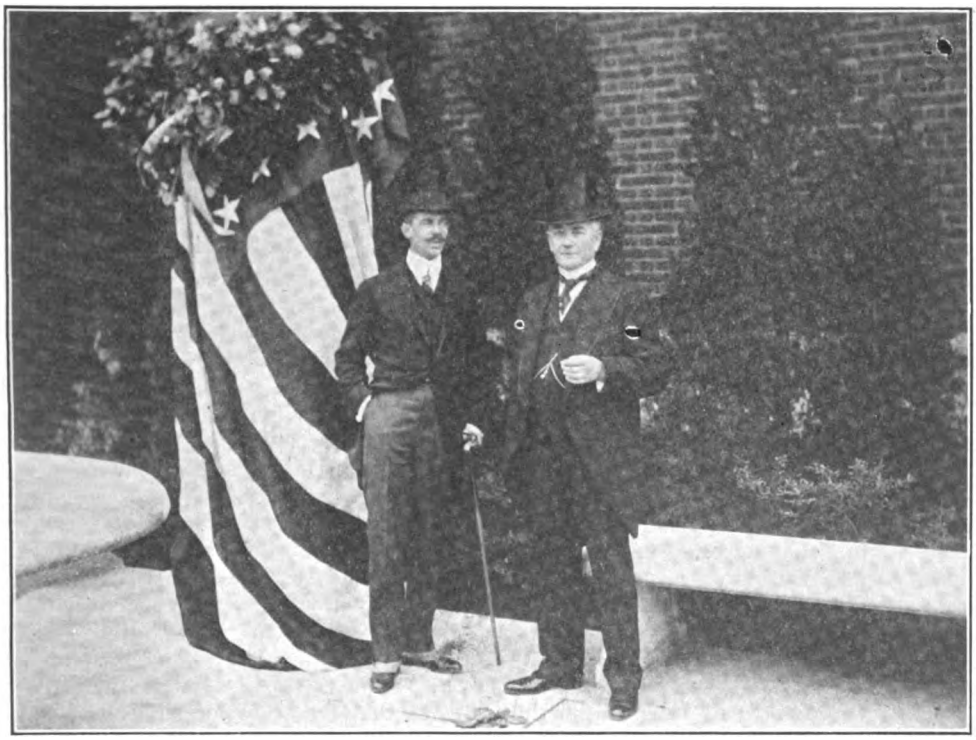
The details of how these men met their end in their devotion to duty are familiar to many of the readers of THE WIRELESS AGE, for the great ocean tragedies in which they figured are mainly of recent date.

The first to die was George Eccles, who stood by his wireless instruments until they were silenced when the hungry sea pounded to pieces the steamship Ohio on an Alaskan reef on August 26, 1909. It had been known from the time she struck that the ship was doomed. In the midst of the excitement of getting the passengers off, Eccles raised an Alaskan land station and with its aid located the Humboldt and the Ruppert City, two fast vessels which were fortunately near by and headed directly toward the sinking Ohio.

The vessel sank within thirty minutes after she struck; ten minutes before the end the rising waters flooded the engine room and made the wireless instruments useless. Eccles appeared on deck, only to discover that the last of the lifeboats had gone. The rescue vessels were then in sight and it seemed certain that he would be saved. But before aid could reach him a mountainous wave lifted the Ohio from the reef and crashed her down on the jagged rocks. Instantly she disappeared beneath the waves and Eccles was seen no more.

Stephen S. Szepanck was lost less than

ten years ago on Lake Michigan under very unusual conditions. Car Ferry No. 18, to which he was assigned, was carrying a long train filled with passengers between Ludington, Mich., and Milwaukee, a distance of a little more than 100 miles. The lake was without a ripple and the ferry boat had arrived within twenty-nine miles of the Wisconsin side when it



William Lawrence Bottomley, designer of the memorial, and Charles C. Galbraith, under whose direction the fund for its erection was secured through popular subscription

struck a rock. Szcpanck had just informed Milwaukee by wireless that they were approaching port when the captain rushed in and directed him to send out the distress call. The signal was immediately picked up by several posts in the vicinity, including a sister ferry boat, No. 17.

The vessel received a mortal blow and filled rapidly. The passengers in the comfortable railroad coaches could scarcely realize their danger. Never was a shipwreck under such circumstances. When the passengers stepped from the coaches they found the decks already awash. Throughout the excitement Szcpanck remained in the wireless room sending out the call for help. When assurances of rescue had been given he passed through the train, stopping at every seat to assure the passengers that aid was coming. When he had done all in his power to aid in placing them in the small boats and sending them away in good order, there remained on the ferryboat only four men, three officers and the wireless operator. Szcpanck returned to the wireless room and was seen no more. When the rescue vessels arrived the ferryboat had disappeared and with it the men who had stuck to their posts of duty.

In the great Titanic disaster of April 15, 1912, it will be remembered that Jack Philips was worn out physicaly from seven hours' unremitting toil in effecting some needed repairs on the preceding day. His assistant had come to relieve him before the hour of midnight, when

his watch regularly ended, and thus was standing beside him when the great leviathan crashed into the iceberg. The great weight of the ship deadened the blow and no one realized the danger when a few minutes later the captain came to the door and suggested that Philips prepare to send out a call for assistance. Ten minutes later the suggestion became an order and Philips' crackling key broadcasted the S O S call. Several ships were picked up, including the Carpathia. Philips continued at the key, sending with a steady hand. The confusion on deck meanwhile was rapidly increasing. The ship had sunk perceptibly at the head and the decks were already awash when the captain returned and ordered the wireless man to abandon the ship. For fully ten minutes more Philips held on, sending out directions to the relief vessels. When he finally left his instrument the last of the lifeboats had gone and it is believed that he remained on board until the final plunge.

He was later rescued from the icy waters by one of the crowded lifeboats, but when with the dawn the Carpathia arrived, it was found that he had died during the night from exposure.

Lawrence A. Prudhunt was but eighteen years old when the Rosecrans was wrecked on the Pacific on January 7, 1913. The Rosecrans carried no passengers and of the thirty-six forming the crew only three were saved. While the crew were busy with the boats Prudhunt remained in the wireless cabin sending out the call for help. He was offered his chance in the boats, but he stayed by his post of duty until the ship broke up beneath him. When the rescuers sought him they found that he had been pinned under the wreckage of the wireless house and washed overboard.

Trapped in his wireless cabin, too, was Donald Campbell Perkins when the State of California sank beneath the waves three minutes after she struck a reef in Gambier Bay, Alaska, August 18, 1913. Perkins was asleep when the crash came. He rushed into the wireless room in his pajamas. While everyone else was struggling for the boats his first thought was to reach his instrument. The inrush of water put the main set out of commission and Perkins coolly adjusted the auxiliary apparatus. His call was answered by the steamship Jefferson, which immediately speeded to the rescue. Knowing that every minute's delay lessened his chance of escape, Perkins continued to communicate with the Jefferson, giving the exact position and other information. Out on the deck excellent use was made by the crew of the few moments left them for getting the boats overboard. Suddenly the vessel listed to port and the lifeboats immediately in front of the wireless cabin broke adrift and jammed fast in the door, holding Perkins a prisoner. A moment later he went down with the ship.

One of the most recent of the sea tragedies occurred with the sinking of the Monroe on January 30, 1914. The wireless operator, Ferdinand J. Kuehn, was a New York boy, only twenty years of age. The Monroe, which plied between New York and Norfolk, sank within twelve minutes after a collision in the fog off the Virginia coast. Knowing that the ship had received her death blow and could remain afloat but a few minutes, Kuehn's assistant brought a life preserver to the wireless room and helped the operator to adjust it. Meanwhile the crew had succeeded in getting three boats away and the order to save women and children first was being rigidly obeyed. Kuehn was induced to go on deck only at the last moment, when it was known that the ship was sinking. As he stood there a woman passenger came toward him and he noticed she had no life preserver. He unfastened his own and insisted that the woman accept it. Then he helped her into a lifeboat. A few moments later the survivors saw him slip on the tilted deck and fall into the water. He was not again seen.

Walter E. Reker was the wireless man on the Admiral Sampson which sank after collision with the Princess Victoria of Seattle, Washington, April 25, 1914. The Admiral Sampson was feeling her way along the coast in a dense fog when the crash occurred. A twelve-foot hole was stove in her bow. To add to the horror of the situation the oil cargo she carried was ignited and the flames quickly spread throughout the ship. Through the bravery and effici-

ency of the crew all but two of the fifty-four passengers were saved. Reker might readily have saved himself by taking to the boats with the passengers and the greater part of the crew. The Princess Victoria had explained by wireless that she was sending for assistance and there was no need for the Admiral Sampson's man to operate his instrument longer. But Reker had found work on deck to do and devoted himself to assisting the passengers adjust their life-belts and reach the boats. He ignored repeated appeals to save himself. When the last boat had left safely, Reker reported to the bridge and remained to share the fate of the captain. He was on the bridge with his superior officer when the ship went down.

Clifton J. Fleming was the youngest of the wireless heroes, only seventeen years old. With Harry F. Otto, his assistant, he was lost in the wreck of the Francis H. Leggett off the Oregon coast on September 18, 1914. The steamer, carrying a large passenger list, was bound from Portland to San Francisco. She had been laboring in heavy seas for two days and was greatly weakened by the pounding of the waves when the cargo suddenly shifted, giving her a permanent list. The sea broke over her and the hatch was wrenched off; through the opening the water poured in great volume. Several boats were launched, but foundered as soon as they struck the water. The wireless men remained at the instruments and succeeded in securing help even as the seas were passing completely over the cabin.

Otto went down with the suction of the ship. Fleming got away safely and it is believed that he would have been saved but for his heroism in giving his chance of life to one of the women passengers. He had just assisted a man to a floating piece of wreckage when a woman was swept against him. Having aided her to grip a floating railroad tie and assured himself of her safety, he remarked that the lumber was not large enough to support them both and deliberately let go and sank.

A full account of the wreck of the Hanalei, in which Adolph J. Svenson perished, was given in the January issue of THE WIRELESS AGE. It was on the morning of November 23, 1914, that the Hanalei grounded on Duxbury reef, fifteen miles north of San Francisco. The senior operator, Loren A. Lovejoy, who was saved, under instructions from the captain directed Svenson to send out a distress call. The signals were picked up by the Marconi trans-oceanic station at Bolinas, the San Francisco station, a revenue cutter and a merchantman. The rising waters put out the dynamos and made useless the storage batteries of auxiliary set. The ship then lurched suddenly, leaving the storage batteries clear of water. Lovejoy sent another call for urgent rescue. A moment later the wireless cabin was swept overboard. Rising to meet the emergency, a flash lamp was employed and the work of rescue directed to the shore by means of dots and dashes of the code made by the light. With the arrival of the flood tide, when the ship broke in pieces, this communication was still in use. Lovejoy said that he last saw Svenson soon after the ship broke to pieces clinging to a piece of the hull. Of Svenson he said: "Throughout our terrible experience he remained cool and resourceful, upholding in an exemplary manner the traditions of the Marconi service."

And this, as may be seen, is a fitting epitaph for all those whose names have been inscribed on the shaft of the memorial fountain.

SIR JOHN CAMERON LAMB DEAD

Sir John Cameron Lamb, who was the senior British delegate at the first International Conference on Wireless Telegraphy held in Berlin in 1903 died on March 30. He was a member, for five years, of the Royal Commission appointed to consider the establishment of electrical communication with lighthouses and lightships. He was formerly second secretary of the Post Office.

Admiral Sir Henry Jackson, who has been appointed First Sea Lord of the British Admiralty to succeed Admiral Lord Fisher, is known for his work in connection with the introduction and development of wireless telegraphy in the navy.

How to Conduct a Radio Club

By E. E. Bucher

ARTICLE XIV

THE experimenter ambitious to become a full-fledged amateur may have had his interest aroused by a visit to a wireless station or by reading an article on radio telegraphy. In either case he realizes that it will be necessary to take certain steps before he will be able to send and receive messages. What these steps are he perhaps does not know. It was to meet the needs of this class of prospective amateurs that this article was written.

Preliminary Education

The beginner in the field of amateur wireless telegraphy should first become conversant with the general restrictions imposed upon the amateur by United States legislation. He should purchase from the Government Printing Office, Washington, D. C., a booklet entitled "Radio Communication Laws of the United States and the International Radio Telegraphic Convention." The price is 15c. per copy.

This publication gives full information as to the regulations governing wireless operators and the use of radio telegraphic apparatus on ships and land. The experimenter should refer first specifically to page 55, paragraphs 63, 64, 65, 66, relative to amateur station licenses, etc.

From these he learns that when specially qualified and having had at least two years of experience, the amateur may, in certain districts, secure a special license for an exceptional station. Such experimenters, of course, belong to a class which he cannot immediately join.

In paragraph 65, he finds that general amateur stations are restricted in transmission to a wave-length of 200 meters, which, to the uneducated, means that further knowledge of the principles of wireless telegraphy must be obtained.

In paragraph 66, he finds that if his station is located within 5 miles of a naval station, the wave-length for transmitting purposes is limited to 200 meters and the energy consumption at the power transformer to ½ k.w. This station is said to be in the "restricted" class.

He learns that "general" or "restricted" amateur stations must be in charge of an operator having an amateur's first grade or amateur second grade operator's certificate, who will be held responsible for its operation in accordance with the United States regulations.

He learns that the station must always be under the supervision of a licensed man. Moreover he finds that for a simple receiving station no license whatsoever is required. Again, provisional licenses are issued to amateurs far remote from radio inspectors. If, after actual inspection, such stations are found to fully comply with the law, the term "provisional" is struck out and the station is indicated as having been inspected. Amateur station licenses and amateur operators' licenses hold good for a period of two years, whereupon they may be renewed.

Requirements for Amateur Licenses

In order to secure an amateur first grade license certificate the applicant must be familiar with the adjustment and operation of wireless telegraph apparatus. He must also be familiar with the rules of the International Radio Telegraphic Conventions, particularly the regulations concerning the requirements in regard to interference. He must be able to transmit and receive at a speed sufficient to recognize distress or "Keep out" signals. A speed of 5 words per minute is generally considered sufficient for the requirements. The writer recommends that the amateur wait until he has attained a speed of 10 words per minute before attempting to take the examination.

For an amateur second grade certificate the requirements are similar to those for a first grade certificate, except that these licenses are issued to an applicant who cannot be examined. If amateurs, for valid reasons, cannot appear in person and are able to convince and satisfy the government authorities as to their knowledge on the subject, a license of this kind may be issued. No fees are required for either an operator's license or an amateur station license.

It is obvious that the prospective amateur is not yet qualified to enter into negotiations with the government authorities; in fact, he must take a number of preliminary steps, particularly from a technical and operating standpoint, which will be mentioned.

It is self-evident that the amateur who cannot interpret the signals of the International Continental telegraph code loses 99 per cent. of the total enjoyment to be derived from operating a set. In fact, unless he attains this degree of proficiency, the apparatus becomes a useless toy and attempts at communication with his friends—even if allowed—will result in hopeless bungling.

It is in order, therefore, for him to begin immediately the practice of the telegraphic code. This he cannot do alone. He will require assistance from an amateur friend who has already passed this stage of development and will send to him for hours at a time.

As far as sending is concerned, to learn the formation of the characters of the telegraphic code is not a difficult task and may be accomplished single-handed in a very short time, but to recognize the characters of the code as sent out by another is somewhat more laborious. The beginner in wireless does not, however, need to wait until he becomes a high-speed telegrapher to enter the amateur's realm; when he attains proficiency at a speed of 10 words per minute, he is quite eligible for a place in their sanctum sanctorum.

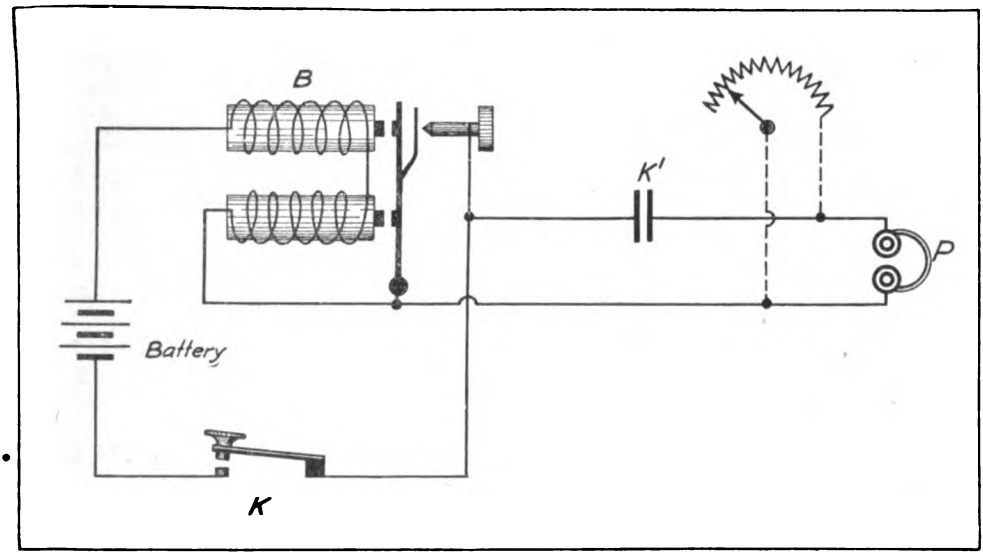


Fig. 1

He now desires to purchase a receiving apparatus, but before going into the details we shall describe a simple buzzer system which may be used to advantage in practice of the telegraph code (Fig. 1.) A simple bell buzzer, B, is energized by a 4-volt dry cell battery in series with which is connected the signalling key, K.

Across the contact of the vibrator is shunted the head telephone, P (of 75 ohms resistance), in series with the condenser, K.

The condenser, K, may be of almost any capacity desired, but is preferably not less than .01 microfarads capacity. It may be necessary to shunt a resist-

ance across the telephone, P, to reduce the volume of sound. The receiver, P, is donned by the learner, the sender transmitting on the key, K. If the buzzer is properly adjusted it will give a perfect reproduction of wireless signals.

An Amateur's Simple Receiving Equipment

The beginner should not attempt the more elaborate fields of experiment until he has become skilled in the simple methods. Having become proficient in the code he should erect a receiving equipment of elementary design and simplicity. A license is not required for receiving purposes and accordingly the receiving aerial may be, within reasonable limits, of any dimensions desired. Here, again, the experimenter must be guided by a sense of the fitness of things. He, therefore, requires an elementary knowledge of the fundamentals of wireless telegraphy which he can obtain from books and periodicals on the subject.

It is also essential that the beginner should acquire knowledge of the elements of electricity and magnetism if he wishes to operate his instruments comprehensively. Some naturally possess this knowledge, while to others it is a matter of attainment. One thing is certain—by slight application such knowledge can be easily gained.

In the study of the elements of electricity the author recommends that the beginner immediately learn the difference between alternating current and direct current. He should familiarize himself with the general conditions under which such currents are handled, learning to know when a circuit is overloaded and the size of fuses to be installed to carry a given amount of current.

He should also make a thorough study of the underwriters' rules in reference to the insulation of power circuits, paying particular attention to the rules which relate to the installation of wireless telegraph apparatus. The underwriter's rules vary in different cities, but a copy of them may easily be obtained for reference. The prospective amateur should also learn the current-carrying capacity of various sizes of wires, thereby making sure that the circuits at his station will not become overheated.

The writer has no particular recommendations to make regarding books on electricity and magnetism. The majority of these works are of value and should be studied carefully.

Summing up the foregoing, it will be seen that the experimenter has prepared himself for the amateur field in three respects:

1. He knows the radio laws which he should obey.

2. He is able to telegraph at a fair speed and is, therefore, qualified to interpret wireless signals.

3. He understands the elementary principles of electricity, and also the fundamentals of radio telegraphy.

He is now fully qualified to embark on his initial experiments and should begin with a simple receiving equipment. For this work the author recommends the simple two-slide tuner connected up as per Fig. 2.

An Elementary Receiving Set

The complete equipment comprises a single-two-wire aerial about 100 feet in length, a two-slide tuning coil, AB, having the sliders S1 and S2, a silicon detector, D, a small fixed condenser, C, and a high resistance telephone, P. The writer does not recommend receivers of less than 1,000 ohms resistance, because telephones of lower value are generally found unsatisfactory and unreliable with the crystalline detectors.

Should the experimenter desire to construct this tuning coil, the following dimensions are recommended: the coil is to be 8 inches in length by 3 inches in diameter and wound closely with a single layer of No. 28 S. S. C. wire.

The slider, S1, enables the wave-length of the antenna circuit to be altered while corresponding adjustments in the receiving circuit are obtained at S2. With a receiving set of this type the learner will become a keen observer of the manner in which commercial and amateur wireless telegraph traffic is handled, thus obtaining a preliminary education which cannot be equalled. Furthermore, a simple receiving set, as per Fig. 2, will give a reasonable degree of efficiency.

Returning to the subject of receiving aerials, the question is invariably asked: "How long shall it be and what is its receiving range?"

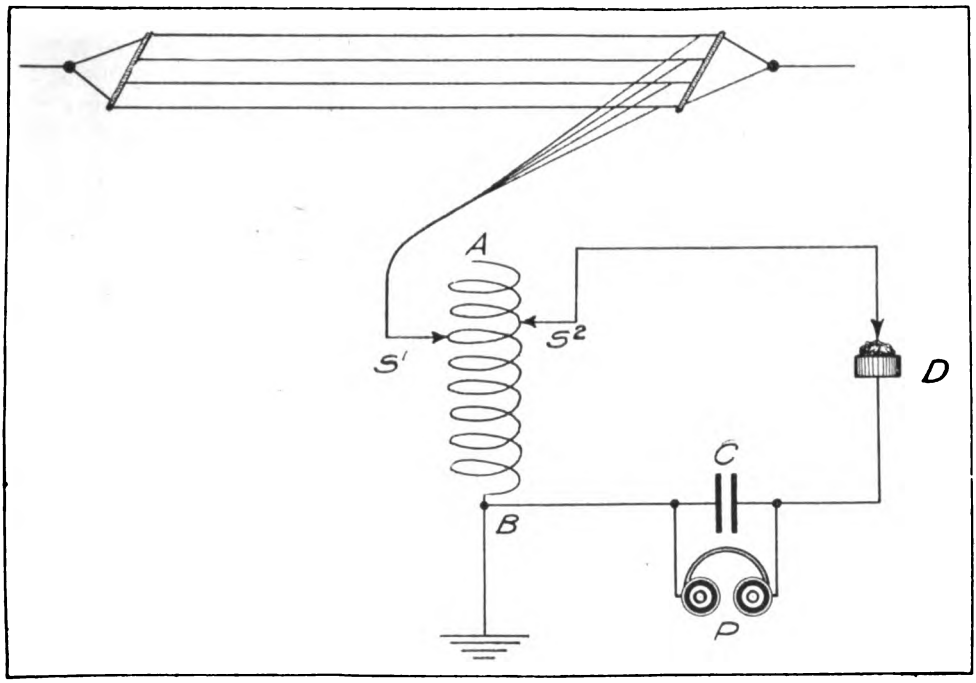


Fig. 2

Now, the actual length of a receiving aerial is probably first gauged by the space available, and second by the wave-lengths and power of the stations from which it is desired to receive. It is best to begin experiments with a receiving aerial suited strictly to the wave-lengths of amateur stations, namely, 200 meters. Later a more elaborate equipment and apparatus may be installed as the learner's knowledge of the subject increases.

The question as to the number of wires to be included in the aerial has been much discussed, but as it is understood today there seems to be little advantage in the erection of a receiving aerial having more than two wires. An aerial comprising from two to four wires, 50 feet in height, by 40 feet in length, with the wires spaced two feet apart, will have a natural wave-length of about 160 meters which is of the correct dimensions to be loaded to a wave-length of 200 meters. Of course, this aerial may be employed for the reception of longer wave-lengths, say up to 3,000 meters, but it will give better results from stations having wave-lengths between 200 and 700 meters.

An aerial having a natural wave-length of 600 meters, however, is altogether too long for the reception of signals from amateur stations working on a wave-length of 200 meters. In any event, for the purpose stated, the aerial should not be more than 100 feet in length.

Having progressed so far in his wireless education, the student should devote himself diligently to the use of the receiving apparatus, familiarizing himself with the methods of communication employed by amateurs at large. Many amateurs are accustomed to use abbreviations in ordinary conversation for the simple words, as per the Phillips telegraph code, and the beginner should learn some of those commonly brought into practice.

It is assumed that he has practiced transmitting regularly on the buzzer set previously described. When he is confident that he is capable of sending without causing undue interference he should purchase a simple transmitting outfit. If his station is located so that the signals will carry beyond the borders of the state in which he resides, a license must be secured. If it is definitely known that

the signals will not carry this distance, a station license is not required. The experimenter should fully satisfy himself regarding this matter by communicating with the radio inspector in his district, giving a complete description of his station and requesting advice as to its probable wave-length and carrying range.

It is somewhat difficult to estimate the range of a transmitting set on account of the variable factors entering into the case. The range is dependent upon:

1. The height and dimensions of the transmitting aerial.
2. The nature of the earth connection.
3. The closeness of energy-absorbing conductors, such as trees, smokestacks, steel buildings, bridges, etc.
4. The character, efficiency and power of the transmitting apparatus.
5. The type of receiving apparatus employed at the receiving station and the skill with which it is handled.

With the average amateur transmitting aerial, taking into account the receiving apparatus generaly employed, a 1 inch spark coil as a transmitting apparatus will give a range of not more than five or six miles. A 2 inch spark coil will cover about ten miles, while a 3 inch spark coil may be relied upon for fair communication at a distance of from fourteen to twenty miles.

Stations fitted with a ¼ k.w. alternating current transformer may be expected to have a range of about 30 miles, while those with a 1 k.w. transformer should do from 40 to 50 miles under favorable conditions. The writer is well aware that in certain cases greater distances are covered by many amateurs, but these are accomplished under extremely favorable conditions (in a clear, open country) with a receiving apparatus of the supersensitive type.

The large commercial companies are in possession of data regarding the aerials of more uniform type which enable them to forecast the range of a given transmitting set quite accurately.

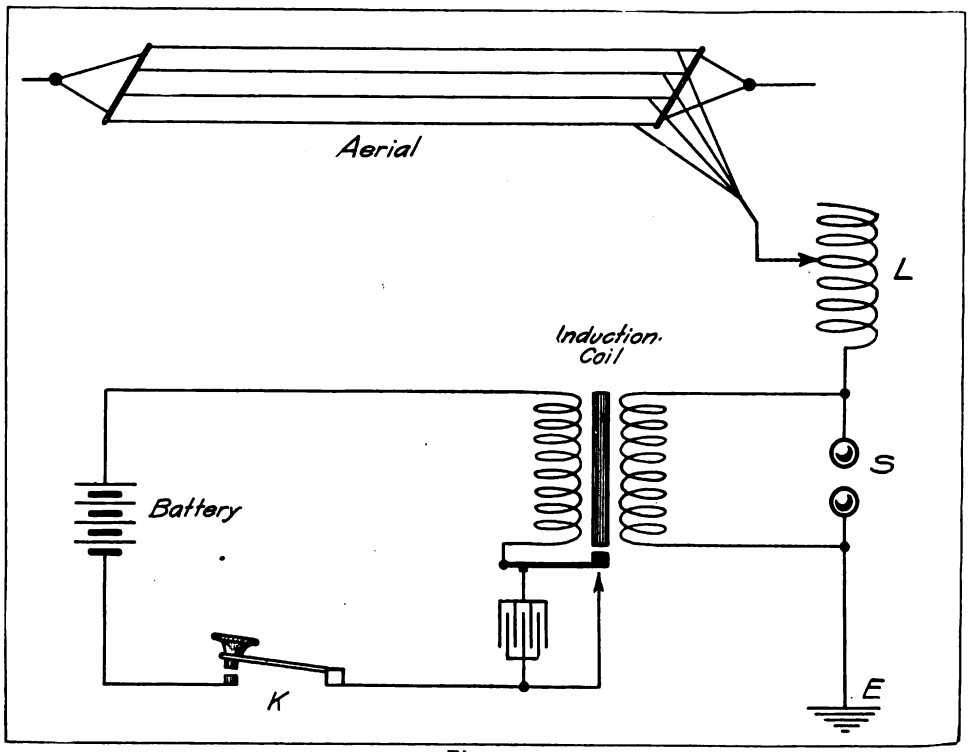


Fig. 3

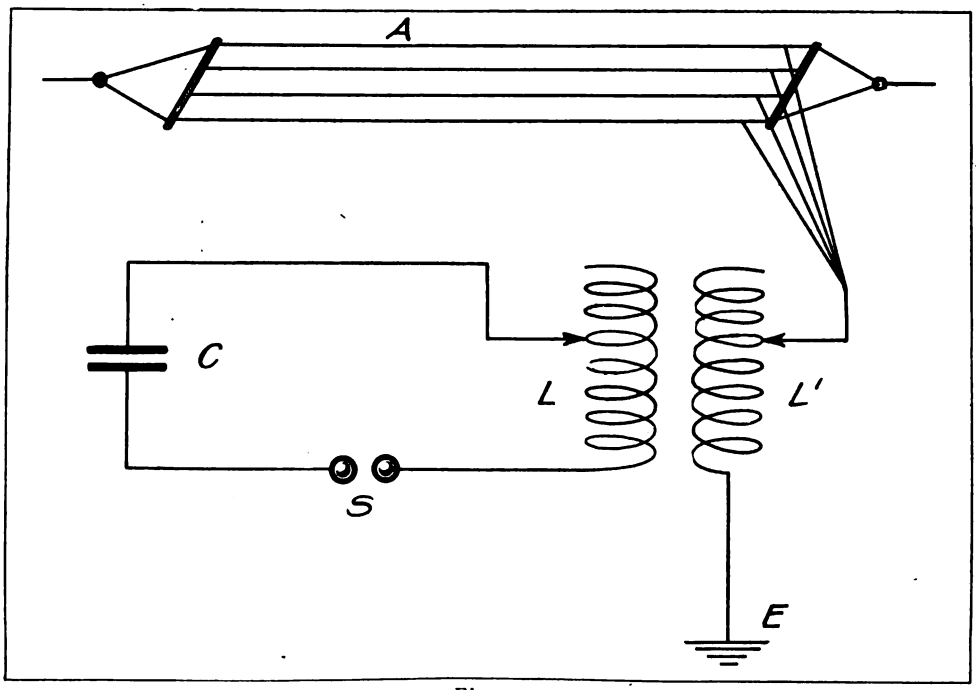


Fig. 4

For the beginner the author recommends the simple transmitting set indicated in Fig. 3. The aerial, AB, having a natural wave-length of about 160 meters, has connected in series with it the tuning coil, L, and the spark gap, S. The spark gap, S, is connected to the secondary terminals of an induction coil having a normal spark discharge of from 1 to 3 inches. The primary winding of the coil is energized by from 6 to 10 volts of storage battery, the cell having preferably a capacity of 60 ampere hours.

The spark discharge points at S should not be more than 3/16 inch in diameter, and may be of zinc or brass. They should be carefully regulated during operation until the discharge is free and clear from flame. As turns of wire are added or subtracted at the coil, L, the wave-length of the aerial system is increased or decreased. Thus, if interference is experienced on one wave-length another number of turns may be selected giving a different wave-length. It should be understood that the United States authorities will not allow a transmitting set of this type to be operated within the zone of interference, because of the fact that the emitted wave is apt to be very "broad" (high decrement). This statement, however, is only correct when the antenna circuit includes no localized inductance such as at the coil, L. The effect of the coil, L, is to sharpen the emitted wave, thereby causing less interference.

An amateur wireless telegraph station is said to be within the zone of interference when it is so closely located to a commercial or naval station that the operation of these stations is apt to be interfered with.

In order to emit a wave of greater purity, an oscillation transformer must be used and connected, as in Fig. 4.

Transmitting Set of the more Advanced Type

The progressive student soon passes the spark coil stage of development and becomes ambitious to acquire a more elaborate and effective equipment in order to place himself on a par with the more experienced amateurs in his vicinity. He, therefore, purchases a high potential transformer, a large high potential oil condenser, an oscillation transformer and rotary spark gap. The

author suggests in the case of the plain spark gap discharger, if the set is to be operated on 60 cycles, that the capacity of the transformer be limited to ¼ k.w.; with the rotary spark gap it may be of the ½ k.w. size.

Returning to the matter of the oscillation transformer, we refer to Fig. 4. Here the coil L, is arranged so that it can be placed inside of L′ or drawn away from it to any distance desired. The coils, L and L′, are high potential coils consisting of a very few turns of heavy copper tubing or stranded insulated wire, the turns being well insulated from each other and of suitable current-carrying capacity. In previous issues of THE WIRELESS AGE, a number of oscillation transformers of suitable construction for amateur work have been fully described.

When the coil, L, (Fig. 4) is drawn at a suitable distance from L′ a pure wave will be emitted from the antenna which will tune "sharp" at the distant receiving station. When the coil, L, is directly inside of L′ a complex wave is emitted which tunes "broadly," causing considerable interference. The actual position of the two coils for a non-interfering wave is determined by means of a wave-meter. It is plain that the oscillation transformer allows the character of the emitted wave to be definitely controlled in compliance with the restrictions. The high potential condenser of the set shown in Fig. 4 is preferably excited by an alternating current transformer rather than a spark coil, although the spark coils of the larger size may be employed.

The transmitting station just described cannot be put into operation until a station license is secured. And a station license cannot be obtained until the owner or other responsible party possesses a first or second grade amateur operating license.

The amateur must then proceed to one of the United States examining points and take the examination for an amateur's certificate. The conditions necessary for obtaining such a certificate have been previously set forth.

Operators' examinations may be taken at the following United States Navy Yards: Boston, Mass.; New York; Philadelphia, Pa.; Norfolk, Va.; Charleston, S. C.; New Orleans, La.; Mare Island, Cal.; Puget Sound, Wash. Also at the following Naval radio stations: San Juan, Porto Rico; Colon, Republic of Panama; Honolulu, Hawaii Islands; Key West, Fla. The following United States army stations are also open for examinations: Fort Omaha, Neb.; Fort Wood, N. Y.; Fortress Monroe, Va.; Fort St. Michael, Alaska; Fort Valdez, Alaska.

Amateurs residing in Washington and vicinity may take their examinations at the Bureau of Navigation, Department of Commerce, Washington, D. C. Examinations are also held at the Radio Inspectors' offices or elsewhere by special arrangement.

Amateurs should write to the examining officer nearest to their stations and secure a copy of form 756—the application blank for an operator's license—and to the radio inspector for form 757 which is an application for a license for a land station. Amateurs at points remote from examining officers and radio inspectors may obtain second grade amateur licenses without personal examination. Examinations for first grade licenses will be given by the radio inspector when he is in the vicinity of their stations, but special trips cannot be made for this purpose. Persons holding amateur second grade operating licenses should make every effort to appear at one of the examination points to take the examination for an amateur first grade license or higher.

Land Station Licenses

To secure a land station license the applicant fills out a blank form on which he states the nature, type and character of his apparatus. The authorities use this information in making calculations and ascertaining the probable wavelength and range of the set. In their final decisions they are not wholly guided by the nature of the set alone, but by the local conditions surrounding the station and the probable interference that it will set up. The license having been granted the beginner may now communicate with his fellow amateurs to his heart's content, happy in the feeling that he has moved up a round on the ladder.

He now decides to inform himself on wireless more fully. He studies the intricacies of more complicated equipments; he attends lectures on the subject, becomes a member of a radio club, and incidentally lends a helping hand to the beginner at the bottom of the ladder where he himself once started. He becomes interested in the general progress of wireless telegraphy and purchases important works on the subject.

Books on Wireless for Amateurs

While there are a number of books published on wireless it is found that each publication is generally devoted to one particular phase of the subject. For general, all-around information the author recommends the "Year Book of Wireless Telegraphy," issued by the Marconi Publishing Corporation. Containing a wealth of data on the entire wireless situation, the information given in this book is indispensable to the amateur as a work of reference.

For a modern textbook covering the elements of electricity and magnetism as well as the more up-to-date equipments employed in radio telegraphic work, the "Text Book on Wireless Telegraphy," by Rupert Stanley, is recommended. While the description of some of the modern types of transmitting and receiving equipments are somewhat brief, the explanations given are sufficient to afford the learner an insight into the general construction and operation of the apparatus.

If the student desires to study wireless telegraphy from the standpoint of the United States naval practice, and incidentally desires a publication on the fundamentals of electricity, the "Naval Manual of Wireless Telegraphy for 1913," by Commander Robison, is of incalculable value. However, should he desire a complete account of the early experiments in wireless telegraphy, particularly those of Marconi, the "Elementary Manual of Radio Telegraphy and Radio Telephony," by J. A. Fleming, is the most comprehensive.

For general knowledge of the fundamentals of wireless telegraphy, but more particularly for the results of research work on receiving apparatus, the "Principles of Wireless Telegraphy," by George W. Pierce, is indispensable.

"Wireless Telegraphy and Telephony," by A. Kennelly, is recommended to the experimenters who require a simple explanation of the propagation of electromagnetic waves through ether. As the student progresses in his work he becomes desirous of owning a wave-meter but wishes a detailed treatise on its operation and general use. For him we recommend the "Wave-meters in Wireless Telegraphy," by Lieutenant Mauborgne.

There is no reason for the beginner who has been able to cover only from 15 to 40 miles to feel discouraged when he hears other amateurs declare that they have received signals at a distance of 2,000 miles. He should keep in mind that the latter results are obtainable only at night time during the more favorable months of the year. In the United States the time favorable for long distance working seems to be from about September 25th to April 15th, of the following year. The question as to what results can be obtained from the middle of April to the latter part of September is problematical.

When the amateur living in Minnesota informs us that he has heard signals from the Key West, Fla., naval station, and commercial stations on the Atlantic coast, he is undoubtedly voicing the truth; such accomplishments are possible, but only during the time previously mentioned. And, again, upon investigation, it will invariably be found that a sensitive receiving set thoroughly understood by the owner of the station did the work.

In attempts at long distance receiving many amateurs do not take into account the effects of local conditions. For example, if the receiving aerial is located behind a steel building, in the tree tops behind other structural steel work, or in valleys, signals from distant stations are not received as well as upon aerials which are in the open country, free from obstructions.

Receiving Detectors

Experimenters frequently ask the writer which of the crystalline detectors are the most suitable for the beginner. For the person who is absolutely uninformed on the adjustment of receiving

detectors, the cerusite or the perikon detectors are recommended. Cerusite possesses a peculiar property—practically the entire surfaec of the crystal is of equal sensibility. The perikon detector possesses somewhat similar characteristics, but not to the same degree.

Galena and silicon crystals are difficult to adjust and to maintain in the sensitive condition. Carborundum crystals are nearly as sensitive as cerusite crystals and will hold their adjustments indefinitely. In fact such crystals are extremely rugged and highly desirable where considerable transmitting is done.

The vacuum valve detectors are also very sensitive and quite stable in action, but require a little more skill than detectors of the crystalline type.

No mention has been made of the inductively coupled receiving tuner in this article as the subject was fully covered in two previous issues of THE WIRELESS AGE.

(To be continued)

EDITOR'S NOTE: It is the custom of many amateurs to discontinue their experiments during the summer for various reasons. This, it is believed, is largely due to the general exodus of the experimenters from the city to the open country during the warmer months and the call of out-of-door sports. The experimenter who puts aside the opportunity to make experiments during the summer overlooks a large field of profitable endeavor and diversion. In the July issue of THE WIRELESS AGE will appear an article entitled "Amateur Wireless Telegraphy During the Summer Months" in the series on "How to Conduct a Radio Club." In it will be described a number of experiments and tests of interest, many of which were made directly under the author's observation.

NEW RADIO RULES FOR CANAL

The Hydrographic Office of the U. S. Navy announces to vessels approaching the Panama Canal zone: "As soon as communication can be established with the Canal, vessels should report their names, nationality, length, draft, tonnage, whether or not they desire to pass through the Canal, require coal, provisions, supplies, repairs, to go alongside of a wharf, the use of tugs, probable time of arrival, length of stay in port, or any other matters of importance or interest. If this information has been previously communicated through agents or otherwise to the captain of the port, it will not be necessary to report by radio, but the probable time of arrival should always be sent.

"No radio tolls, either coast station or forwarding, will be imposed against ships on radiograms transmitted by ships on Canal business. There will be no charge made against the Panama Canal by Canal Zone land lines or radio stations for the transmission of radiograms to ships on Canal business."

The naval service will claim no charges from ships on messages sent by masters of vessels to any government official in the Canal Zone, which messages contain information set forth in the first paragraph. Such messages will be treated as Canal business. In order to facilitate accounting it is requested that such messages be checked "CB," indicating that the messages are sent on Canal business.

CONSENT NECESSARY FOR BURIAL

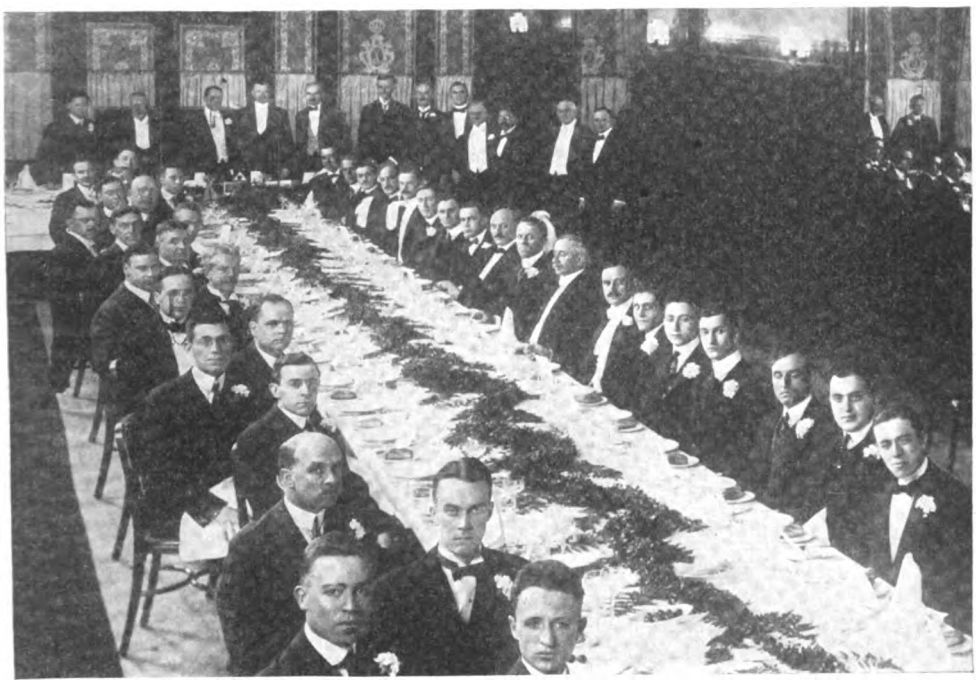
Judge Shearn in the Supreme Court, New York, recently overruled a demurrer of the Atlantic Transport Company, in the suit brought by H. Blair Finley, holding that a steamship company in this age of wireless has not the right to bury at sea, without the consent of relatives, a passenger who dies after the vessel has left port. Finley sued for $3,000 because his father, Clement B. Finley, was buried off Nantucket Shoals on a voyage of the steamship Minneapolis from London to New York.

The steamship company contended that the practice of immediate burial at sea is countenanced by custom. Judge Shearn ruled that in view of the facilities afforded by wireless telegraphy, whatever reason it might have had for existence is past. He gave the company ten days in which to answer preparatory to trial.

THE INSTITUTE MEETING

At a meeting of the Institute of Radio Engineers, held on May 5, at Columbia University, New York, Benjamin Liebowitz presented a paper on "The Pupin Theory of Asymmetrical Reports in Unidirectional Fields, With Special Reference to the Theory of the Goldschmidt Alternator." The theory of the Goldschmidt alternator in particular as developed by Professor Pupin was discussed.

Radio Institute Dinner



Photograph showing members of the Institute of Radio Engineers and others at banquet given in honor of Dr. Braun and Prof. Zenneck

WHAT was described as a "strictly neutral" feast was given by the Institute of Radio Engineers on April 24 at Lüchow's restaurant in New York. Dr. Ferdinand Braun, professor of physics, University of Strassburg, Germany, and a distinguished countryman, Prof. Johann Zenneck, were the guests of honor. In the gathering of eminent scientists many nationalities were represented, notably those of the belligerent countries, proving that the field of scientific research observes no outside influences. Warfare of another kind, the grim commercial battles fought out in the courts, was also represented in a delegation of notables from the National Electric Signaling Company, the Atlantic Communication Company and the Marconi Wireless Telegraph Company of America, all mingling on the friendliest terms throughout the evening. Judge Julius M. Mayer, who is presiding in one of the legal contests, was present, as he assured everybody, "in a strictly neutral capacity."

In the accompanying photograph may be seen those at the guest table; they are, standing in the background, from left to right: Prof. George W. Pierce, of Harvard University; Dr. Braun, John Stone Stone, president of the Institute and toastmaster; Prof. Zenneck, Dr. Lee De Forest, Nikola Tesla, Dr. Fritz Lowenstein, Dr. Alfred N. Goldsmith of the College of the City of New York, Judge Mayer, Dr. Karl G. Frank of the Atlantic Communication Company, Edward J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Com-

pany of America, and R. H. Marriott, government radio inspector.

The speakers were Dr. Braun, Prof. Zenneck, Prof. Pierce, Dr. De Forest, Judge Mayer, Dr. Goldsmith, Nikola Tesla and Inspector Marriott.

Dr. Braun experienced some difficulty in expressing himself in English and begged permission to extend his thanks in his mother tongue. One of the surprises of the evening came when Dr. Goldsmith was later called upon and disclosed the fact that he had taken down in shorthand the guests' remarks, and forthwith read a translation from the German for the benefit of those who had not understood what had been said.

Prof. Zenneck spoke of the consideration he had received at all hands during his visit and Tesla followed with a summary of German scientific activities from the human interest viewpoint; he also expressed the hope that wireless would prove an agent of peace in binding the nations closer together. Prof. Pierce and Dr. De Forest spoke mainly of experiences of a humorous order in the early days of wireless communication, Judge Mayer defined the mental attitude of the judiciary and the difficulties in mastering the intricate problems presented in court. Mr. Marriott, in predicting accelerated development in wireless, took occasion to praise the amateur, the builder of experimental apparatus and the magazines which reported development and thus saved repetition of effort.

More than fifty members attended the dinner. Mr. Marconi arrived on the Lusitania but a few hours earlier in the day and although a marconigram invitation was delivered to him aboard the vessel before she entered port, a previous engagement prevented his acceptance and a message to this effect dispatched to the Institute was read to the assemblage.

WHISTLE AND WIRELESS COMBINED IN FOG

W. W. O'Farrell, electrician first class, first operator on the United States revenue cutter Manning, has reported an unusual experience.

"Along about the 4th or 5th of May, 1914," he said, "the Manning was lying at anchor in Alert Bay, B. C. About midnight a very dense fog shut down about the bay and the Inside Passage, well known to Alaskan travelers as very dangerous to navigation in foggy weather. I had the 12 to 4 a. m. watch, and about 3 a. m. had just finished clearing N. P. D. (Tatoosh), when a vessel very near Camosun called and asked where we were. I answered and told him we were at anchor in Alert Bay. He came back, saying that they were off Alert Bay, but had lost their bearings in the fog and were in a bad way unless they could find somewhere to anchor until the fog lifted. As I knew they were very near, I suggested that the operator ask his captain to blow the whistle, and that I would go on deck and listen for it. He did so, and on reaching the deck I could hear a whistle very faintly, which I guessed rightly was theirs. I then informed him that I could hear the whistle, and suggested he go and tell his captain that we would blow ours and he could then be guided to an anchorage near us. He did so, and the vessel was very soon anchored alongside of us.

"I do not know the name of the ship, as I did not look it up at the time, and promptly forgot all about the incident until the other day, when we again anchored at Alert Bay. I do not possess a foreign call book, so the letters will have to do unless someone is interested enough to look up the name of the vessel. I remember her call letters very well; they were V. F. Z.*

"I do not say that any lives or property were saved, but it certainly relieved the captain and passengers to know that they were safely anchored and not running in the fog without correct bearings, and also it may be a good thing for operators to remember in a like position."

It has been announced that the United States navy will establish a wireless station on Cape Cod especially equipped to guide vessels along the Atlantic coast in time of fog.

*The Camosun.

IN THE SERVICE

If early distinction counts for anything, good fortune should be with Chauncey D. Warner, assistant engineer of the Marconi Wireless Telegraph Company of America, for he started in life as a person of mark. This statemen is borne out by the official records of Webster County, Nebraska, which bear testimony to the effect that he was the first boy born in that county.

Warner's parents were among the pioneers who left New York State to establish a home in Nebraska, settling in Red Cloud, where the subject of this article was born. The recollections of his boyhood are of Indians, cowboys and bucking broncos, all of which made up an environment that might well have influenced the youth to follow any career but one requiring study and application. Young Warner, however, had in mind a course at the University of Nebraska at Lincoln, and accordingly he set out to realize his aims, with the result that he was enrolled as a student at the University. Outside of his studies his chief interests at Lincoln lay in the Engineering Society, of which he was elected president.

Warner was graduated from the University in 1896 with the degree of B. Sc., going soon afterward to Colorado, where he engaged in civil engineering. After spending almost two months in Colorado he returned to Red Cloud and began to consider plans for his future. In Nebraska and the neighboring states there was little opportunity to become identified with electrical industries, to which he had planned to devote his efforts, so he determined to make a place for himself in the field in the East.

His first employment was with the Iron Clad Rheostat Company, of Westfield, N. J. Then he entered the service of the Moore Light Company, with offices in New York, becoming assistant chief engineer and sales manager. During the development of the "vacuum breaks" and high frequency generators in 1902 he was in charge of the laboratory, afterward being detailed to the supervision of the sales and constructive work. About this time a small vacuum break-coherer set was designed and made up by means of which signals were transmitted and received from the tops of buildings in Newark, N. J., approximately one mile apart. Warner has taken an active interest in wireless since then.

He was in the employ of the Moore Company for fifteen years, entering the service of the Marconi Company in April, 1912. His duties with the latter company have included the supervision of the equipment of the Marconi stations at Ketchikan, Juneau and Astoria; the equipment of the United Fruit Company's stations at New Orleans, Swan Island and Santa Marta, and the direction of the equipment of various craft with auxiliary sets. He also aided in selecting the sites for the trans-oceanic stations at Belmar and New Brunswick. He recently acted as chief engineer while Frederick M. Sammis was on a tour of inspection of the stations in the Northern District.

Latest portrait of Marconi, taken aboard the Lusitania when he arrived in New York a few weeks ago

WAR CALLS MARCONI TO ITALY

The trial of the Marconi Wireless Telegraph Company against the Atlantic Communication Company for infringement of patents, which had been in progress for more than two weeks before Judge Van Vechten Veeder, in the United States District Court in Brooklyn, N. Y., would be adjourned, it was announced on May 21, after Guglielmo Marconi had declared that he intended to leave for Italy at once because that country was on the verge of war. Mr. Marconi arrived in New York on April 24, being one of the principal witnesses in the case.

In a brief address to Judge Veeder he said that after consulting the Italian authorities in New York he had been advised to return to Italy immediately. Although war between Italy and her foes had not yet been declared, he explained, it seemed to be a matter of only a few hours. Mr. Marconi then shook hands with Judge Veeder, the counsel for the Atlantic Communication Company, and Johann Zenneck, a German expert, who had been summoned from Belgium to testify.

Judge Veeder said that the trial would be adjourned for several months and that a further adjournment would be taken in the event that Mr. Marconi could not return at that time.

In the course of the trial two wireless equipments were set up in the court room by the defendant company which attempted to show the difference between its apparatus and that of the Marconi Company. One session of the court was held at the wireless station maintained by the defendant at Sayville, L. I., Judge Veeder wishing to make a close inspection of the parts of the apparatus in dispute. While at Sayville Mr. Marconi sent a test message to Arlington.

Mr. Marconi, who is an officer in the Italian navy, believes that it will give an excellent account of itself. He said that its officers and men are well trained and that a number of new ships had been commissioned since the European war began, among them being several of the dreadnought type. The economical situation in Italy, he declared, was good.

He believes that if Germany and Austria-Hungary had consulted Italy during the crisis that preceded the outbreak of the war, the conflict might have been prevented. The Italian government did not favor the war.

Mr. Marconi left New York on the steamship St. Paul on May 22, for England. From that country he will proceed to Italy.

MARCONI ORDER AFFIRMED

Judges Lacombe, Ward and Rogers, sitting in the Circuit Court of Appeals, New York, handed down a decision on May 13, affirming the order of Judge Hough granting a preliminary injunction restraining the De Forest Radio Telegraph & Telephone Company, the Standard Oil Company of New York and Lee De Forest from infringing the fundamental Marconi and Lodge patents relating to wireless telegraphy. It had been urged before Judge Hough and the Court of Appeals that it was inequitable to grant the injunction because the Marconi Company had recently raised its rental price to steamship companies to $100 a month. Judge Hough said in his opinion:

"The action of Judge Veeder and that of the courts of the Third Circuit in respect to the Fessenden patents, followed by a treaty of peace between complainant and Fessenden party, has undoubtedly put the Marconi Company in a much stronger position than it previously occupied. I am convinced that down to the present time the expense of operation (and of litigation), has been so enormous that complainant has received no fair return from the invention which under decisions now ruling I must hold to be of the greatest value and worthy both of praise and reward."

The decision of the Circuit Court of Appeals in effect affirms this ruling of Judge Hough. The decision also affirms the orders of Judge Hough denying the motions to vacate or modify the injunction as well as motions to suspend the operation. The court stated that it was not necessary to add anything to the discussion, as the Marconi and Lodge patents and the prior art had been fully and carefully considered by Judge Veeder in the suit of the Marconi Company against the National Electric Signaling Company.

The Radio Development Association of Hamsville

Prologue

Several years ago amateur wireless telegraphy was only beginning to take firm root and few experimenters were possessed of the finely finished instruments to be seen in numberless stations of the present day. There were no radio inspectors to hamper the amateur's wave-lengths and prescribe doses of rotary gaps and oscillation transformers for the treatment of impure or broad waves, so these were of every length from one hundred to several thousand meters.

In a general way, however, there were many wireless stations—and there was a particular one at Hamsville, a sleepy village of less than three hundred inhabitants, lying in a sheep ranching district far up in the foothills of Northern California. (Of course the real name of the village is something else, but even under its true name, Hamsville probably could not be found on any self-respecting map.) Hamsville would have been a pitifully unimportant and antiquated hamlet but for one thing. Its citizens—that is, a few of them—had electric light service, a phenomenon due to a power company having constructed a hydro-electric plant on the Rocky River up in the Snow Mountains and running a high tension line from there to a distant city. As this line passed only a few miles to the westward of Hamsville, the enterprising power company ran a small branch line up to the village; but it had not proved a very profitable investment, for about a dozen families, all told, could be induced to use the current, and then only on Sunday nights when callers came. In such a peaceful environment one would hardly have expected to find so modern an accessory as the amateur and his wireless apparatus. But there they were, and if it had not been for the heavy current consumption consequent thereon the branch power line would probably have fizzled out entirely.

Neither would the incidents related herein have occurred, which of course is of more interest to you and to me.

CHAPTER I

IT is of little importance, chronologically or otherwise, but for the sake of accuracy it may be well to state that the story opens on a chilly December evening. The young wireless men of Hamsville were congregated about the dilapidated stove in 'Lectricity Bob's station. There was Fred Schindler, and there was Slim Slattery, while behind the stove sat Johnny Sprague, a quiet little fellow of eleven; and next to him was Spunk Gilmore, an ignorant dare-anything who played hookey from school about five times a week on the average, and whose pursuit of radio knowledge was seriously hampered by ignorance of correct spelling. The group was completed by Robert Morrison, who had put up the first aerial in Hamsville and was generally known as 'Lectricity Bob. He had been an electrical experimenter ever since the day that storekeeper Henry Brown had given him an old-fashioned electric door bell outfit, principally because it had laid on a shelf in the store so long that Henry finally became convinced that he would never get rid of it unless he gave it away. From that humble beginning Bob had progressed

rapidly and, as we now see him, had become the owner of a complete wireless station.

This was located in an old shed which had served for many years as a chicken coop; the fowls finally being ejected to make room for 'Lectricity's wireless set when it had grown beyond the size his mother would permit on a table in the front sitting room. The chicken coop, renovated and given a coat of whitewash, had since been spoken of in awesome tones as "'Lectricity Bob's wireless plant." The station's principal claims to largeness, however, were those of comparison. There were four other "plants" in the town.

Bob was the possessor of a big transformer which he had constructed mainly from the charred remains of a burnt-out pole transformer given to him by the light company. He had rewound it in a haphazard fashion and it pulled so much current that every light within a quarter of a mile dimmed or went out entirely whenever he pressed the key. This transformer produced a tremendous spark in the gap, which Bob kept as wide as he dared, decreasing the efficiency of the set perhaps, but greatly improving its noise-producing qualities. Holding the key down for several minutes at a time and watching the sparks flash was a pastime that sent the wheel in the meter racing like a fan motor, but was a source of much pleasure nevertheless. This gratifying pursuit could not be enjoyed *ad lib,* however, since the transformer became hot as a stove after being used steadily for a few minutes.

Another treasure the electric light company had contributed was a large ammeter; this he had screwed to the wall, although it had not been connected up, for as Bob had told his friends: "It's a perfectly good ammeter, only part of the inside has been took out of it; and it don't make no difference anyway, 'cause even if it won't work, it is just as good as if it did." His friends had agreed that this was true.

Then there was, of course, a condenser for his transformer; a condenser which consisted of a great number of tin foil covered bottles of all sizes and colors, with the tops broken off to make possible the inside coating. The bottles were in a soap box under the table and when the set was in operation the container filled with blue fire. A helix hung from the roof just above the table; it was an immense square arrangement which Bob had made by winding a piece of galvanized iron fence wire around a heavy frame constructed from the abandoned chicken roost. This apparatus, together with a couple of needle point gaps to take care of the kickback, a couple of switches and a home-made key, completed the transmitting equipment.

Despite the generous size of all the parts of this set, Robert never worked with anyone outside of Hamsville. This might have been because there was a difference of about three hundred meters between the open and closed circuit wave-lengths, or possibly because there was no other amateur within several hundred miles of Hamsville. But such communication details made no difference to the aspiring amateur; as long as he was able to exchange signals with his four friends in the village and had a good fixed spark he was entirely satisfied.

Although Bob was seventeen years of age and still poking along in the sixth grade in the little public school at Hamsville he was looked upon by the people of the village as an extra smart boy. To them, he was a born genius—one destined to make a name for himself in the world. They would have called him a second Edison, had anyone among them thought of it. All Hamsville could, and did, tell each other and all strangers how Bob had not only constructed his wireless plant single handed, but had also personally supervised the transformation of soap boxes, tin cans, bell wire and such heterogeneous collections of junk into instruments for the village's four other young emulators of Marconi.

These four boys held Bob in highest esteem; he had taught them all that they knew about wireless, and was always ready to come over and help them out when their sets refused to work. The services of the consultant usually were required because they had forgotten to close the aerial switch (if they had one) or because their seventy-five ohm telephone cords were disconnected. But in

either case, 'Lectricity Bob was all-sufficient. In fact he was omnipotent.

Who but he could have initiated them into the exciting operations of tuning for the two outside stations they could hear, Mare Island and San Francisco? He alone had guided them through the intricacies of tuning coil construction, and shown them that a variable condenser was nothing more than Van Damp's bean can, covered with paper and arranged to slide into a tomato can fastened to a board. He, too, had laid bare to them the paper and tin foil secrets of the fixed condenser. Of the code he was a master. In the approved copying attitude he would listen to the press which came buzzing in at the great speed of about sixteen words a minute, and he could get a couple of lines once in a while; as a matter of fact on several occasions, at the expense of strenuous mental effort, he had copied a whole news item partly correct.

Once he had heard Mare Island sending a long official message to a battleship, and he copied it without losing a single letter. That the battleship was about two thousand miles out in the ocean and the static so very bad that the message was sent at about ten words a minute and repeated three times, was not mentioned; but even had it been known, the triumph would still have been as great. Every one in Hamsville heard about it and thought it a most remarkable feat—another proof of Bob's superior ability. The young man in question was as pleased with himself as a successful graduate from the Marconi school who has just got his license, and he tacked the message up in a conspicuous place on the wall near the ammeter, so that whoever might chance to visit the station would not fail to see it.

But to return to the chilly evening when the five Hamsville amateurs were warming the stove in Bob's station:

Bob was just telling them of an idea which had popped into his head that very day. He had been reading how many of the amateurs in the big cities were forming wireless clubs, and had conceived the idea that he and his friends might well do likewise. "We can have a club as well as them other fellers," he insisted.

"Aw, what's the use of us doin' that?" asked Spunk. "What do they do in them clubs you've been tellin' about?"

"Oh, they have a president and they have some place where they have regular meetings, and so on," explained Bob. "Can't you see what a lot of fun it would be for us to do it?"

"Yes, I see—like a blind man," said Spunk. "Can't we meet here just the same as we've always done, whether we have any club or not?"

"Well I reckon it would be pretty good all right," ventured Slim, "only there ain't enough of us to have much of a club. Time we 'lect some other officers 'sides a president there would be nobody left."

"Well, that don't hurt none," Bob assured him.

"There won't be no scrap then about who's goin' to be the officers and who's not, will there?"

"We can do it all right," interrupted Fred. "I reckon we can do it just as well as them city fellers what Bob's been tellin' us about."

"What are you goin' to call this here club anyway?" inquired the still dubious Spunk.

"Well, I haven't thought of a good name yet," replied Bob. "But we don't want no common name like Hamsville Wireless Club, like all these other fellers are doin'. We want to have some classy, important sounding name, like the World Wireless Company, or sumpin' like that."

Whereupon all question as to whether or not they should have a club was forgotten in the animated discussion about its official title.

"Dad" Morrison, who had retired an hour before, was awakened by the discussion in the wireless station, almost directly underneath his bedroom window. After trying vainly to go to sleep again, he very unwillingly got up and went downstairs. "What in tarnation's the matter in here, anyway?" he demanded, poking his head in the station door as he shivered uncomfortably in the cool night air. The argument subsided. Bob commenced to explain that on this hallowed ground was being formed a wireless company, and the consideration before the house was the selection of a name "whereby best to call it."

"Gol dern ye," interjected the exas-

perated father before Bob could finish, "do you think me and ma are agoin' to be kep' awake all night on account of that humbug bizness? Gol darn it." He paused for breath. "Ye'r up to some fool monkeyshines all the time. Every night either some of you fellers is a-roostin' here jabbering away like sixteen bluejays an' a talkin' machine or else that dern contraption," and he pointed expressively at Bob's spark gap, "is a-bangin' away like a Fourth of July celebration. You'd ought to call yourselves the Bughouse Wireless Nuts Company for the Prevention of Sleep; that's what you ought, by heck," and with that brilliant suggestion he slammed the door shut and went grumbling back to bed.

The discussion came to an end shortly afterward, not, however, until Bob had selected from a wireless magazine a name which they all agreed would be satisfactory. The name, The Radio Development Association of Blank City, amended to Hamsville, so as to properly fit their own organization, was unanimously carried in a rising vote.

"Golly! that's a swell sounding name, ain't it though?" exclaimed Fred enthusiastically. "I'll bet none of them can beat that!"

"Yep, it sounds all right I reckon, but it's plagued hard to remember, and we don't any of us know eggsactly what it means," objected the fault-finding Spunk.

"That don't matter none," Fred assured him. "We can all write it down on a piece of paper so's we won't forget it." Whereupon each proceeded to do that very thing.

The meeting then adjourned, after they had agreed to sit in executive session on the following night to appoint the various officials needed for the association.

A full hour before the time set the members of the R. D. A., as they already called it for short, were assembled at Bob's station. That is, all except Spunk, who put in a belated appearance which he explained was due to having been obliged to do some repair work to his set that evening; he had kept at it until he had finished.

"By the way, what was the matter with your outfit last night, Spunk?" inquired Fred. "I was callin' you a long time and you didn't come back."

"I heard you all right," replied Spunk, "but I couldn't work my coil," and his face filled with indignation. "Yesterday ma she got a leak in her teakettle, which same teakettle she didn't want to throw away, seein' as how she had only had it for about a year, so pa he tried to solder it up fer her an' he didn't have no soldering acid, an' so he went an' took the dope outa my 'lectroliquidic interrupter, an' he used up so much that I had to fix up some more today—an' he never got the teakettle fixed neither! Doggone it anyway, pa's always takin' my stuff when he wants it fer somethin'; the other day he wanted to take my aerial wires down to make a clothesline with fer ma, an' I had a hard time to keep him from doin' it, too." Spunk's voice broke with indignation.

"Shucks, that's nothin'!" replied Fred, "you didn't get licked like I did. I was trying to make one of them acetylene gas lights for my magic lantern, like what I read about in the Farmers' Magazine, and last Wednesday night I had it in the house trying to make it work. I kept putting matches to it, but it wouldn't burn worth a cent. The Farmers' Magazine said to add more water if it didn't burn good, so I did; an' when I tried to light it again the dang thing took fire all over an' exploded or somethin' an' one of the pieces flew up and hit the hangin' lamp with a bang an' made a big dent in the shade, an' the water run all over ma's floor an' ma she got mad an' grabbed me

an' helped pa to give me the worst lickin' I've had in two weeks." The experimenter stopped for breath.

His hearers sat in silence; evidently something more was expected of him. "An' it cost mor'n fifty cents to make it too," he added mournfully.

But with such incidents, or accidents, as matters of common occurrence the troubles of the five were soon forgotten in the excitement attendant upon the important task of appointing officers of the R. D. A. Bob was made president as a matter of course; Fred was appointed secretary, and Slim secured the office of treasurer. Then the five faced an unexpected problem. Spunk and Johnny were still to be elected and no one could think of any other offices to be held. The question was considered long in silence. Puzzled glances passed back and forth among the group. Suddenly Slim exclaimed:

"Say, don't they have assistant president or sumpin' like that in those reg'lar companies?"

"Oh, sure! I forgot all about that," replied the newly elected chairman with relief. "They have vice-presidents; at least I think that's what they call 'em."

A magazine was sought and the title verified. So Johnny was made vice-president, and, following up this new idea, Spunk "vice-secretary," an office which Bob finally convinced him would not call for particularly strenuous efforts in discharge of duties."

"Now, there's one more thing that we've got to do," said Bob, "an' that's to fix up a constitution."

"Whadda'ya mean, Kahn's tertushun?" demanded Spunk. "How much will it cost? Can we make one?" he demanded further. "Doggone it! what's the use of all this hard work a-makin' officers if you have to do more all the time? Do all companies have officers and this feller Kahn's tertushuns?"

"Constitution is the word," corrected Bob patiently. "It's not a 'lectrical device. It's a paper. Remember one time we read in the history in school how the United States has a constitution that was wrote by George Washington an' some of his friends, an'——"

"Naw, not Washington, Aberham Lincoln," interrupted Fred in a positive tone of voice. "I know 'cause I studied that hist'ry a lot."

"Aw, shut up," growled Spunk. "It don't make no difference who wrote it; a Chinaman might have done it f'r all you know."

"Well, I wasn't sure which one did it," continued Bob. "Anyway I was goin' to say that this constitution is a lot of laws tellin' what's to be done with murderers, fellers who go duck hunting outa season and all such."

"What's that go to do with us?" came from the unenlightened one.

Bob looked at him disgustedly. "Ain't I been tellin' you all the time that we got to have laws for our company same as the United States has, an' all companies has?"

The general idea finally percolated into Spunk's consciousness and the group forthwith set about drawing up a set of rules to govern the activities of the R. D. A.

Regulations beyond counting were suggested and passed in the hour following, but the keynote was contained in three rules which can be mentioned here:

Rule 9 provided that "any person joining the R. D. A. must have a wireless outfit and must know the code."

Under rule 10, "No person was allowed to send more than seven words a minute," to which was added: "Except when sending to the president, when eight and one-half words is allowed."

Rule 15 insisted that "no girls or any other females will be allowed in this company."

The rules were committed to memory and the secretary instructed to later transcribe them to paper. "I'll bet you old Lincoln himself couldn't have done it any better'n that," said Bob when the work had been completed to the satisfaction of all present.

Spunk rose and stretched luxuriously, "I'm goin' home," he said.

Thus adjourned the first meeting of the organization which purposed to be a means of great uplift in the community.

CHAPTER II

Ten months had passed by. The chicken coop still boasted a big sign

above the door, painted in rough black letters and telling to all that here were the "Headquarters of the R. D. A.," while on the door itself was a smaller sign carrying the afterthought, "Main Office."

It had been a period of great development and some expansion. The R. D. A. had picked up one new member, but his interest in wireless proved to be but a passing fancy and he had been dropped from membership.

What had started on its career in a whirl of enthusiasm now seemed to be quietly passing out of existence. The R. D. A. had not held an official meeting for some time.

Bob refused to see an end to his hopes. Many times he had thought of engaging prospects and attempted to gather the clan about him, but he had failed. On the night which caused this chapter to be written, however, he had a brilliant inspiration. Steadily, for upwards of a half hour, his crashing spark shook the little building. The four brother members finally heard the general call and noted down the request that they assemble without fail in the headquarters on the following Saturday night. Further inquiry was summarily cut off; not a word would the president tell of his plans. When once the summons had been acknowledged his crashing spark ceased.

It was a master stroke of advertising. Four heads immediately bobbed closely together and the buzz of speculation continued through the two nights intervening; on Saturday they were assembled long before the time set.

Bob rose to address them with a dignity that hinted at things mysterious and inviting. "You know," he commenced, "we haven't done anything with our club for quite some time, an' I've been figgerin' with all my might to get up some new things for us to do. I've been studyin' about it for quite a spell, but I couldn't think of nothin' . . . until just the other night, when I told all you fellers to come over. All of a sudden I thought of a fine stunt we could try—have a lot of fun and make a lot of money."

"Well, hurry up an' tell us. What's the plan? Give it to us," came from the impatient Spunk.

"Shet up!"

"Hold yer way."

"Hold yer horses!"

"Wait a minnit, can't yer?"

"Order!"

"I think we could have a great time," continued Bob, swelling with visible importance, "if we should take a wireless set and go round to some of the towns in the valley, an' hire a hall an' give a wireless show. We could put up a set an' hang up some wire on the roof or somewhere's an' hook a bunch of receivers onto the set an' let the crowd listen to Mare Island, whenever he gets goin', an 'then I could bring my sendin' outfit an' show 'em the spark an' I think it would be a great scheme, don't you?"

All four listeners were so dazed by the dazzling possibilities and the wonderful flow of language that for a few minutes they would say nothing on the scheme so suddenly placed before them. Even the doubting and fault-finding Spunk was at a loss for words to fittingly express his emotions. The project was amazing; napoleonic.

"I think," continued Bob, visibly swelled with pride, "that we had best try Bingleton first, 'cause it's the biggest town in the valley an' besides the Ladies' Improvement Club in Bingleton have got a extra big hall, an' there they have a dance every month an' so you see we could go over there some time when they're a-goin' to have a dance an' put up the wireless set in one of them side rooms they've got there.

"We could let in 'bout twenty-five at a time an' let 'em hear the signals an' show 'en the spark an' then send 'em out an' take in a new bunch an' so on." The president's voice had been rising in cadences that broke into a shrill treble as with an all-embracing gesture he effectively delivered his climax: "We could charge about two bits apiece—making as much as thirty dollars all in one night!"

"Whew!" gasped the circle.

"Golly! that would be a lot of money, wouldn't it though?" said Slim in a voice filled with awe.

Spunk looked puzzled and the frown deepened on his brow; it was difficult to find something wrong here. Then: "But how are we ever goin' to pack a wireless

outfit an' ourselves an' such things as we'd have to have, clear down to Bingleton?" he announced in a voice of triumph. "It's twenty miles away from here."

But Bob, like a true, shrewd general, had prepared for all contingencies. "I can fix that all right," he replied with studied carelessness. "We can take them there two colts what pa had broke in last winter an' hitch 'em to the spring wagon an' I just reckon we'll get there all right, all right."

"Get there in pieces," forecasted Spunk gloomily, for he had painful memories of the time when he had rashly attempted to ride one of those colts.

"I think it would be better if we got a whole hall some time when there ain't no dance," offered Fred.

"I thought of that," said Bob, depreatingly, "but the suggestion's no good. It would cost a lot of money to get the whole place, an' besides there is always a big crowd to the dances an' so we'd be sure of gettin' a few people anyway."

"'Lectricity is right about that," agreed Spunk for once.

Various projects were then discussed, ranging from the money-making possibilities to inserting a piece in the Bingleton Courier, "about the great wireless show run by the R. D. A., of Hamsville." In the midst of the discussion the president rose and rapped with a piece of kindling for order.

"I've got here a letter what I've already wrote to the old hens' convention," he announced. "I'll read it to you." The letter ran as follows:

"Dear Ladies, we wud like to bring a wireless set and come over to Bingleton some time when you are going to have a dance and give a wireless telegraphy show. We wud like to know if we cud git one of your small side rooms in the hall some night when there is goin' to be a dance and we will bring there our wireless set an set it up durin' the dance and how much wud you charge for it and when are you goin to have the next dance.

"yours truly,

"ROBERT MORRISON,

"President of the Radio Development Association of Hamsville.

"p. s.—Address is Robert Morrison Hamsville."

"Gosh! That sure is a swell letter, all right," said Fred, enthusiastically. "It sounds just as good as them letters them Senators down in Washington has been writin'. I'll bet you them there women will think we're sure some big outfit."

"An' I had some job to write it, too, let me tell you," declared Bob. "It ain't no simple thing to spell out the full name of the R. D. A. It was the first time I had to spell it for 'bout three months an' I had to go out an' look at the sign on the wall an' so's to be sure that I get it right I bet I had to look at it 'leven times at least."

"I s'pose that new howlin' spark bizness of yours will figger prominent in this, 'Lectricity?'" ventured Spunk.

Bob nodded assent. The device referred to was his particular pride and joy, the particular pride and joy of all for that matter. What Spunk had referred to as a "howlin' spark bizness" was in reality a rotary gap, the most recent addition to Bob's set. Envious for a long time of the descriptions he had read in the wireless magazines, the electrical genius of the circle had worried exceedingly over the lack of the more advanced type of spark. The spark of a set, to him, was the main thing; but he had been unable to build one, through lack of a motor. One day, however, he had accompanied his father on a trip to a neighboring village and when they returned Bob was in possession of an old discarded fan motor, rescued from a pile of miscellaneous junk in a wayside blacksmith's shop. After hours of patient toil he finally succeeded in getting it to run with uncertain regularity. Then it was fitted with a wooden disc carrying a number of large wooden screws driven about its circumference and equipped with the two usual standards on each side of the disc. In its working the gap exceeded even the most sanguine expectations of its creator. It would start up with a sort of low, moaning sound until it had reached full speed, when its weird crescendo rose to a wailing screech like that of a lost soul. It could be heard a great way off, and on the first night it was put in operation it created what amounted almost to a panic of terror in the immediate neighborhood. No one could have foretold what the consequences would have been had the gap

worked with regularity, for Bob was in the habit of sitting with the key depressed, listening enraptured to the screeching. For about three minutes this would continue, and then the motor usually went out of business. All would be quiet for a period, excepting for a faint tinkering with the motor. It would begin once more, only to be mercifully silenced a few minutes later.

"In addition to the rotary gap," said Bob, "we can take along my whole sendin' outfit an' we'll gather up a good bunch of tuning coils, fixed condensers an' things to fill out with so's to make it look like a big set." Everybody thought this was a good idea and the meeting adjourned when Bob remarked, "I'll mail this letter to-morrow."

The anxiously awaited reply came a few days later and requested that the R. D. A. send a representative to Bingleton to consult with the ladies' committee. This was responded to with alacrity and in the person of the president, who reported that evening a terrible session filled with embarrassing moments. Permission had been granted them, nevertheless, although it was specially provided that the boys should pay for any damage which might result from the introduction of this innovation. "A great big woman, lookin' like one o' the warriors in the history book, had an awful lot to say and come pretty near not lettin' the R. D. A. give the show because we wuz all boys. I give her so much 'lectrical talk, though, that she figgered I knew everything that wuz ever writ an' that's how she come to give in," boasted Bob in telling of the interview. "I told her we did not require much current, too, an' I've been wonderin' whether them lights over there are goin' to blink like these here in Hamsville does when I use my set. . . . Gee, I hope it'll be all right."

"Sure, it will," said the others hopefully.

And thus it was that on a Saturday morning two weeks later, a cheerful crew set forth in a spring wagon filled with instruments and headed towards Bingleton down in the valley. At nine the two young colts were pulled to a stop 'mid a chorus of "Whoas!" and the five future Marconis gazed appraisingly at the hall which was their destination. A room which had been recently converted into a public library had been placed at their disposal, and here they promptly assembled. While two wires were being strung from a nearby flagpole to the roof of the hall, the heterogeneous mass of apparatus was being laid out on the table and connected to a lead which was brought in through the window.

The equipment as installed consisted of Bob's sending outfit, complete with the formidable rotary gap, while for receiving there were a number of detectors, tuning coils and odds and ends of this and that, selected from the stations of the other four. Most of this apparatus was not connected up in any way with the working units, but lay in an impressive array on the generously proportioned reading table. "Just to fill in an' make it look bigger," as Bob expressed it. Two single high resistance receivers and one low resistance watch case receiver lay side by side with another which plainly showed signs of long service on some wire telephone. Current was brought to the transformer through a cord run to a chandelier and it was tested out with great excitement and rousing cheers from a number of small boys who had gathered about the hall and were watching the proceedings with the greatest curiosity, not unmingled with awesome admiration.

With but a single stop for a snack of luncheon at noontime, the work was pushed forward steadily and early in the afternoon all was thought to be in readiness. Then Fred suddenly startled the assemblage by the whispered intimation that no signals could be heard in the low resistance receivers, although they could be heard quite plainly in the others. Alas, it was true; and despite Bob's most heroic efforts the refractory something refused to disclose itself. After hours of unsuccessful testing and experimenting the others were ready to give up.

The president noticed the flagging spirits of his erstwhile staunch supporters and redoubled his efforts. It was no use. Seeing that the widely advertised wireless show was liable to go by the board, he rallied them around him with a stirring peroration which emphasized

the thirty dollars and the necessity and desirability of acquiring same—by artificial signals. The drooping spirits revived and the plan was quickly unfolded.

A cigar box was secured and the buzzer which Bob had used for adjusting his detector—the same one which had been furnished gratis by Storekeeper Brown—was placed in the box and packed around with pieces of newspaper. The clapper had been cut off and the buzzer padded with a small piece of rag to make it give a high-pitched note. When connected up it could be scarcely heard in operation in the cigar box, but it could be heard in all of the receivers to which it was connected. Two wires were run out to the wagon; this was placed close to a small back door in the library and it was arranged that Spunk should be stationed on the driving seat and would manufacture signals by touching the two wires together. "We can tell 'em it's Honolulu talking to San Francisco," said Bob. "An' they'll like it just as well as if they heard the real ones, 'cause they won't know the diff'rence anyway." But the explanation was unnecessary; the others had been readily convinced that this was the best thing to do.

Late in the afternoon the colts were hitched up so that an early start could be made on their long homeward drive when the dance had been concluded; as later events proved, this was most fortunate preparation. The plan of action for the coming evening was then rehearsed and it was decided that Johnny, who was the quickest at figures, would sell tickets, and Slim would take them at the door, while Bob and Fred would operate the set and Spunk furnish the signals from the wagon.

CHAPTER III

It is strange what momentous issues sometimes grow out of the most trifling causes. Thus the tiny flame of a match may cause a burned city, and rich men's sons like Clyde Marlow may happen by the merest chance to notice the heading of an announcement in the Bingleton Courier and set the fates at variance with well laid plans.

Clyde was on the return trip from a long drive to the Rocky River in a new automobile and was accompanied by his friend, Randolph Morgan. They had stopped at a road house for refreshments and Clyde was idly glancing over the four pages of the weekly sheet when he came upon the heading,

R. D. A. TO GIVE BIG WIRELESS SHOW

His curiosity was aroused, for he himself was a wireless enthusiast and the owner of a very complete and expensive, not to mention efficient, station in Santa Rosa. And so he continued to read.

> The Radio Development Association of Hamville, composed of five young men of that town, have arranged to give an exhibition of the wonders of wireless telegraphy at the Ladies' Hall on Saturday night. The members of the organization are the owners of very powerful and complete wireless stations, one of which they will instal in the library and operated under the direction of Robert Morrison, son of our esteemed neighbor, Silas Morrison. Young Morrison is president of the educational association, which in this distinctive manner makes its initial bow to Bingleton. A series of remarkable experiments, illustrating the wonders of long distance receiving, will follow a comprehensive lecture on the principles of this wonderful art.

"Piffle!" ejaculated Clyde. "A powerful wireless station on a reading table," he observed in a tone of disgust.

"What's that you're saying?" came from Randolph, who was also the owner of an up-to-date station.

"Read this," and Clyde, dispensing with further explanation, handed over the paper to his friend after indicating the offending news item.

When Randolph had read it he looked at his companion with an amused smile. "Seems that this bunch of hammy hayseeds of Hamsville are putting something over on the highly esteemed citizens of Bingleton, eh, what?" he observed.

"It certainly looks as if they were going to try to," the other answered. "But what beats me is, how on earth wireless telegraphy ever got started way up here among these sheep ranches. Bingleton is a little burg in the valley about fifty miles from here,

a little bit of a place; and Hamsville—well, I've never even heard of it before. Some crossroad up in the foot-hills, I suppose."

Clyde turned again to the item. "Say, this fracas is to come off tonight! Just for a lark, let's run over there and see what they've got. It's about five o'clock now and if we start at once we can reach Bingleton by eight at the latest. I guess this new gasoline chariot of mine will take us over those hills in jig time." But the rutty roads they soon encountered considerably slowed down the predicted pace.

. . . . . .

Meanwhile things were happening at the hall. At about seven o'clock the five members of the R. D. A. began to do business; a number of ranch hands and other young men of Bingleton came early so as to take in the wireless show before the dance started. Quite a crowd grouped themselves about the table. Bob soon found that he would have no need of the lecture which he had laboriously written and memorized several days before, as the spectators immediately plied them with questions, not over half of which they could answer. Out in the wagon seat Spunk was faithfully touching the two bare wires together and creating a meaningless jumble of dots and dashes in the receiver which the members of the audience listened to in turn with many expressions of awe and wonder.

"An' you say that a feller way over in Honolulu is makin' that there noise?"

"Ain't it the beatenest thing?"

"Jest think of hearin' them stations what's four or five days' journey away!"

"An' there ain't no wire connection, either."

"'Course there ain't; how could these here little boys get 'nuff wire to reach from here to Honolulu?"

The comments grew in volume and amazement grew apace as each new wonder was unfolded. "So that there feller over'n Honolulu, he's a-talkin' to another feller in San Francisco!" repeated old Jake Prout, by admission the champion well digger of California. He shook his head uncomprehendingly.

That gentleman struggled mightily to free himself

"Kin the station in San Francisco hear him now, kin he?"

"Why sure he can hear him," replied Bob, astonished. "Why not?"

"Well," replied Jake, "I can't figger how the feller in San Francisco can hear him when all his noise is comin' in this here machine."

This was the opportunity Bob had awaited. In the gravest tones he could command he delivered the time-worn explanation of the wireless set sending out waves in every direction, in the manner of ripples set up when a stone was thrown into a quiet pool of water.

"An' them there wires hangin' outside on the flagpole catch them waves?" exclaimed a bystander.

"Sure they do," replied Bob. His voice had taken on a note of superiority.

"Don't think much of that arrangement," snorted the questioner. "Seems to me I'd get a clothes basket."

"A clothes basket? What good would that do?" said Bob.

"A big, roomy clothes basket I calc'late would ketch more waves than them two smooth fence wires hangin'——"

"Say, what's that thing fer?" interrupted another, pointing to the fixed spark terminals inside the helix.

"That's a spark gap," explained Bob

in a wearied tone of voice, "an' when the set is workin' a big spark jumps between those two rods."

"An' 'cause that spark is so powerful and so dangerous you have to keep it in that cage," ventured Ezra, a chicken rancher.

"Sure," said Jake.

"Do tell, now, ain't it jest wonderful?" observed someone in the gathering.

When all present had enjoyed to the full the alleged signals from Honolulu, Bob stepped to the other end of the table and impressively closed the little battery switch. He had thoroughly tested out his transmitting set in the afternoon and as there had been no lights burning in the hall the line had been able to withstand the heavy pull of the transformer. Now practically every globe in the hall was turned on but Bob had not given that a thought. The rotary gap started up slowly with a rattle and a clank, amid many exclamations of wonder from the spectators.

Ezra catapulted through the open window

"Now," said Bob, when it had attained full speed, "you watch that wheel and I'll show you the spark that does the sendin'," and as he spoke he pressed the key. The blinding spark screamed out for a second, but the load was too much—"Vut!" went one of the big fuses in the power side of the meter. Every light in the building went out. It was as dark as a coal mine in the library.

"Help! Murder!" arose in a high shrieking treble as the belle of Bingleton threw her arms around Ezra's neck and hung on for dear life, while that gentleman struggled mightily to free himself, wondering meanwhile whether he had been struck blind or entirely killed.

Jake Hood, who was standing near the gap, lowered his head like a mad bull in a charge and made a frantic dash through the darkness toward the place where he estimated the door to be. But his sense of direction was wrong and the unfortunate Jake rammed his head into the wall with a force that created something more or less than six million stars and comets scintillating before his eyes. With a yell of pain he turned and made another dive in the opposite direction, only to bring up against the corner of the table and go sprawling headlong to the floor. Determined to sell his life dearly, however, he rose once more. Ahead shone a faint glimmer of light, and suddenly realizing he was standing before a window he ripped off the shade with one stroke, threw up the sash and leaped out with a whoop like that of a Comanche Indian, landing on his back on the ground several feet below. There he lay gasping for breath and thanking his lucky stars for such a miraculous escape.

Following closely behind him Ezra catapulted through the open window, finally free from the tenacious embrace of the screaming fair one. With a resounding thud his feet found a resting in Jake's abdomen, and the two rolled over in a struggling and gasping heap.

But the excitement was not confined to the library alone. Mrs. Marsh, the secretary of the women's club and a dour, fiery-haired Amazon, had wearied of the wireless set and had gone into the kitchen to see how things were progressing in that quarter. When the lights went out, following close on the scream of the spark, she instinctively knew that all in the library were being electrocuted, and dropping an armful of chinaware to the floor, she ran out into the hallway, howling emphatic appeals for mercy at the top of her voice. Caught up in the mad rush of the dancers, she was twisted and turned and finally ejected out of the door along with the rest.

For a few moments after the accident

Bob was nonplused. He knew that what ever had gone wrong had certainly not been caused by a kickback, for he had carefully seen to it that morning that the needle-point gaps were properly connected. Suddenly he remembered the fuses. Rushing out the back door to the wagon and hunting around for a minute for a screwdriver and a piece of wire, he demanded a box of matches from Spunk, who was still sitting in the wagon, petrified with astonishment.

Bob vaguely recalled having seen the meter and fuses somewhere in the hallway. He struck a match and ran in what appeared to be the proper direction. There they were, and it took but an instant for him to climb on a chair and by the light of several more matches set a piece of wire across the blown fuse.

Immediately the lights glowed again as bright as ever. The crowd, now greatly increased, and headed by Mrs. Marsh and the angular president, Miss Reed, surged back again like a wave. Bob retreated into the library with the angry president and secretary in pursuit.

The crowd halted at the door, none caring to venture further. "I thought you told us that this awful thing was so perfectly safe!" began Miss Reed, "you fiend incarnate, you almost killed all of us! Why did you start that deadly machine? You've scared everyone half to death!"

"Yes, and you made me drop a whole armful of dishes," chimed in Mrs. Marsh. "You will most certainly have to pay for everyone of them! and don't you ever dare to bring any wireless machine or any other kind of machine, in here again. Just so soon as this dance is over, you get your stuff into your wagon and get right out of here!" She glared at the young experimenter maliciously.

"No harm has been done at all, ma'm," said Bob, mustering up his courage bravely, "only a fuse was blew out—that's all."

"No harm done, eh?" exploded Jake from the edge of the crowd around the library door. "I reckon this ain't no harm, is it?" and he tenderly rubbed a large swelling on the top of his head. "And where Ezry Pratt jumped in the middle of my front and pushed it clean

She instinctively knew that all in the library were being electrocuted

to the back, ain't no harm neither?" Becoming bolder he cautiously stepped inside the door and began an examination of the surrounding wall.

"What's that!" broke out in Miss Reed's high treble. "What are you looking for?"

"What'm I lookin' for?" repeated Jake, belligerently. "I just a-happen to be lookin' to see if I didn't make a dent in the wall; tryin' to get outa here I hit it like a pile-driver."

Miss Reed turned away. "Never mind, don't bother looking," said she. "If there is a dent there these young rascals will have to pay for it!"

Bob assured them that there would be no further trouble now that everything had been fixed all right, and to prove to them that this was so, he started the rotary gap again and pressed the key. Promptly the fuse on the other side of the line blew out and plunged the hall into darkness.

"I knew it! I knew it!" yelled Jake, as he galloped down the hallway to the open air, closely followed by the panic-stricken crowd.

The hall was emptied in an instant. "Isn't it perfectly dreadful!" gasped Mrs Marsh; and the breathless assemblage reflected the horror in her eyes.

"That terrible machine will kill us all yet!" wailed Miss Reed.

"And it's spoiling the dance entirely!" came in petulant tones from one of the younger set.

Meanwhile Bob was very active. When

he saw the result of the second attempt to operate the set he stopped just for an instant to tear loose the wire from the condenser, and rushing out into the hallway climbed up on the chair and placed a piece of wire across every fuse in sight; and not satisfied with that he put wires across the meter as well. Everything then to his satisfaction, he went back to the library, determined to make another attempt. But by then the assem-

blage had recovered its mental balance and fright had turned to indignation; he was excitedly commended to take up the wireless set and clear out at once.

"Don't you dare start that thing again!" cried Miss Reed, backing away from the door as the rotary gap commenced slowly to revolve. "It will be all right this time," said Bob convincingly. And so it was! The lights looked as if they would go out, but when they had flickered down to a dull red they stayed that way until Bob let go of the key, when they flashed bright again. Everyone was greatly relieved and the curiosity of the newcomers offset the fears of the others. Although they still feared the terrorizing spark, it proved to be the main attraction. The library was kept jammed full; the crowd changing about every twenty minutes and keeping Johnny busier than ever before in his experience, raking in the quarters, literally by the handful.

When ten o'clock came everything was going smoothly and steadily and the boys began to think of themselves as on the high road to fortune. Downstairs, grouped about the front steps, a group of the older men were discussing the marvels of modern invention. Suddenly their thoughts were turned from wireless telegraphy to another great scientific achievement, the automobile. Most of their knowledge here, too, was based on hearsay; no one in Bingleton owned a machine. Therefore, great was the speculation as two headlights drew nearer and nearer and a powerful car thundered to a sudden stop in front of the hall.

Two stylishly dressed young men descended and with careless nods passed through the door. It was Clyde and his friend, and neither in particularly good humor. They had been delayed by three punctures and a blowout. Nothing at, in, or near, Bingleton looked good to them.

"Two," snapped Clyde, presenting himself before the ticket window, which was merely an opening in the wall between the library and hallway. Johnny handed out two tickets and stared curiously at the boy before him. There was something ominous in that air of assurance, and for the first time in the course of the evening the treasurer became embarrassed. He mixed up the change hopelessly; Clyde became impatient on the third recount and airily waved aside the shiny coins which were due him. Great was the amazement of the curious bystanders. So unused to this type of indifference was Slim, he remained gaping in the doorway as the tickets proffered him dropped from his nerveless hand.

The room was packed and the two young men elbowed their way to the table with some difficulty. For a minute they stood side by side watching the operation and saying nothing. Bob was droning on for the steenth time with his explanation of the phenomena that made the Honolulu signals audible. His hearers were visibly impressed and the lecturer stopped for an instant to let the weight of his words sink in. It was an unfortunate pause. His eye caught the amused twinkle in Randolph's.

Assuming a boldness he did not feel, Bob inquired: "Is there any information you would care to have?"

"Yes; there is one thing you can tell me," responded Randolph. "Where on earth and how in the world did you man-

age to get together such an extraordinary collection of junk?" his voice ringing out clear and sharp with a note of accusation.

As one, the crowd turned to Bob. He was speechless; somehow he felt that it was all up.

"Here, let me listen to those signals from Honolulu you're talking about!" continued Randolph, taking the receiver from the hand of an astonished rancher. Five seconds later he put it down and an expression of disgust swept over his countenance. "Here, listen to this," he said as he handed the receiver to Clyde.

Clyde listened scarcely a moment when he threw it down with the exclamation, "Fake!" and rapidly ran over the piled up instruments until he located the two buzzer wires leading off behind the bookcase. Looking meaningly at the assemblage he followed up this clue and disappeared through the back door, tracing his course by the aid of a flashlight. An instant later the flash discovered Spunk sitting quietly in the wagon seat, peacefully rubbing the wires together and all unconscious of the impending calamity.

"Why, this is the biggest bunco I ever ran into!" broke from Clyde as he made a precipitous return to the room. "They have a fellow outside there who has been making all these signals with a buzzer hidden around here somewhere," and his eyes swept hastily about the library. "And as for this," and he pointed derisively at the outfit on the table, "it's nothing but a cheap bunch of home-made junk, nothing at all like a really good wireless set!"

With the speed of a prairie fire his denunciation spread through the hall and an angry murmuring arose on all sides. The ambitious amateurs who had sponsored the show, dumbfounded at first, were among the earliest to recover their presence of mind. Everybody present and the greater percentage of those out on the dancing floor had paid to see the wireless demonstration. It was time to get away in a hurry. And just as this thought broke upon all the boys simultaneously, an angry murmur arose from the people they had tricked.

Bob showed himself the little general again. Without attempting any explanation, he faced the crowd and told those in the room that if they would go out into the hallway and pass by the ticket window he would give them all their money back.

But his hearers in the library did not move. From the hallway and elsewhere the threatening murmurs swelled in volume and began to take the form of suggestions as to proper punishment for the hoax. The advance guard of the angry crowd began to press towards the table.

'Lectricity Bob stood firm. "Get out!" he screamed. "If you don't get out right away, I'll set the spark after you and kill every one of you in a second!" Assuming a most threatening attitude, he reached forward and started the gap motor.

An ink bottle smashed against the wall an inch above the frantically bobbing red head

It had the desired effect. Hardly recovered from the fright of earlier in the evening, and certain that if the spark was released it would instantly reduce the hall and everyone in it to a pile of ashes, the throng turned as one and fought their way into the hallway, some of them clapping their hands over their eyes to shut out the awful death-dealing shriek which was to come. In a second the library was emptied of all save the two young men from Santa Rosa.

"Smart bunch of young fakers, aren't you?" said Clyde with a sneer.

Spunk had been witnessing the proceedings with inward fear and trepidation, although he preserved a brave front. The supercilious smile on the visitor's face, however, proved too much for him. "Get out," he shrieked vindictively, and emphasized his command by hurling a heavy dictionary with perfect aim. Down went Clyde in a heap, and in an instant they had forced him through the doorway on the heels of his friend's retreat.

as many of the condenser bottles as possible, Spunk still delayed in the library. The crowd in the hallway, tricked and then derided by mere boys, was now unmanageable; they were kicking and pounding on the door in a way that left it but a question of moments when it should leave its heavy oaken frame. Mrs. Marsh was frantically, but vainly, attempting to climb in through the ticket window.

Spunk set down his bottles and

Spunk industriously began tossing over the tailpiece the precious condenser bottles

Quick as a flash Bob slammed the door shut and locked it. "Here!" he cried to Johnny, "take all the money and get out into the wagon right away!" And turning to the other three: "You fellers have to help me pack the transformers out to the wagon —an' be quick!" Unthinkingly they obeyed and together carried the heavy transformer out of the room, while Bob followed with an armful of instruments, dumping all into the wagon. He ordered Slim and Fred to untie the colts and face them toward the road; then calling Spunk to follow he returned for the bottle condenser and the rotary gap.

With the latter instrument tucked safely under his arm, Bob started back to the wagon. Attempting to salvage

reached for an armful of magazines, sending them flying in that general direction. Nothing daunted, Mrs. Marsh came on, gasped, and then jammed fast in the ticket window; there she remained, screaming out demands for him to cease his work of destruction. By way of answer an ink bottle flew from Spunk's hand and smashed against the wall an inch above the frantically bobbing red head. Then, grabbing up as many of the condenser bottles as he could carry, he dashed out to his waiting companions.

The colts started off with a gallop, grazing the corner of the hall and ripping loose a shower of splintered wood. A cry arose from within, and the irate Bingletonites poured through

the doorway to take up the pursuit in the darkness.

On dashed the wagon, rocking and swaying along the rutty road. . . . There came a time when the boys thought they were safe from pursuit and at a word from their leader the colts were pulled down to a walk. Scarcely had this been done when an ominous roar arose out of the darkness, increasing in volume with marvelous rapidity.

"It's that smart Aleck's automobile! They're goin' to run into us!" yelled Spunk, as the big headlights rounded a bend in the road and began bearing down upon them. Bob grabbed the reins and urged the colts forward to their greatest speed, Fred and Slim aiding by pelting them with a few of the detectors. At the back of the wagon Spunk industriously began tossing over the tailpiece the precious condenser bottles, carefully observing that each one landed in the center of the road.

In an instant there was a loud report, followed by two short and sharp ones. A stream of dirt and stones shot up in front of the headlights and a grinding, crashing sound was heard as the beams of the powerful lamps suddenly disappeared over the brim of the ditch and were extinguished against a picket fence on the opposite rise.

"We're killed, they're shooting!" screamed Fred.

"Shootin' — you fool!" shouted Spunk. "It's nothin' but them broken condenser bottles—they got three tires!"

. . . . . .

Five minutes later the wagon was peacefully jogging along the road to Hamsville. Not a sound had been uttered in the intervening period. Then:

"I've got moren'n forty dollars here," said Johnny; a muffled jingle came from his coat pocket.

"Gee!"

And the wagon rolled steadily on, a frog croaked, a whippoorwill chirped and five minds instantly turned toward new fields to conquer.

TO TIME RACES BY WIRELESS

Wireless timing will be employed at the annual regatta of the Mississippi Valley Power Boat Association at Hannibal, Mo., July 5, 6 and 7. Association officials have been authorized to purchase the necessary equipment and all of the big events will thus be timed by the most accurate known method.

This system of timing was tried out at Buffalo last fall and it was found there was a difference of one second or more to a mile between the wireless and the old system of sight timing. The wireless is absolutely instantaneous and the racing men will get the benefit of every factional part of a second of speed made.

With some of the greatest boats in America scheduled to appear at Hannibal, including Commodore Pugh's Disturber IV, Johnson Brothers' Black Demon IV, and Commodore Blackton's Baby Reliance, there is every reason to expect a new world's record for fresh water will be established.

IN HONOR OF MORSE

More than 100 old-time telegraphers, retired and still in active service, met at the Seattle Press Club, on April 27, and paid honor to the memory of Samuel Finley Breese Morse, inventor of the telegraph, who was born on April 27, 1791. In addition to commemorating the birthday anniversary of the man whose invention now performs a prodigious share of the world's work, the gathering was also given an opportunity to live over experiences of the days when each of them "sat in" on some "fast" wire and devoted himself entirely to reading the mysterious clicks of the sounder. J. R. Irwin, superintendent of the Northern District of the Marconi Wireless Company and president of the Dot-and-Dash Club, under whose auspices the meeting was held, presided as chairman.

The Dot-and-Dash Club, formed two months ago, received more than twenty-five new members during the course of the meeting. The organization plans to hold meetings regularly.

BOOK REVIEWS

LIST OF RADIO STATIONS OF THE WORLD, *by F. A. Hart, Chief Inspector, Marconi Wireless Telegraph Company of America, and H. M. Short, Resident Inspector, New York, Marconi International Marine Communication Co., Ltd.*

Realizing the growing demand for a modern, up-to-date and complete list of radio telegraph land and ship stations, Inspectors Hart and Short have compiled such a list from the latest available information, largely from sources inaccessible to the general public. The volume is a distinct advance on any similar work which has been published and the arrangement of the material is distinctive.

Part One contains an alphabetical list of Call Letters from AAA to ZZZ and the vessels and land stations to which they have been assigned. Naval vessels are shown in italics and coast stations in small capitals. Where call letters have not yet been assigned spaces have been left so that the ship or coast station may later be filled in.

Part Two is a list of naval stations arranged alphabetically by station and country.

Part Three is an alphabetical list of commercial ship stations showing call letters, ownership, control and nationality, forming a ready reference with Part One.

Part Four is a list of land stations arranged alphabetically by station and country.

So comprehensive and convenient is the scope of the work the Marconi Company has already ordered a number of copies for the ship and shore stations under its control.

The book is strongly bound in cloth and is built for service. The price is $1.00 net, postpaid, from the Book Department, Wireless Age.

A WIRELESS RECEIVING SET FOR TIME SIGNALS. *By Austin C. Lescarboura.*

A monograph published in the interests of Brandes' receivers, this description of an inexpensive jeweler's set purposes to make possible the construction of an equipment for tradesmen who have been unable to secure the advertising benefits of accurate time service owing to the prohibitive cost of manufactured instruments. Moderate skill in the use of simple tools, an outlay of twenty or twenty-five dollars and careful attention to the directions given should produce the set described; one adequate, it may be said, for the ordinary uses of trade for which it has been prepared.

ECONOMICS OF BUSINESS. *By Norris A. Brisco.*

For the serious-minded amateur and the commercial operator who looks to the higher executive positions in the wireless field, this book offers many opportunities for profitable study. The principles on which the great international structure of business are founded are generally a closed book to the aspiring youth and, no matter how hard he may try to understand, many years pass over his head before his business environment brings him in touch with structural things. For broad-gauged vision and understanding the best studies are those directed to the methods of successful business enterprises. What successful business men have to say of their own experiences is valuable information, if properly analyzed. And these two methods the book has combined in placing between its covers a surprising amount of information. This is not a work on wireless telegraphy, but it is one that every one engaged in the field can read with profit, particularly those who seek a business career in the radio field, rather than a scientific one. Price, $1.50, from the Book Department, The Wireless Age.

HOW TO PASS U. S. GOVERNMENT WIRELESS EXAMINATIONS. 118 ACTUAL QUESTIONS ANSWERED.

This volume, which was prepared under the editorial direction of THE WIRELESS AGE, should have a place on the table of every wireless enthusiast. As its title indicates, it was written especially to supply the needs of those who contemplate trying the government wireless licenses examinations. The book can be obtained from the Marconi Publishing Corporation, 450 Fourth avenue. Price, 50 cents.

From and For those who help themselves

Experimenters' Experiences.

The Editor of this department will give preferential attention to contributions from amateurs covering the design of transmitting sets, wave-meters, etc. There is an over-supply of material on receiving tuners, particularly "loose-couplers," the designs for the majority of which present nothing new or original.

FIRST PRIZE, TEN DOLLARS

A Receiving Detector of High Efficiency

On account of the erratic action of the galena detector and general unreliability many amateur experimenters are compelled to resort to a less sensitive mineral. It is rather disagreeable to have a detector "go dead" right in the midst of a message because you happen to lay your arm on the table or perhaps move the receiving tuner.

The following described detector retains the high degree of sensibility of the galena detector, but practically never goes out of adjustment. In outward appearance it is much similar to a Marconi coherer.

Two plugs, made of a strip of tinfoil 3 inches in width and about 2 feet in length are inserted in the ends of a glass tube, the diameter of the plug, of course, depending upon the diameter of the tube. The roll is then cut in half to provide two plugs. One end of each roll is filed smooth and the other end flattened in a vise and bored with a ⅛-inch hole through which is passed a small brass bolt to fasten it to the standard. A general idea of the manner in which it is constructed is shown in the accompanying diagram.

The plugs are separated by about ¼ inch and the intervening space is a little more than half filled with equal amounts of finely powdered galena and silicon scraped with a knife from the solid material. The amount in proportion of the constituents may be varied by the experimenter. In the detector built by the writer a small amount of pyrites was also used. The adjustment is effected by simply revolving the glass tube and regulating the potentiometer. The instrument is connected up as any other current-using detector. The accompanying diagram gives exact dimensions of all parts. Owing to its extreme simplicity the detector can be made by anyone in half an hour. The high efficiency of this detector is due to the great number of sensitive points formed by the finely divided particles.

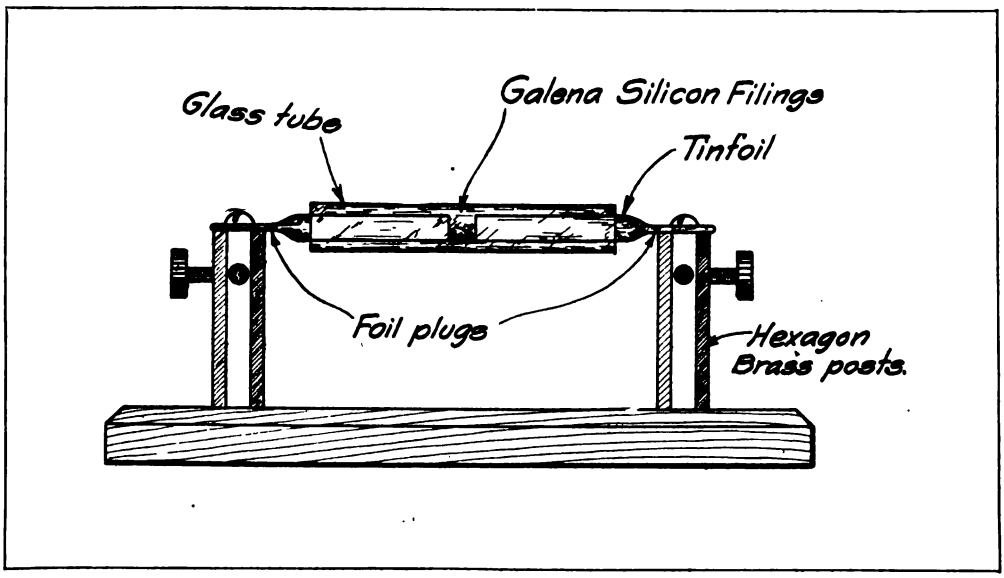
The detector may be handled while in operation without interfering in the slightest with the receiving. The writer has even by way of experiment pounded with a hammer on the operating table, while listening in, and aside from the momentary disturbance set up, the message continued clear and distinct.

(Name and address of contributor not given.)

SECOND PRIZE, FIVE DOLLARS

Zinc Spark Gap Electrodes

One of the problems the wireless experimenter encounters in the design of a transmitting outfit is the construction of



Drawing, First Prize Article

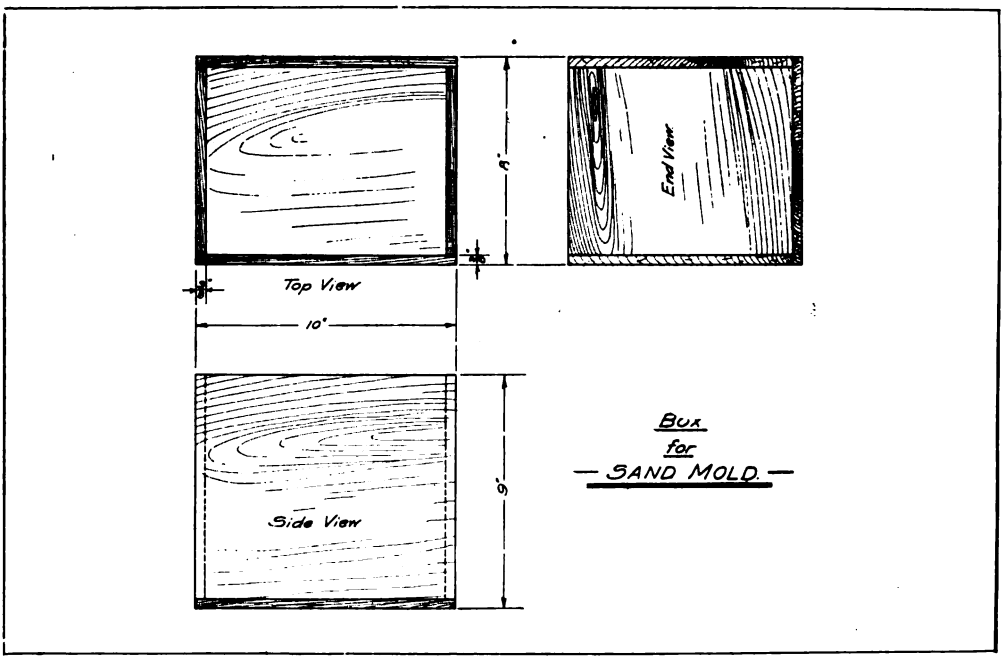


Fig. 1, Second Prize Article

a satisfactory stationary spark gap. The average amateur spark gap has electrodes so small that they will not accommodate the discharge of the average spark coil or transformer, thus causing a loss of efficiency through heating. If the dimensions of these spark gap electrodes were increased even for a small coil, the radiation of the set would increase correspondingly. For satisfactory conduction and radiation of heat, the cooling fins of a stationary spark gap must be

cast integral with the spark electrodes. It is sometimes difficult to purchase zinc rods 1⅛ x 1½ inches in diameter from which to turn large electrodes with radiating plates, but I have found it very easy to melt up scraps of zinc and run the molten metal into a sand mold somewhat larger than the electrodes you desired when finished.

The scrap zinc must be cleaned by scraping away any chemical formation, and then melted in an iron crucible. The crucible may be placed in an ordinary furnace until the metal appears molten. The sand mold can be made in any convenient box, somewhat similar to the dimensions of the box shown in Fig. 1.

The dimensions of the pattern in which form the zinc is to be cast may be changed to suit the individual requirements, but for all types of spark gaps up to ½ kw. the pattern need be no larger than 1½ inches in diameter, as shown in Fig. 2. The casting must be fairly long, at least 7½ inches, to allow it to be turned in a lathe conveniently.

It is very important to allow a slight draft on the pattern so that it may be drawn from the sand without breaking the mold. The draft may be seen in Fig. 2. Place the pattern in the box and pack the moistened sand tightly around it. Draw the pattern carefully from the sand by means of a hook, A, Fig. 2.

The molten metal must be cleaned, so that it is best to skim the surface of all impurities with an iron ladle. Be sure that there is enough metal in the crucible for the entire bar, for the mold must be made at one pouring. Then pour the metal in the mold very slowly. It is upon this process that the success of the casting depends, for if the metal is poured too fast the casting will be full of air holes and worthless for spark gaps.

Allow the casting to cool and take it out of the sand. It is then placed in the lathe and turned to 1¼ inches diameter and then finished to 1⅛ inches in diameter. Fig. 3 shows the dimensions of the electrodes for use on spark coils or small transformers.

A casting of this size will conveniently allow two sets of electrodes so that the time and trouble will easily be repaid to the experimenter building a good spark gap.

JOHN E. BRADY, *Maryland.*

THIRD PRIZE, THREE DOLLARS

A Compact Receiving Tuner

My receiving set is compactly enclosed in a mahogany case 19 inches in length, 14 inches in height and 9 inches in width. The detecting apparatus and other instruments are mounted on a slab of polished fibre.

The complete apparatus also comprises a variometer like that described in the June, 1914, issue of THE WIRELESS AGE, by J. L. Munger. I do not, however, use this instrument as a variometer but employ it as the oscillation transformer of a receiving tuner.

In the instrument described by Mr.

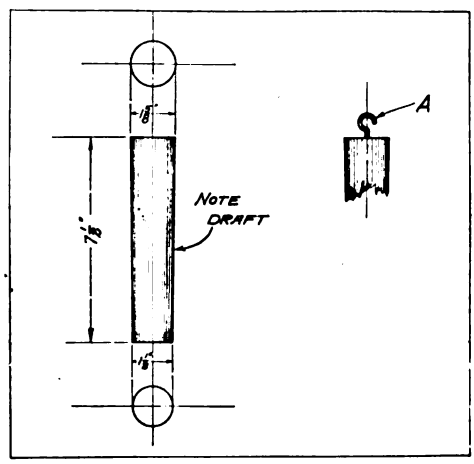


Fig. 2, Second Prize Article

Munger the tubes on which the windings were made were two inches in width, but I have increased the dimensions to 3½ inches in width, leaving the diameter the same. With this arrangement I am enabled to receive longer wave-lengths than would be possible with his design.

The inner tube, of course, is a little less in width so that it may revolve freely. The rod for varying the coupling between the two windings has been extended so that a pointer may be attached on the outside of the case. The variation of the inductance is obtained by means of a 10-point switch for the primary winding and a similar switch for the secondary winding. On each switch one tap represents ten turns of wire; therefore 9 taps represent 90 turns of wire; the remaining taps represent the remaining number of turns.

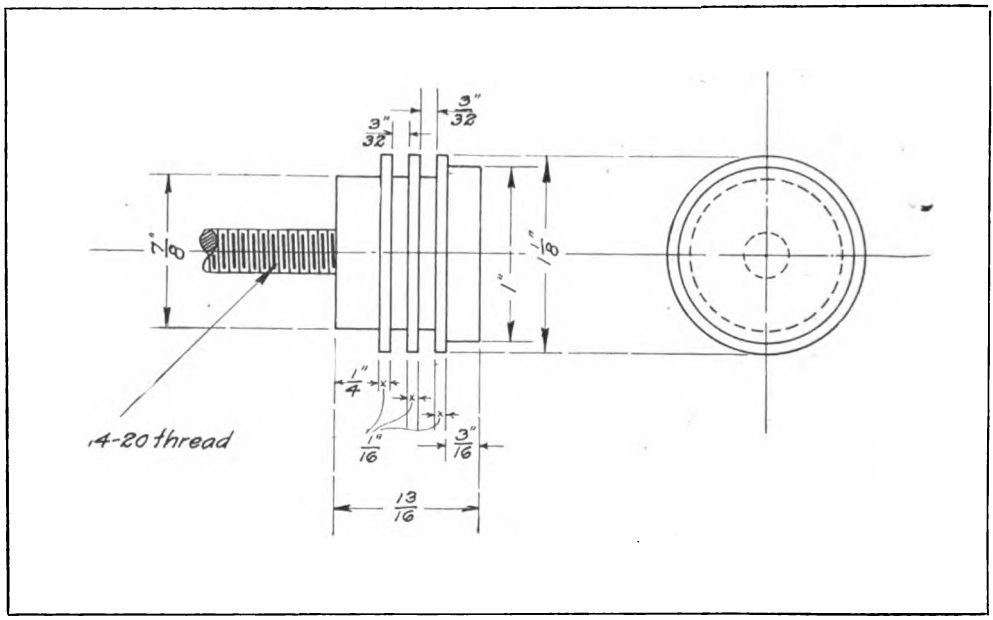
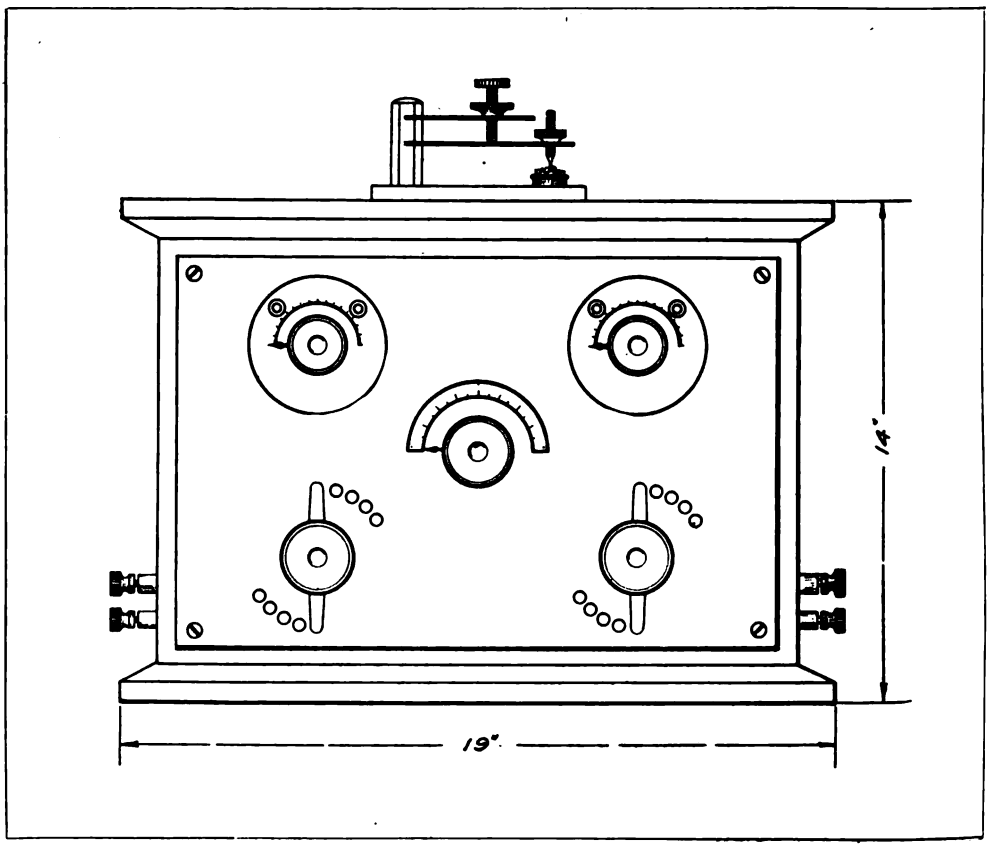
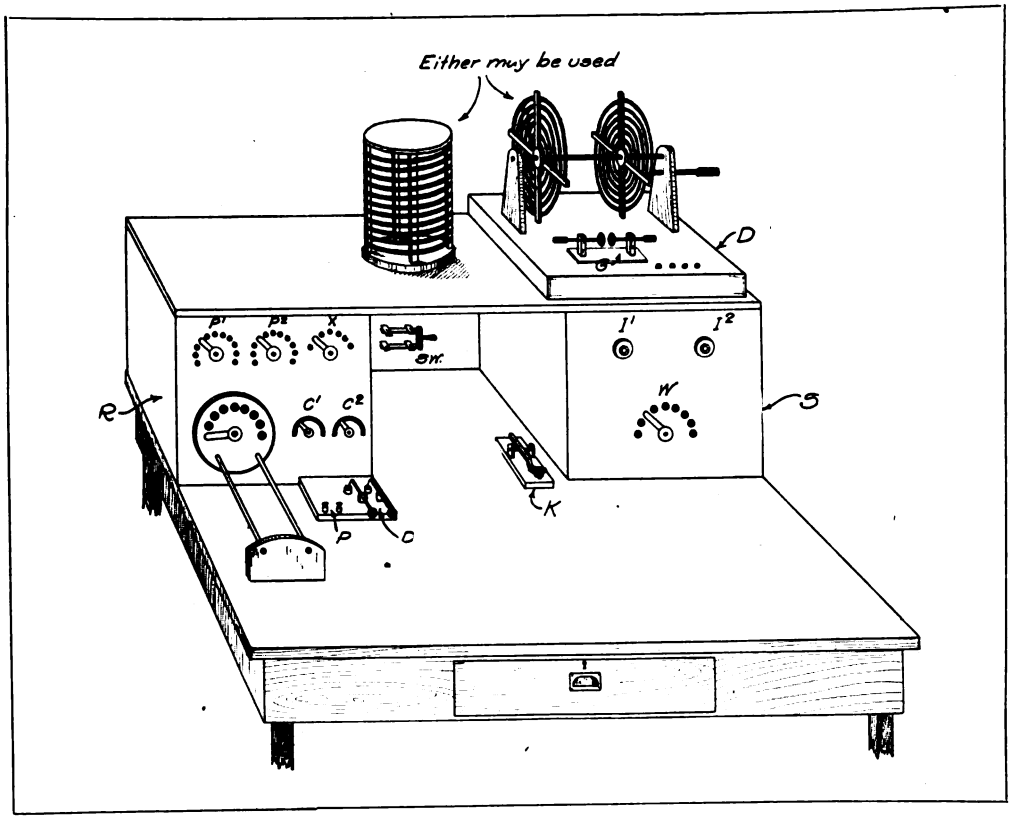


Fig. 3, Second Prize Article



Drawing, Third Prize Article



Drawing, Fourth Prize Article

In order to effect close tuning I prefer two variable condensers of the Clapp-Eastham Company's type as they are suitable capacities, small in size and easy to mount. The detector I use is of the "Ferron" type but galena with a fine wire arrangement may be used. I have found the latter arrangement works very well and the detector stays in adjustment for a considerable length of time.

The detector is mounted on the top of the cabinet, being independent of the other instruments. I am using Brande's Superior receivers and a small condenser for same.

My chief aim in building this set was to produce one which had a neat appearance and could be operated with convenience, and I am quite sure that amateur experimenters building one of similar design are bound to be satisfied.

W. SOLBERG, *New York.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A Compact Amateur Wireless Set

In looking over the photographs of certain amateur wireless telegraph stations I notice that many experimenters have their instruments scattered all over the table. This state of affairs, I believe, is destructive to the general all-around efficiency of the set, and I am certain that it destroys the appearance.

I, therefore, wish to suggest a design for a compact transmitting and receiving set which I trust will meet with the amateur's approval. A general layout of the equipment is shown in the accompanying drawing, the transmitting apparatus being mounted to the right of the cabinet, the receiving apparatus to the left. I have given no specific dimensions for the various parts of the equipment, my drawing simply being intended to show the manner in which the apparatus may be assembled.

The front of the receiving cabinet is preferably made of hard rubber, although hard wood, which has been given two or three coats of shellac, blackened with lamp black, will serve the same purpose.

The receiving transformer may be of any size desired, the primary taps being brought out to the two switches, P1 and P2. The receiving condensers, C1 and C2, may be of any make suitable for the purpose and should be mounted as shown.

A switch for the taps of a loading coil is indicated at X. Two or three detectors, having a multiple point switch so that any one may be used as desired, may be mounted on the detector stand, D. The telephones are connected to the binding posts at P.

The position of the change over switch SW, and the key, K, are clearly indicated in the drawing. The sending apparatus, S, contains the transformer from which the secondary terminals are brought out to insulators I1 and I2; the primary taps are brought out to a switch, W. The sending condenser, D, may be placed over the sending apartment, while the spark gap, G, is placed on I1 and the helix either over it or perhaps better to the left of D.

The amateur will find it much easier to tune down to the 200-meter wave owing to the absence of long leads which are required when the apparatus is scattered about the table.

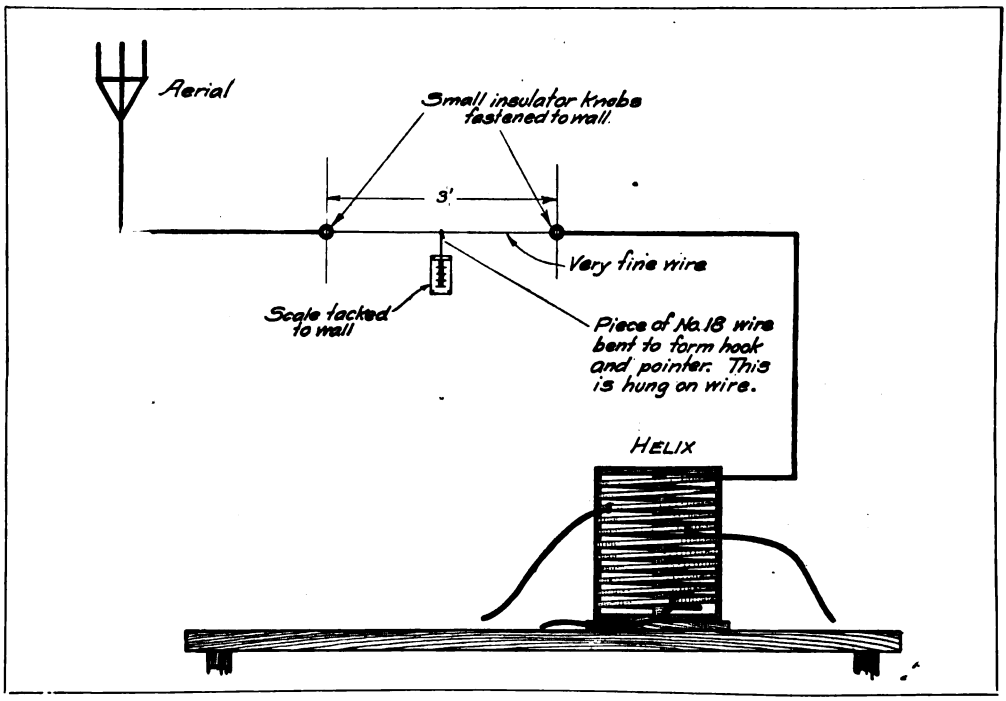
FRANCIS STRUTHERS, *Massachusetts.*

HONORARY MENTION

A Cheap Hot-Wire Meter

A great many amateurs when they come to tune their transmitting apparatus find that they are badly in need of a good hot-wire meter, but after consulting with their pocketbooks they are forced to abandon the idea and do without. The meter shown in the accompanying drawing will work as well as any on the market for this kind of work, as the essential thing is not to know the *number* of amperes sent out, but to know *when* you are sending the most.

I have used a meter of this kind very successfully to measure the output of a one-inch coil, using No. 40 copper wire for the hot wire. The size of the wire used depends on the power of the set, varying from No. 40 for small spark



Drawing, Honorary Mention Article, F. C. Beckley

coils, to No. 28 or 30 or even larger, for transformers. The proper size of wire to use can best be determined by experiment. If Climax or other resistance wire be used the hot wire may be very much shorter.

In operation the wire heats and expands, allowing the pointer to descend over the scale. If this movement be over ½ inch, a larger wire should be used. The pointer should not weigh over ¼ ounce.

F. C. BEEKLEY, *Pennsylvania.*

HONORARY MENTION

A Hint for Selecting Galena Crystals

I have found a method for selecting a sensitive galena crystal, which I have never known to fail. I find that it holds good for all types of galena crystals and I believe that the amateur making use of my advice will be saved considerable useless experimenting.

Galena crystals with a flat surface without a flaw on them are invariably found to be worthless. A sensitive crystal has a ruffled surface and the sensitive spots can generally be located in this vicinity. This test is facilitated by means of a buzzer. I might advise that this ruffled surface generally appears near to a sharp edge of the crystal.

FRED CARLSON, *New York.*

CHANGE IN MESSAGE ORDER

The Marconi Wireless Telegraph Company of America has called attention to the fact that the following is to be substituted for Paragraph 6 of the Navy Department's instructions regarding the enforcement of the order of President Wilson concerning wireless communication:

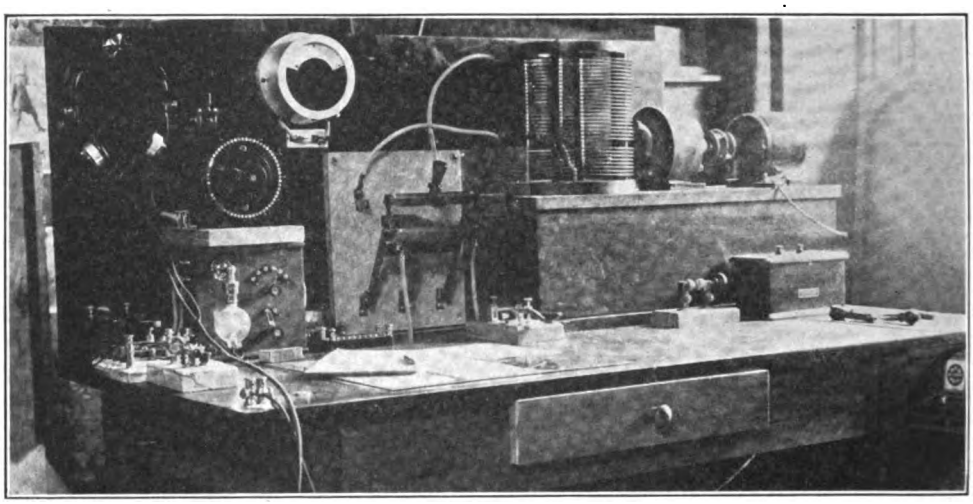
"Code or cipher messages are permitted between shore radio stations entirely under the jurisdiction of the United States and between United States shore stations and United States or neutral merchant vessels or neutral shore stations, provided they are not destined to a belligerent subject and contain no information of any unneutral character, such as the location or movements of ships of any belligerent nations. In such messages no code or cipher addresses will be allowed except those registered prior to July 1, 1914, and certified copies of which are filed at the United States radio station through which the message is to be transmitted. All messages must be signed either with the sender's name or with a duly certified registered name complying with the requirements for registration of address. Radio operating companies handling such messages must assure the government censor as to the neutral character of such messages. Such messages, both transmitted and received, must be submitted to the censor at such time as he may designate, which will be such that will not delay their transmission."

The paragraph in question originally declared that: "In such messages no code or cipher addresses will be allowed and all messages must be signed with the sender's name. Radio operating companies handling such messages must assure the government censor as to the neutral character of such messages. Such messages both transmitted and received must be submitted to the censor at such time as he may designate, which will be such that will not delay their transmission."

The Marconi Company has also called attention to the closing sentence of Paragraph 4 of the Navy Department's instructions. The paragraph is as follows:

"No cipher or code radio messages will be permitted to be sent from or received at any radio station in the United States via any foreign radio station of a belligerent nation, except from or at certain stations directly authorized by the government to handle such messages. Press items in plain language relating to the war, with the authority cited in each item, will be permitted between such stations, provided no reference is made to movements or location of war or other vessels of belligerents."

With the Amateurs



Station of A. M. Lindsay, Jr., Rochester, N. Y.

Experiments have been conducted by the wireless society of Tufts college, in which the messages were transmitted and received without the use of aerial antennae. The results of the experiments show the best results from the use of the ground antennae were obtained when the receiving wires were laid in a direct line with the transmitting station. Two ordinary wires, 90 feet in length, were found, when stretched on the ground in this manner, to be sufficient in receiving messages from points 50 to 75 miles distant.

The Capitol City Radio Club is one of the latest additions to the ranks of wireless amateurs. It was organized with eighteen members on March 6, in Washington, D. C. B. S. Flather is president; C. Godfrey, vice-president; E. French, treasurer; J. Gamble, recording secretary, and S. Culverwell, financial secretary. A one-half kilowatt transmitting set, the property of the president, has been designated as the club's central station.

The Wireless Association of Pennsylvania has been conducting extensive tests with the Armstrong circuits for the valve detector, and at the meeting of June 8 a review will be held consisting of the results of tests presided over by Malcolm Ferris. At the meeting of June 25 a talk will be given by G. W. Garvin and E. C. Andrews on oil condensers.

The May meeting of the Radio Club of America was held on Saturday evening, May 1, in Fayerweather Hall, Columbia University, New York. Paul F. Godley spoke briefly on activities in radio work on the Pacific coast and presented a most interesting and instructive paper on "Methods of Measuring the Intensity of Incoming Signals." The paper was illustrated by instruments and circuits used in these quantitative measurements. Mr. Godley also demonstrated the use of some recently developed oscillating valve circuits and many interesting signals were received during the meeting.

Marconi Men

The Gossip of the Divisions

Eastern Division

J. A. Worrall and R. H. Poling are serving on the St. Louis of the American Line as senior and junior, respectively. Worrall has the distinction of being one of the first of the few operators to secure an extra first-grade license.

R. Duna is now on the Colorado. The operator previously assigned to her was suspended for leaving the vessel after reporting on board sailing morning.

W. F. Dillon has been assigned to the Guantanamo, a one-man ship.

R. C. Cuthbert is no longer in the service.

J. Keinast, formerly of the Southern Division, is now attached to the John D. Archbold.

Walter Neumann of the Southern Division has been assigned to the Texas at Philadelphia.

D. Levin is another of the Southern Division operators to be assigned to a ship of this division. Levin relieved L. M. Burt on the Louisiana.

N. W. Bard has resigned.

L. M. Burt, formerly of the Port Arthur station, is now senior on the Parima.

C. S. Thevenet has been promoted and is now first on the City of Columbus. G. R. Gould takes his old post of junior on the Apache.

Sidney Giffin was relieved by C. C. Short on the Gulflight before she left New Orleans on the voyage on which she was torpedoed.

W. V. Moore has been assigned to the steam yacht Alberta.

W. Travers and C. T. Hiller have been assigned to the El Rio as senior and junior. Hiller was formerly attached to the Gulf Division.

R. H. Fleming is now in the Gulf Division, having been assigned to the San Juan as junior a few weeks ago.

M. A. Luedtke has been re-engaged and is now attached to the Mexico, of the Gulf Division.

R. P. Woodford is now attached to the New York of the American Line as junior. Woodford was formerly attached to the Trans-oceanic staff.

C. B. Darcy, who was senior on the Seminole when she went aground in the tropics a few weeks ago, is now attached to the Bantu.

J. M. Harrison has been temporarily assigned to the Virginie of the French Line.

A. J. Minners and E. Bambourakis, senior and junior of the Finland, have the distinction of being the first operators to take that vessel through the Panama Canal. The Finland is bound for San Francisco.

W. W. Rich is now attached to the steam yacht Corsair.

James R. Joiner, of the Marconi School of Instruction, has been assigned as second on the Florizel. T. A. Tierney, the senior, was the only operator on board while the Florizel was seal hunting in the ice fields.

W. A. Hutchins has returned to the Great Lakes Division. His place as junior on the Tennyson was taken by H. A. Carder.

Stanley Russell and G. Nolan have been assigned as first and second on the Satsuma. Russell was second operator on the Seminole when she went aground in southern waters. Nolan is fresh from the Marconi School of Instruction.

J. R. Conway is now senior on the Philadelphia of the Red D Line. C. Murray takes his former detail as junior on the Momus.

A. E. Smith has relieved E. N. Pickerill as senior on the Creole. Arthur Cohen takes the place vacated by Smith on the City of Montgomery.

L. C. Nunn is now senior on the Huron.

H. E. Cohen is senior on the Relay, which has just been placed in commission. Henry Markoe is junior.

Alex Schneider is first on the El Oriente.

The steamer Clan MacIntyre has been equipped for the English Marconi Company. L. T. Barker and W. E. Bisgrove have been assigned to her.

W. S. Weatherbee has relieved J. A. Johnson on the Alabama.

The Sarnia of the Atlantic Fruit Company has been equipped. A. Darlington and W. A. McDonald are doing duty aboard her.

P. Boucheron has temporarily relieved J. S. Merrill on the Comanche.

The new ship of the Gulf Refining Company, the Gulfcoast, has been equipped with Marconi apparatus. W. S. Wilson was assigned to her.

L. R. Schmitt has relieved L. Brundage as senior on the Morro Castle. Brundage is on sick leave.

A. G. Berg has been promoted to senior on his ship, the Esperanza. W. C. Thompson is junior.

B. N. Lazarus has been transferred to the Alamo.

L. F. Whitehead has been assigned as second to the A. W. Perry.

H. T. Munroe has been assigned to the City of Bangor, which recently went into commission.

Southern Division

W. E. Newmann was recently assigned to the Texas at Newport News, Va.

E. P. Hough has relieved H. J. Sacker as senior operator on the Juniata.

D. Levin recently relieved L. M. Burt on the Louisiana at Baltimore. Burt returned to his home in Philadelphia.

C. H. Warner has been transferred from the Dorchester to the Vigilancia at Savannah, relieving Operator Husk of New York. The Vigilancia sailed for Havre, France. The vacancy on the Dorchester was filled by Water Osterloh, formerly of the Merrimack.

J. E. Bell, who made several trips to Providence on the Parthian, has been reassigned to the Howard.

W. J. Phillips was recently assigned to the Parthian as senior operator, J. H. McCauley remaining as junior.

H. H. O'Day has been assigned to the Borgestad, relieving J. R. Lange. J. F. Larrimore was assigned to the Ontario in place of O'Day.

J. R. Lange and E. L. Petit have been assigned to the newly equipped Sibiria as senior and junior, respectively. The Sibiria was equipped at Baltimore with a ½ k.w., quenched gap panel set, by Marconi Engineers Murray and Wyble.

A. Doehler has been assigned to the Cretan as senior operator.

Clement Murphy has been assigned to the Burmese Prince at Newport News, Va., which sails in a few days for Havre, France.

H. Graf, late senior operator of the Kershaw, has been assigned as second trick operator at the Baltimore station in place of S. Cissenfend. Graf has been anxious for a land station detail for some time. R. P. Linderborn has been promoted to be senior of the Kershaw in place of Graf, and L. W. Passano has been assigned as junior.

Marconi Operator Arthur Bernhardt. He received the S O S that sent the Algonquin searching for the lost Prins Maurits

H. J. Sacker has been assigned to the Juniata as senior operator in place of C. R. Robinson.

P. H. Singewald, late senior operator on the Dorchester, has been assigned to the Southerner, at Charleston, S. C. The vacancy on the Dorchester was filled by J. L. Brannan.

Constructor M. C. Morris is equipping the Southerner, at Charleston, S. C., with a ½ k.w., 120-cycle panel set. The Southerner is a sister ship to the Georgiana which was recently equipped at Charleston, S. C., with a similar set.

T. M. Stevens, Superintendent of the Southern Division, E. M. Murray, Chief Inspector, and R. Y. Cadmus, United States Radio Inspector of the third district, recently made a special test of a ½ k.w., 500-cycle, quenched gap panel set on the Juniata, from Baltimore to Boston and return. Excellent results were obtained, the vessel being in communication with Boston, Virginia Beach, Va., Cape Hatteras, N. C., Miami, Fla., and several other important coast stations. On one occasion the Juniata was in touch with Cape Hatteras at a distance of 390 miles in the daytime.

A. Campbell, formerly of the Philadelphia station, has been assigned to the

second trick in the Cape May, N. J., station, in place of Operator Smith.

Operator W. J. Phillips has recently returned from a trip to Genoa, Italy, via South America, on the Palermo. Phillips returned from Italy as a passenger on the America.

Pacific Coast Division

A. W. Baxter, in charge of the East San Pedro station, made a two days' visit to San Francisco on May 10th and 11th.

E. R. Fairley, acting assistant on the Aroline, recently relieved A. W. Baxter at East San Pedro for a few days.

B. C. McDonald, acting as relief for W. L. Baker at Avalon, returned to the Hermosa on April 22nd, Baker resuming charge at Avalon.

D. Duran, formerly in the San Francisco district, sailed on the Nushagak for Clarks Point, April 29th.

C. Mathews recently left on the Kvichak for Nak Nek. Mathews is in charge of the squad this season.

R. M. Bitzer left on the Kadiak for Karluck, April 10th.

A. Seidl was detailed to relieve L. C. Rayment for one trip on Barge 93, beginning the voyage on May 5th.

J. H. Southard was assigned as operator in charge of the Centralia, May 2nd. The Centralia carries one operator.

L. V. R. Carmine and E. D. Bryant sailed on the China for the Orient, May 8th, as first and assistant, respectively.

J. A. Falke, formerly of this division, was returned to the California, vice S. P. Smith, on April 29th, at New York. The California is now on her way to Brazil.

H. W. Underwood was assigned to the Cuzco as assistant, on April 25th. He joined the Cuzco at East San Pedro. E. J. Browne is operator in charge.

D. R. Clemons and P. E. White are acting first and assistant on the City of Topeka.

W. P. Giambruno relieved E. A. Werner as operator in charge of the J. A. Chanslor, on May 10th, at Avon. Werner has taken a short leave of absence on account of ill health.

A. H. Randow, in charge of the apparatus aboard the Dakotan, was transferred to the San Francisco district on May 1st.

G. H. Harvey relieved H. G. Austin as operator in charge of the Honolulan, April 21st.

R. A. Germon, in charge of the Korea, was transferred to the Jim Butler for service in Mexican waters, leaving April 15th.

D. M. Taylor and W. P. Schneider left on the Korea as first and assistant, April 16th.

When the Korrigan III was seized by the Mexicans in the Gulf of California on April 10th, H. W. Everett transferred the wireless equipment to shore at Santa Rosalia, where he is now successfully operating it as a shore station.

I. L. Church was assigned to the Santa Cecilia, April 20th, bound for New York.

J. F. McQuaid is now acting assistant on the F. A. Kilburn.

L. T. Franklin and F. Deckard sailed on the Lurline, April 28th, as first and assistant, respectively.

J. A. Miche and C. Bentley are scheduled to sail as first and assistant on the Manoa, May 11th.

G. F. Shecklen arrived as operator in charge of the Minnesotan, on May 10th. He is now attached to the San Francisco district.

O. Mock and L. W. Stevens sailed on the Northland as first and assistant, May 4th.

C. Bailey of the Oliver J. Olson was transferred to the Pan American at New York, on April 17th. Bailey is to remain in the New York district until a vacancy occurs westbound.

Y. de Bellefeuille and E. J. Des Rosier left on the Peru for Panama, April 22nd, as first and assistant.

N. J. Marthaler recently relieved A. Konigstein as operator in charge of the General Y. Pesqueira. Konigstein obtained leave of absence on account of ill health. He expects to recuperate at the mud baths in the South.

J. E. Johnston and B. C. Springer are acting as first and assistant on the Queen.

F. A. Lafferty was assigned as assistant of the Rose City, April 16th.

N. McGovern joined the Roanoke as assistant, May 10th.

S. J. Morgan of the Leelanaw arrived at Bremen recently.

H. G. Austin and J. M. Flottman sailed on the Siberia as first and assistant, April 22nd.

W. E. Chesebrough relieved O. Wilts as assistant operator aboard the San Ramon, May 3rd.

F. W. Brown is acting assistant on the Santa Clara since April 20th.

George Gerson of the New York district was assigned to the Santa Cruz, on April 10th.

A. R. Short was assigned to the Vance, on April 26th. Shortly after leaving San Francisco the Vance was damaged in the storm, being towed to San Francisco afterward. Operator Short performed his work creditably.

C. T. Nichols relieved E. Smith as assistant operator on the Wilhelmina May 4th.

J. W. Morrow and J. T. Brady sailed on the Wapama, May 1st, as first and assistant, respectively.

Seattle Staff Changes

H. W. Barker has been temporarily assigned as assistant engineer in the construction of the semi-high power station at Astoria and will be engaged in the tuning of the new plant.

A. W. DeSart, foreman of the Construction Department, has resigned to accept the position of assistant radio inspector at Seattle.

H. Linden, who was temporarily relieving on the Spokane, has returned to his berth on the President.

W. J. Manahan, after a short trip to San Francisco, has returned to the Seattle shop.

H. F. Wiehr of the Paraiso is off duty as a result of the lay-up of that vessel.

J. W. Gregg, second on the Paraiso, is assistant on the Admiral Evans.

A. G. Simson, assistant on the Admiral Evans, has been transferred to the Spokane.

G. P. Williams of the tug Oneonta is taking a vacation. H. J. Scott is relieving him.

W. B. Wilson, station manager at Friday Harbor, is receiving congratulations upon the arrival of a daughter.

C. E. Bence, station manager at Juneau, arrived on the Admiral Evans, accompanied by Mrs. Bence, on his way to San Francisco for a short vacation. He has been relieved at Juneau by Gus Lang, senior operator on the Evans.

The next edition of the Service Magazine will contain the announcement of the opening of the new Astoria, Ketchikan and Juneau stations for commercial traffic. Ketchikan is already completed, and first class communication has been established between Ketchikan and Juneau, day and night.

The Astoria station recently made transmitting tests, under the direct supervision of Chief Engineer F. M. Sammis, assisted by Mr. Moir, the engineer in charge of construction, and his assistant, H. W. Barker.

I. F. Julien, who has been acting as Mr. Moir's assistant at Astoria, is returning to Seattle for a short visit, in order to arrange for the removal of his family to Astoria, where he will take up the duties of station manager at the new station.

KEEPING IN TOUCH ON SWAN ISLAND

A notable record of wireless achievements is shown by the reports of the operators in the United States Fruit Company's lonely but powerful station on Swan Island, where, except for wireless, the inhabitants are cut off from the world for months at a time.

Situated in the Caribbean Sea, ninety miles to the northwest of the coast of Honduras, 2,000 acres of coral and sand form Swan Island, which is a peculiarly ideal location for a wireless station. Its perfect isolation makes it secure from interference by other stations and for this one important reason its efficiency is much greater than some stations on the mainland. Eight years ago the United Fruit Company built the plant to act as a clearing house for all the wireless business from its stations in New Orleans, 800 miles away; Santa Marta, 700 miles away, and its smaller stations throughout Central America and the West Indies. The most modern and powerful equipment in the world for the distance required has been employed.

VESSELS EQUIPPED WITH MARCONI APPARATUS SINCE THE MAY ISSUE

Names	Owners	Call Letters
s. s. Sarnia	The Atlantic Fruit Company	KVR
s. s. Sibiria	The Atlantic Fruit Company	KVS
s. s. Clan Macintyre	Cayzer, Irvine & Company	MOC

ALBERT MEDAL FOR MARCONI

The Royal Society of Arts has presented the Albert Medal to Guglielmo Marconi "for his services in the development and practical application of wireless telegraphy." The medal is awarded annually as a reward for "distinguished merit in promoting arts, manufactures and commerce." It was instituted in 1863.

MARCONI'S TRIBUTE TO EDISON

Guglielmo Marconi was among the well-known men who paid tributes to Thomas A. Edison when a gold medal was presented to the latter by the Civic Federation in Carnegie Hall, New York, on May 6. Mr. Marconi said that the entire world acclaimed Mr. Edison as friend and benefactor.

SERVICE ITEMS

David Sarnoff, assistant traffic manager of the Marconi Wireless Telegraph Company of America, has returned to New York after a trip to New Orleans.

John H. Tingle has resigned from the auditing department of the Marconi Wireless Telegraph Company of America to enter the employ of an exporting house. The members of the stenographic department gave a luncheon in his honor in the resting room in the Woolworth Building on May 7.

G. W. Almour, who represented the Marconi Wireless Telegraph Company of America, at Key West, Fla., is no longer connected with the service.

NEW MARCONI QUARTERS

The Cliff street offices of the Marconi Wireless Telegraph Company of America have been removed to the eighth floor of the building at 57 Duane street, New York. The new quarters include a lounging room for operators.

THE SHARE MARKET

New York, May 26.

The only advances shown in Marconi issues are confined to the dividend-paying English preferred stock. The brokers report that some activity is shown in these securities and attribute it mainly to the difficulty of securing the stock, which is principally held in foreign countries. Italy's declaration of war and the recall of Mr. Marconi making necessary a postponement of the Telefunken patent suits, the trading in American stock is practically at a standstill. A slight fractional decline is revealed in to-day's quotations and, pending the clearing up the situation arising through President Wilson's note to Germany, the tendency in the several Wall Street markets is to let trading drift further into idleness.

Bid and asked quotations to-day:

American, 2⅜-2¾; Canadian, 1-1½; English, common, 9½-14; English, preferred, 8½-12½.

MARCONI AID ASSOCIATION

At a meeting of the employees of the Marconi Wireless Telegraph Company of America, held at the company's New York offices, on May 24, an association was organized to be known as the "Marconi Wireless Aid Association."

The following were elected officers: President, E. T. Edwards; vice-presidents, David Sarnoff, A. H. Ginman, T. M. Stevens and F. H. Mason; secretary, L. MacConnach; treasurer, K. P. Kirk.

The executive committee is composed of G. S. DeSousa, E. B. Pillsbury, G. H. Porter, W. A. Winterbottom, L. Lemon and Miss T. N. Brown.

The objects of the Marconi Wireless Aid Association are similar to those of other aid associations and societies in the telegraph service.

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MARCONI WIRELESS TELEGRAPH COMPANY OF AMERICA

WOOLWORTH BUILDING

233 BROADWAY, NEW YORK

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Edward J. Nally
John Bottomley
James Van Vechten Olcott

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James W. Pyke
George S. De Sousa
James R. Sheffield
John L. Griggs
Edward L. Young

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Edward J. Nally — James R. Sheffield
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Harry Shoemaker.....*Research Engineer*
Roy A. Weagant.....*Assistant Engineer*
C. D. Warner.....*Assistant Engineer*
Julius Martin .....*Assistant Engineer*

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Traffic Department

George S. De Sousa.....*Traffic Manager*
David Sarnoff....*Assistant Traffic Manager*

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Lynn C. Everett.....*Assistant Engineer*
Edw. B. Pillsbury...*General Superintendent*
Lee Lemon .....*Superintendent*
William A. Winterbottom.*Commercial M'g'r*
Harry Chadwick.....*Office Manager*
Paul C. Kast.....*Cashier*

Manufacturing Department

Aldene, N. J.

G. W. Hayes.....*Superintendent of Factory*

Purchasing Department

G. Harold Porter.....*Purchasing Agent*

Publishing Department

J. Andrew White....*Editor of Publications*
Wheeler N. Soper.....*Assistant Editor*

Pacific Coast Division

Merchants Exchange Bldg., San Francisco

A. H. Ginman.....*General Superintendent*
John R. Irwin.....*Supt. Northern District*
George J. Jessop....*Supt. Southern District*

Eastern Division

Operating Department, 29 Cliff St., New York

Ernest T. Edwards.....*Superintendent*
G. W. Nicholls.....*District Superintendent*

Southern Division

American Building, Baltimore, Md.

T. M. Stevens.....*Superintendent*

Gulf Division

917 Decatur St., New Orleans, La.

E. C. Newton.....*Superintendent*

Great Lakes Division

Schofield Bldg., Cleveland, Ohio

F. H. Mason.....*Superintendent*

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

S. H., New York City, asks:

Ques.—(1) I have a problem which I wish you could solve for me. My aerial has a single wire, having a natural wave-length of a little less than 300 meters. I hear amateur stations on their 200-meter wave-lengths best with about one-half of the wire of the primary winding in use. When I connect a Murdock $5 variable condenser in series with the aerial I cannot hear amateurs. I have not a wavemeter so I do not know when my aerial is adjusted to a wave-length of 200 meters, but I am, of course, sure that many amateurs in my vicinity do not emit a pure wave. I wish you could explain why I require so much wire on the primary winding with my circuits apparently out of resonance for the best signals. The amount of wire I use for amateur wave-lengths is the same that I employ in getting the weather reports from the Brooklyn Navy Yard.

Ans.—(1) We might answer this query at once by the statement that your receiving tuner is improperly designed. Lacking data concerning its construction and over-all dimensions, however, we are puzzled to give an explanation of your trouble. Are you sure that the antenna has a wave-length of 300 meters? Perhaps its natural wave-length is less than you suppose, and therefore you require the amount of inductance stated to adjust to the amateur wave-length. Again, it may be that the secondary winding of your receiving tuner does not have a sufficiently small value of turns in use at the lowest wave-length adjustment to get that circuit in resonance with amateur wave-lengths. On this account oscillations must be forced into the detector circuit which, of course, can only be done by the use of a considerable amount of inductance in the primary winding. That you hear the Brooklyn Navy Yard on the same wave-length adjustment at which you hear amateur stations may be accounted for by the fact that you probably employ a very close coupling between the primary and secondary windings and therefore receive signals, due to forced oscillations, from other wave-lengths. If your receiving tuner is properly designed and the wave-length of your aerial is as you state about 300 meters, the addition of the condenser in series should result in an increase of signals from amateur stations. These phenomena are undoubtedly due to the ill design of the receiving tuner.

* * *

P. W. D., Anglesea, N. J., asks:

Ques.—(1) Does a condenser in series with the aerial when transmitting cut down the emitted wave-length?

Ans.—(1) Yes; by a certain amount, depending upon the capacity of the condenser.

Ques.—(2) What is the longest wave-length I can adjust to with a receiving tuner designed as follows: A primary 3¼ inches in diameter by 7 inches in length, wound closely with No. 24 enamel wire; the secondary winding is 3½ inches in diameter by 7 inches in length, wound with No. 50 D. S. C. wire. This receiving tuner is connected with the aerial, comprising six wires 135 feet in length by 40 feet in height.

Ans.—(2) If the secondary winding of the receiving tuner is actually wound with No. 50 D. S. C. wire you should be able to adjust to wave-lengths of between 6,000 and 7,000 meters. The natural wave-length of your aerial is about 320 meters, and it will be increased to 3,000 or 4,000 meters by the addition of the primary inductance in series.

* * *

T. A. B., New Orleans, writes:

Ques.—My aerial consists of six strands of No. 14 aluminum wire, 48 feet in length. It is 64 feet from the ground on one end and 20 feet from the earth on the other; in fact, it is almost perpendicular. This aerial is just in course of erection and I should like to know if its position would interfere with operating. If not, what is the wave-length and the receiving distance?

Ans.—The approximate wave-length of your aerial is 170 meters. This disposition of the aerial should not interfere with efficient working and we see no reason why you should not obtain results. Of course, you cannot expect to receive at extremely long distances with this aerial, but you should be able to hear ship and shore stations within a reasonable distance from your city.

* * *

O. E. C., Pawtucket, R. I.:

A fan motor designed for operation on 125 cycles is bound to heat up when connected to a 60-cycle source of energy because of the fact that the winding has not sufficient impedance for the lower frequency. We are

unable to account for the sudden stopping of this motor and then starting at a later period, except that there may be a loose connection in the field coil windings which shakes loose after the motor is in operation.

* * *

F. P. G., Charleston, S. C., asks:

Ques.—(1) I have all the standard works on the theory of wireless telegraphy, but I want a book or pamphlet which will give me such practical details as the number of words to count in getting the check of a message, how figures and punctuation marks are counted, etc. Where can I purchase such a book? I also wish to know whether the operator's personal "sign" is to be included in the check.

Ans.—(1) Outside of the service of the Marconi Company there is no book available containing the information you want, that is to say, applying particularly to the handling of wireless telegraphic traffic. The cable method of counting and checking words is used in the radio service. If you will secure a copy of the Western Union or Postal tariff books you can obtain full information on this subject. The Marconi traffic (tariff) book is not available to those outside of the service. You might communicate with the Department of Commerce or the radio inspector in your district and secure a copy of the London International Radio Telegraphic Convention, and also the United States Regulations pertaining to the transmission of radio telegraphic traffic. A book covering this phase of the situation will be issued under the auspices of THE WIRELESS AGE. Referring to the latter portion of your query, the operator's personal sign is not included in the check of the message, nor in any portion of the message.

Ques.—(2) I heard the government inspector ask this question: "How would you test your antenna insulation to see if it is perfect?" What is the correct answer?

Ans.—(2) The insulation of an aerial is most satisfactorily tested by connecting a spark gap directly in series with it, the terminals of the spark gap being in turn connected to a high potential transformer or induction coil. If the aerial insulation is bad no spark discharge will occur at the gap even when it is shortened to say ⅛ inch.

Ques.—(3) I have often heard NAO (Charleston, S. C.) use this character:

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What does it mean? Is it a mistake for the numeral 1.

Ans.—(3) This is not a distinct character and is probably an error in making the numeral 1.

Ques.—(4) I sometimes hear a signal which sounds like AHR at the beginning or ending of a message. What does this mean?

Ans.—(4) This is an abbreviation often used on the American Morse lines and means "another"; that is to say, the sending operator has still another message to dispatch.

Ques.—(5) Why is it that a variable condenser in shunt or connected across the primary of a receiving transformer has absolutely no effect on the signals, but again will entirely cut out others, notably, NAN and NAR, unless properly adjusted? Is it because these stations are more sharply tuned than others?

Ans.—(5) This is a subject that has not been as thoroughly investigated as some others, but without going into the details of a complete explanation we can inform you that the open oscillatory circuit of your receiving set has a certain effective capacity and a certain effective inductance. When a condenser is connected in shunt to the primary winding you have a second oscillatory circuit which at certain adjustments will not change the wave-length of the antenna system. Suppose, for example, that the antenna system were adjusted to a wave-length of 1,000 meters with a certain amount of inductance connected in series with the primary winding. If, then, a condenser is connected across the primary winding so that the circuit comprising the coil of wire and the condenser has a wave-length of 1,000 meters you, in reality, have two 1,000-meter circuits in parallel. A little closer examination will reveal that by so doing you have in some instances doubled the capacity of the antenna system and halved the inductance value; therefore you have not changed the wave-length at all. In other words, if you connect two oscillatory circuits of identical wave-length in parallel the system as a whole will vibrate at the same wave-length as each of the individual circuits. This is probably the condition that obtains when the addition of capacity at the condenser has no effect on the received signals. There are so many factors entering into the case we could not give a specific answer unless we had actual and detailed data (numerical values) of all the equipment.

* * *

E. T. M., Chicago, Ill.:

It is totally impossible to calculate the wave-length of an aerial having the design shown in the sketch accompanying your communication. We should say that the wave-length of this aerial is about 250 meters although we are not certain. It is highly desirable that you secure a wave-meter to place this apparatus in resonance at the wave-lengths you desire, namely 200 meters and 425 meters. Apparently the wave-length of this aerial is not too long to be reduced to 200 meters by means of a series condenser. You should construct a short wave condenser of four plates connected in series, each plate having dimensions of 10 x 10 inches, covered with tin foil 8 x 8 inches. This condenser will probably reduce the wave-length of the aerial below 200 meters, but it can be raised to that value by the addition of a small amount of inductance. We do not understand the description of your sending condenser. In fact, it is not at all clear and, therefore, we cannot give advice as to its probable capacity.

You say that you believe the capacity value is .019 microfarads. This is too large for work on 200 meters, but is about correct fo

425-meter work. A condenser for use at a wave-length of 200 meters should not have a capacity greater than .01 microfarads. The secondary winding of the oscillation transformer, as described by you, has insufficient turns to raise the wave-length of this aerial to 425 meters. We advise you to construct an aerial tuning inductance to be connected in series with the aerial. You will obtain far better results by exciting this antenna with a small induction coil, measuring the wave-length with a wave-meter. Then you should add sufficient turns in the antenna circuit until you attain first a wave-length of 200 meters and next a wave-length of 425 meters. Perhaps the radio inspector in your district will call at your station and adjust it to a definite wave-length. We believe, however, that you are within the zone of commercial interference and will not be allowed to work your station at a wave-length of 425 meters.

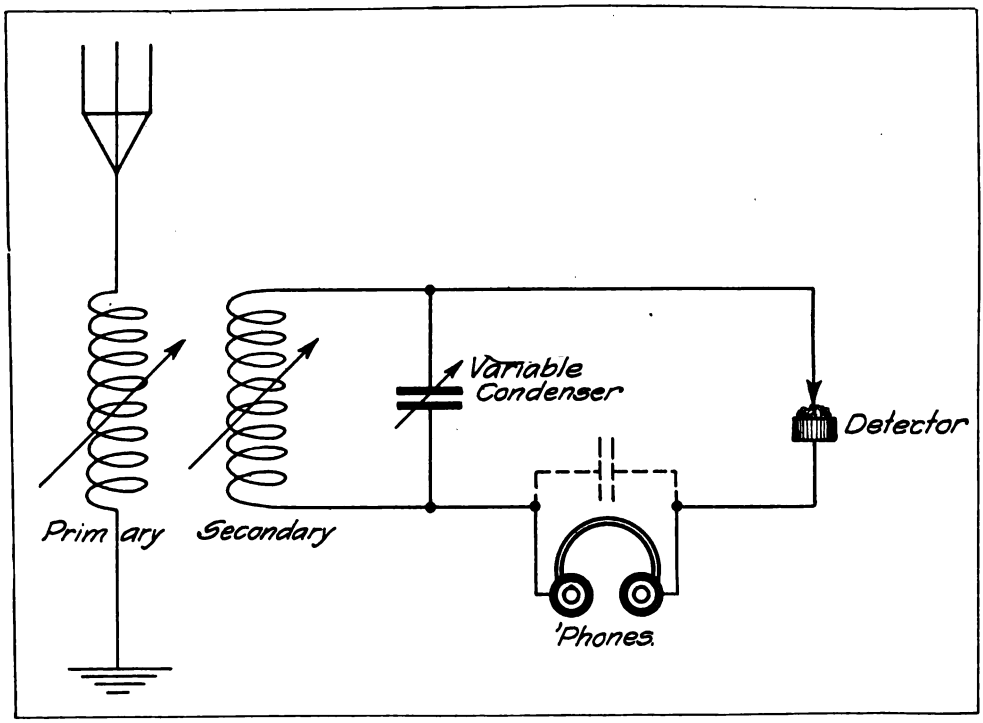
* * *

K. H., Marion, Ohio:

It is a fact, as the article in the March issue of THE WIRELESS AGE says, that in order to receive the signals from the war ships of the British Admiralty close tuning is necessary. The Admiralty ships which you hear in Ohio are not operating on long wave-lengths nor is the emitted wave particularly sharp; but the ships of the Admiralty in the Mediterranean Sea and in the North Sea use very long wave-lengths for official communications and must be carefully attuned to in order to be received. Your receiving set is doing nothing out of the ordinary, because the signals from the Admiralty ships lying off Sandy Hook, N. J., are heard by all the amateurs within a radius of 1,000 to 1,400 miles.

We do not know the two strange stations you hear or where they are located. There are very few trans-Atlantic liners of the larger types, such as the Mauretania, at present engaged in trans-Atlantic service; therefore, you do not hear the signals.

Ans.—(3) You say that when you move the slider of the primary a click is heard in the head telephones; this is a sure indication that there is a loose connection between the primary winding and the slider; that is to say, the slider does not make a good contact and when the circuit is opened and then closed you hear a click due to the accumulation of static charges which discharge through the receiver windings.



Ans.—(4) The vessels engaged in the trans-Atlantic service are fitted with 1½ k.w. sets supplied by the International Mercantile Marine Communication Company, Ltd., of London, England.

* * *

W. H. W., Anniston, Ala.:

The receiving set you describe in connection with the antenna of the dimensions given should afford a night range of 500 miles, but the daylight range is rather doubtful; it may possibly be 150 miles.

In the accompanying sketch we give a complete circuit diagram for your apparatus. Your description included no fixed condenser, which should be placed in shunt to the head telephones, as shown by the dotted line in the drawing.

R. F., Davenport, Iowa, writes:

Ques.—(1) Please tell me how a 2-inch wireless coil drawing 6 amperes can be operated on a 30-volt storage battery without being injured?

Ans.—(1) You should connect a resistance coil in series with the battery to cut down the current consumption. Why not connect the storage cells in parallel, that is to say, make a series parallel connection so that the resultant voltage will be suitable to the coil in question?

Ques.—(2) Will the spark produced by the coil be of sufficient volume to employ a rotary gap?

Ans.—(2) No. The use of a rotary gap in connection with a spark coil has never been satisfactory.

Reply to third query: The night range of your apparatus is about 1,500 miles during the winter months.

* * *

L. F., Fort Stanton, N. M.:

The "Text Book on Wireless Telegraphy," by Rupert Stanley, will fill your needs regarding the modern systems of wireless telegraphy. There are several books in the market for the more advanced students of wireless telegraphy. We suggest that you get in touch with the Book Department of THE WIRELESS AGE, 450 Fourth Avenue, New York City.

* * *

H. S., Albany, N. Y., writes:

Ques.—(1) When employing a rotary spark gap in connection with a ¼ k.w. set should the condenser capacity be greater or smaller than when using a stationary gap?

Ans.—(1) The condenser capacity should be of smaller value when employing the rotary gap.

Ques.—(2) With a 350-meter aerial and a receiving tuner capable of tuning to 1,800 meters, what should be the size of the wire and the dimensions of the tubes of the loading coil to efficiently receive Glace Bay? Should the secondary be loaded, too?

Ans.—(2) It requires an extremely sensitive receiving detector to hear Glace Bay inland (in the States), and we are in doubt whether you would be able to receive these signals. A loading coil 25 inches in length by 5½ inches in diameter, wound with No. 20 S.S.C. wire, will raise the wave-length of the antenna circuit to about 8,000 meters. A loading coil in the secondary circuit, 15 inches in length, 5½ inches diameter, wound closely with No. 26 wire, should raise the wave-length of the secondary circuit to about the same value.

Ques.—(3) Kindly tell me the difference between a 40 and a 60-cycle transformer.

Ans.—(3) For a given number of watts the 40-cycle transformer will have a greater value of impedance than the 60 cycle transformer (in the primary circuit); that is to say, there will be more turns of wire or a larger iron core than in the case of the transformer having a higher frequency.

* * *

E. S. L., Kenosha, Wis.:

The vacuum valve detector, properly connected up, should give better signals than the silicon detector. Make sure that your connections are proper for the vacuum valve. The positive pole of the high voltage battery should be connected to the plate and the negative end of the high voltage battery connected to the positive end of the filament battery. Again, the secondary winding of your receiving tuner should be so constructed that for the wave-length desired inductance predominates in the secondary winding and the capacity in shunt is at a minimum value. Perhaps you have insufficient potential in the high voltage battery to bring the vacuum valve to a sensitive condition. If there is any doubt in this respect try adding additional cells in the circuit. If it requires an abnormal value of voltage to secure the blue glow in the bulb, apply an alcohol torch to one side of the bulb until the blue glow appears at a much lower potential. The January, 1914, issue of THE WIRELESS AGE contains definite instructions for the operation of the vacuum valve.

* * *

R. D. M., New Orleans, La.:

Ans.—(1) A receiving tuner, the normal wave-length range of which is 1,000 meters, is too small to be boosted in either the primary or secondary windings to a wave-length of 5,000 or 6,000 meters. For the longer wave-lengths it is best to design a special receiving tuner having sufficient values in both the primary and secondary windings to attain this wave-length. Data for the construction of tuning coils of definite wave-length were published in the series on "How to Conduct a Radio Club," in previous issues of THE WIRELESS AGE.

The January, 1914, issue of THE WIRELESS AGE contained a complete article on the adjustment of the vacuum value.

Ans.—(3) A potentiometer for use with a carborundum crystal should have a resistance value of between 300 to 400 ohms. Generally one cell of battery is sufficient in connection with this potentiometer.

Ans.—(4) The fixed stopping condenser for use with the carborundum detector should have a capacity of .003 mfd.; although it may vary from .0015 to .004. Twelve interleaved sheets of tin foil 3 x 4 inches, separated by thin paraffin paper and closely pressed together, will give the desired capacity.

Ans.—(5) A small potential will increase the sensitiveness of the galena, silicon and perikon detectors. This is not believed by the amateur field at large, but is nevertheless a fact. If the potentiometer has a resistance of 300 to 400 ohms, a fixed resistance of 2,000 ohms connected in series will reduce the potential of a single cell of battery to such value that it may be conveniently employed in connection with the detectors named.

* * *

A. C. C., Lewiston, Mont., writes:

In the Electrical World of March 13th, Dr. A. H. Taylor gave a description of a double vacuum valve type of receiver for continuous waves. Would his arrangement of connec-

tions be as efficient for amplifying spark stations (providing the two stopping condensers were cut out) as the conections shown in the January, 1914, issue of THE WIRELESS AGE?

Ans.—(1) The arrangement described by Dr. Taylor is equally applicable to the reception of damped or undamped oscillations. The circuit may be used either with or without the fixed condensers. If a fixed condenser is employed in connection with the secondary winding of the receiving tuner its capacity should not be more than .00005 microfarads. With the condenser in series, the secondary winding must have more turns of wire than when it is not used. It is suggested that you employ a variable condenser at this point, say for instance a small Blitzen condenser, having a maximum capacity of .0008 microfarads and a minimum capacity of .00001 microfarads. The fixed condenser connected in series with the auto-transformer to the second vacuum valve is preferably of variable capacity and should have a value of about .001 microfarads, depending to some extent upon the constants of the auto transformer. With the exception of the fixed condenser described in the article referred to, the diagram of connections is a replica of the connections shown in the January, 1914, issue of THE WIRELESS AGE. The method as described by Dr. Taylor for the reception of damped and undamped oscillations is not particularly efficient because of the fact that the filaments must be burned to such an extremely high degree of incandescence. There are circuits in use for amplifying the signals from the single vacuum valve bulb that require a very low degree of incandescence at the filament and give extremely sensitive results. As a matter of fact, it has been found possible, with a 60-foot aerial, to read signals from Honolulu in New York City. In the arrangement of circuits described by Dr. Taylor the local telephone circuits of the audion do not generate pure undamped oscillations. but we really believe upon investigation will be found to be traversed by a series of interrupted direct currents taking place at a very high rate per second of time. Also the circuits shown allow of no control of the local energy and thus, whether or not the detector will be responsive to undamped oscillations, is a "hit or miss" proposition. The foregoing statements will cover your queries second and third.

* * *

L. P. L., Rochester, N. Y.:

Inasmuch as you have done everything possible to maintain your vacuum valve in a sensitive condition we cannot give advice why such a falling off in signals has been obtained. We suggest that you carefully inspect all connections, noting particularly whether one or two of the cells in the high voltage circuit have not become "dead." This is an error that has recently been discovered in many vacuum valve circuits, namely, one or two of the individual cells in each flash light unit have become exhausted and have seriously hindered the passage of current through the telephone circuit. As you have made a number of tests to determine the trouble, we have no additional advice to give. There is no reason why results should not be obtained from the vacuum valve amplifier described in the January, 1914, issue. If amplifications are not received there is something wrong with the connections employed.

* * *

F. O., Berkeley, Cal., writes:

Ques.—(1) What is the voltage of a transformer of 1 k.w. capacity which is wound through 110 volts, 60 cycles, which will jump (arc) ¼ inch between needle points when cold, but will jump over 9/16 of an inch in air when the points are red hot, the maximum input being used in both cases.

Ans.—(1) This corresponds to a voltage of about 8,500.

Ques.—(2) How many plates of glass, 8 x 10 x ⅛ inches in thickness with tin foil 6 x 7 inches on both sides, assembled and mounted as per sketch, should be used with the transformer referred to in order to get the maximum capacity with 200 meters' wave-length, allowing 2 feet of wire for connections and two turns of No. 4 copper wire, 1 foot in diameter and spaced one inch in the primary winding of the oscillation transformer?

Ans.—(2) The condenser should have a capacity of .008 microfarads. Thirteen of these plates connected in parallel will give the desired capacity.

Ques.—(3) I have an induction motor for 110 volts, 60 cycles, giving 1,800 revolutions per minute. I should like to know the diameter of the wheel, the number of plugs, and the radius from the shaft to the line of plugs thereon for a synchronous rotary gap running at certain speed.

Ans.—(3) It will be rather difficult to keep the motor in exact synchronism with the alternating current charging the condensers. For a synchronous spark discharge you require only four electrodes on the revolving disc. The disc should be about 6 inches in diameter with electrodes placed at a distance of 2½ inches from the center. The electrodes should be 3/16 of an inch in diameter.

If you desire a spark gap of the non-synchronous type the disc may be 8 inches in diameter and fitted with 12 points equally spaced about the circumference and at a distance of 3 inches from the center. These electrodes also should not be more than 3/16 of an inch in diameter and should revolve very closely to the stationary electrodes.

Ques.—(4) Would this gap give as much or more radiation as the high tone gap described in the August, 1914, issue of THE WIRELESS AGE?

Ans.—(4) It is likely that it will give increased radiation because of the increased size of the electrodes.

Ques.—(5) Please tell me how many turns of No. 8 copper wire, 10 inches in diameter, spaced ¾ inch apart. I can use with an aerial of four wires spaced 4 feet, 8 inches; 40 feet long x 50 feet in height at one end and 20 feet at the other end, with a lead-in of 15 feet at

the lower end, and a ground wire of 25 feet in length, to keep within a wave-length adjustment of 200 meters?

Ans.—(5) Eighteen turns of the size wire you suggest will raise the wave-length of the circuit to about 200 meters.

* * *

F. J. R., Auburndale, Mass., writes:

Ques.—(1) What does "one" signify when it follows the call of the sending station?

Ans.—(1) There has been some misinterpretation of this signal. You probably mistake it for the signal "AR," which is the termination signal for a radiogram, according to the International Telegraphic Convention.

Ques.—(2) Is the diagram of a ship station published in the October, 1913, WIRELESS AGE, which is required for the first grade commercial license issued by the United States government?

Ans.—(2) Use may be made of this diagram, but it is not necessarily the one that must be drawn to comply with the examination. The authorities who hold the examination are more interested in the fundamental circuits of a wireless telegraph set, although at times it is necessary to insert the details of commercial apparatus.

Ques.—(3) What is the wave-length of an aerial, T type, 40 feet high by 90 feet in length, with a 30-foot lead-in? It consists of three wires.

Ans.—(3) The wave-length of this aerial is about 210 meters.

Ques.—(4) What are the calls and the power of the amateurs holding special licenses in district No. 1?

Ans.—(4) The following stations are listed as having special licenses:

Location.	Call Letters.	Wave-Length.	Owner.
Amesbury, Mass.	IXA	300, 600	Wireless Specialty Apparatus Co.
Boston, Mass.	IXB	300, 600	Wireless Specialty Apparatus Co.
Boston, Mass.	IXH	300, 400, 600	Holtzer-Cabot Electric Co.
Cambridge, Mass.	IXP	300, 550, 600	George W. Pierce.
Cambridge, Mass.	IYH	300, 550, 600	Harvard Univ.
Chelsea, Mass.	IXT	300, 600, 700	William J. Murdock Co.
Gloucester, Mass.	IXI		John Hays Hammond, Jr.
New Bedford, Mass.....	IVO	200, 300	Lester I. Jenkins.
Pittsfield, Mass.	IXG	600	Gen. Elec. Co.
Watchaug Pond, R. I.....	IXW		Ralph C. Watrous.

Ques.—(5) What is the address of the Radio Relay League?

Ans.—(5) Address your communications care of Clarence W. Tuska, Secretary, Hartford, Conn.

* * *

W. A. C., New Orleans, La., writes:

Ques.—(1) Please let me know if I can receive signals from the Arlington station with the following apparatus:

A 2-wire aerial, 125 feet in length, the wires spaced 6 feet apart and placed 60 feet above the ground; a commercial loose coupler; tuning coil 12 inches in length; two .01 microfarad fixed condensers, silicon and galena detectors and 2,000 ohm head telephone set. If not, please let me know what is required.

Ans.—(1) You have not given us the dimensions of the loose coupler and therefore we cannot make a definite reply; but with one of the condensers as described in shunt with the secondary winding of the receiving tuner and the loading coil in series, you should have but little difficulty in receiving the signals from Arlington, provided the loose coupler has the dimensions to be expected in the average amateur set.

Ques.—(2) What is the wave-length of this aerial?

Ans.—(2) About 325 meters.

Ques.—(3) To hear Arlington's signals, should my aerial be directed toward that station?

Ans.—(3) It is possible if you employ a flat top aerial, that a certain definite direction may give the best results, but it is more or less problematical. The directional effect of aerials are not violent except where the flat top portion of an aerial is considerably longer than the vertical portion. With the aerial you describe we are inclined to believe that it will make little difference in which direction it is swung.

* * *

J. G. S., Frankfort, Mich., inquires:

Ques.—(1) Can previous issues of THE WIRELESS AGE, such as the January, 1914, issue, be purchased from your company, and at what price?

Ans.—(1) Back numbers of all issues except the June, 1914, issue, can be purchased at the regular price.

Ques.—(2) Please give the dimensions and data for the construction of a ⅛ k.w. open core transformer to be operated on 60 cycles, 110 volts, alternating current.

Ans.—(2) The following data are for a transformer of the closed core type, having a square frame: length of the core, 9 inches; width of the core (outside measurement), 6½ inches; thickness of the core, 1½ inches; number of layers in the primary winding, 16; width of the secondary section, 5 inches; thickness of the insulation between the core and primary, 3/16 of an inch.

The primary winding is separated from the secondary winding by empire cloth. The primary is wound with 3½ pounds of No. 16 D. C. C. wire, while the secondary is wound with 8 pounds of No. 34 enameled wire. The secondary should consist of seven sections, ¼ of an inch in thickness and 2½ inches in width. The insulation between the secondary winding and the iron core should consist of empire cloth ¼ of an inch in thickness. We

have no data for an open core transformer of this capacity.

Ques.—(3) What detectors are suitable for 3200-ohm telephone receivers?

Ans.—(3) Any detector of the crystalline type is suitable for telephones of this value of resistance.

Ques.—(4) Does a quenched gap improve the tone of the spark from the spark coil?

Ans.—(4) No.

Ques.—(5) Is it practical to use a rotary spark gap on a spark coil?

Ans.—(5) No.

* * *

B. E., Shilosh, N. J., asks:

Ques.—(1) What is the inductance of a spirally wound aerial 14 inches in diameter, the wires being spaced 1 inch apart and the coil 20 feet in length, as per the enclosed diagram?

Ans.—(1) Do you wish to know the effective inductance of this coil when it is used as an element of an oscillatory circuit, or do you desire to know the low frequency inductance of the coil alone? Is the coil grounded on one end? The inductance of the helix itself is 2.93 microhenries.

Ques.—(2) Is there any sure method of preventing the lights flickering when a 1 k.w. transformer is used? The electric light company will not allow me to install a transformer unless I will guarantee that the lights will not flicker.

Ans.—(2) You will encounter the least trouble in this respect if you use a closed core transformer fitted with a magnetic leakage gap having a high power factor. Sometimes these effects are at a minimum when connection is made directly to the city mains through a separate meter. If your transformer has a poor power factor there is nothing that we can suggest to help you. Try to obtain permission from the electric light company to make a trial and if flickering of the lights is experienced it may be reduced to some extent by variation of the condenser capacity in the closed circuit or by the insertion of a reactance coil in series with the primary winding. Inasmuch as we have no data concerning your set we cannot give further advice.

Ques.—(3) How many No. 14 B. & S. copper wires bunched together would be equivalent to a No. 4 solid copper wire, as required by the underwriters?

Ans.—(3) Five No. 4 wires connected in parallel will afford the same current carrying capacity.

Ques.—(4) Does THE WIRELESS AGE answer more than one set of questions from the same person?

Ans.—(4) Yes, if the questions have value and are of interest to our readers in general.

The description of the phenomena in your last query is too lengthy for reproduction, but we are inclined to believe that the odd station which you hear at five o'clock in the afternoon is the Goldschmitt high-frequency alternator station at Tuckerton, N. J. While it is not possible to receive undamped oscillations on the ordinary receiving apparatus, it has been the experience of the Editor of this Department that the signals from the Tuckerton station may be read on an ordinary crystal detector up to a distance of about 70 miles. It is likely that this is due to the immense amount of energy radiated by this station.

* * *

E. G. R. inquires:

Ques.—(1) In building an aerial for long distance work please tell me which would be the better for general use: a 2-wire aerial 250 feet in length and 55 feet in height at one end and 45 feet at the other, or the same amount of wire stretched out in one piece, making it a single wire aerial 500 feet in length, the height remaining the same.

Ans.—(1) For stations such as Sayville and Arlington and the government station at Key West, Fla., we prefer the single wire aerial 500 feet in length. For reception from amateur stations the two strand aerial, 250 feet in length, is preferable.

Ques.—(2) With the following instruments and aerial, please tell me what size loading coil and size of wire I would have to make to be able to hear the high power station at New Brunswick, N. J. The loose coupler primary is wound with No. 22 enameled wire on a tube 3½ inches in diameter and 4½ inches in length; the secondary winding consists of No. 28 silk covered wire made on a tube 3 inches in diameter and 4 inches in length; it is to be used in conjunction with the 250-foot aerial just described. The detectors to be employed will be of the crystalline type.

Ans.—(2) You will require a loading coil 30 inches in length, made on a tube 5 inches in diameter, wound full of No. 20 S. S. C. wire. In the secondary circuit, you will require a loading coil 20 inches in length, wound closely with No. 30 wire, the tube being 5 inches in diameter.

Please note that the New Brunswick station is not in operation.

* * *

G. W. F., Rochester, N. Y.:

We have carefully considered your query and enclosed diagram and advise as follows:

Either one or both of the aerials, as you suggest, are too short for the satisfactory reception of signals from high power stations. If you wish to comply with the amateur law concerning transmitting, either of the aerials may be employed for the purpose, but on the other hand if you expect to receive signals from the high power stations of the United States you should erect, if possible, an antenna having a linear length of no less than 1,000 feet. Since you seem to be limited in this respect it is difficult to give further advice. It is also a problem to calculate the wave-length of an antenna of the type you suggest.

The wave-length of an antenna is generally measured with a wave-meter. Past issues of THE WIRELESS AGE have contained complete instructions for this measurement. A 10-foot

spreader is quite sufficient for an 8-wire aerial.

* * *

M. B. R. asks:

Ques.—(1) Will you please inform me what stations BBH and BEH are?

Ans.—(1) BEH is the steamship Argonaut; BBH is the steamship Implacable.

Ques.—(2) How many turns of No. 18 D. S. C. wire (B. & S. gauge) should be wound on a frame 5 inches square, to give a maximum wave-length of 800 meters when used in connection with a .005 microfarad variable condensers? What should be its minimum wave-length?

Ans.—(2) Ten and one-half turns of No. 18 wire with two leads, each 12 inches in length, extended to the variable condenser, will give the circuit a period of 800 meters. The minimum wave-length of the circuit, that is to say, the minimum wave-length at which the wave-meter can be practically worked, is about 120 meters.

* * *

L. T. S., Worcester, Mass.:

Ans.—(1) It is impossible to give the wave-length of a tuning coil alone, except the natural period of the coil which, of course, can be readily measured; but to give data for the construction of a coil which will tune to 5,000 meters is out of the question unless the calculator knows the size of the antenna (the inductance of capacity value) with which the coil is to be used.

Ans.—(2) With an aerial 170 feet in length and ordinary receiving apparatus, such as you describe, you will not be able to hear stations across the ocean. This work can only be done with the vacuum valve detectors and special associated circuits which, for the present, cannot be published.

Ques.—(3) Please tell me what size rotary spark gap disc, and the number of points I must use in connection with a ⅛ h.p. motor turning 4,300 revolutions per minute? This set is to be used with a 20,000 volt, 1 k.w. Thordarson transformer on 110-volt, 60-cycle alternating current.

Ans.—(3) The disc should have a diameter of about 8 inches and be fitted with 8 spark discharge points (no more). The disc may be constructed of bakelite, micalite or any of the insulating substances which can be purchased to-day on the open market.

Ans.—(4) You should obtain a license for a 200-meter amateur station; inasmuch as you are located a considerable distance from a naval station, you will be allowed to use nearly the full output of your transformer. Your aerial is somewhat too long to be reduced to a wave-length of 200 meters. Full data on the size of an aerial to meet the government restrictions have been published in the Queries Answered Department in previous issues of THE WIRELESS AGE. There is no advantage as far as distance is concerned in using an inductively-coupled oscillation transformer over the plain helix type.

* * *

F. L. B., Los Angeles, Cal.:

Ques.—(1) Please give me the wave-length and the receiving range of an aerial consisting of two strands of No. 14 copper wire, each 100 feet long, base 7 feet. The height of the aerial is 35 feet at one end, and 15 feet at the lowest end. The aerial is surrounded by trees and the lead-in is 50 feet in length, passing directly over a tin roof. The aerial slopes entirely down hill. The receiving set consists of a loose coupler, a fixed condenser, galena and silicon detectors, and a 75 ohm telephone receiver. About what wave-length can I tune to with this aerial and loose couplers of the following dimensions: The primary is 4½ inches in length by 4 inches diameter, wound with No. 20 copper wire. The secondary winding is 3¾ inches in length by 3½ inches diameter and has a 7-point switch.

Ans.—(1) The natural wave-length of this aerial is about 245 meters. The primary winding, as described, will raise the wave-length to about 700 meters. We can give no definite advice as to the wave-length of the secondary circuit of your tuner because you have not furnished us with the size of the wire employed. The secondary winding should be made of No. 30 or 32 S. S. C. wire. The primary of the receiving tuner should be wound with No. 26. With wire of this size you can reach a wave-length adjustment of about 2,300 meters. If you wish to attain a wave-length adjustment of 3,000 meters so as to be able to hear the Arlington time signals or other long wave-length stations, the primary winding should be 5 inches in length, wound closely with No. 26 wire. Better results will be obtained by the use of telephone receivers having a high value of resistance; say 2,000 ohms.

* * *

H. T. C., Atlantic City, N. J., writes:

Ques.—(1) My antenna is located on the roof of a hotel. I have trouble in receiving, because of the noise of a 110-volt D. C., 300 ampere, 50 h.p. generator. When the main switch is pulled I do not hear the noise. Is there any way of overcoming this?

Ans.—(1) You have a difficult problem on your hands. There is only one genuine cure for this trouble: If the D. C. leads from this generator were enclosed in iron conduit and the conduit properly connected to earth the effect would be at a minimum. You might try putting two 1 microfarad condensers in series across the D. C. line, grounding one terminal of the telephone receiver through a very small condenser to earth.

* * *

S. M., Portland, Ore., writes:

Ques.—(1) Please tell me which of the following is best suited to raise the spreader of an aerial, from the standpoint of durabilty and efficiency: ¼-inch braided cotton rope, ¼-inch twisted cotton rope, ¼-inch sash cord, 3/16-inch galvanized iron cable, ½-inch twisted manila rope?

Ans.—(1) We should prefer, for general durabilty, 3/16-inch galvanized iron cord which, of course, must be carefully insulated from the wires in the antenna. There is a class of

rope used for this purpose which is known as Russian boat rope and is very durable.

Ques.—(2) Can you give some formula for paint or any compound to be used on the wire, insulators and rope, for the purpose of keeping spiders off? They build their webs and cocoons on everything, causing the antenna rope and insulation to leak in time of dampness.

Ans.—(2) We suggest that you employ glazed porcelain or electrose insulators in your antenna system, which we believe will be proof from the spiders. We fail to see how spiders could injure galvanized iron rope. You might try covering the spreaders with black asphaltum paint, which possesses insulating properties and may prevent the destruction of the wood. There is no reason why you cannot employ metallic spreaders made of iron gas pipe. The spreaders are, in turn, insulated from the halyards by hard rubber insulators or glazed porcelain insulators connected in series.

Ques.—(3) Please tell me which antenna is preferable: A four wire aerial, 2½ feet apart, 63 feet in length by 48 feet in height, or a six wire aerial 1½ feet apart, same length and same height?

Ans.—(3) There is very little difference. The last-named aerial will have a lower value of resistance giving better conductivity. The increase in wave-length will be very slight and not sufficient to warrant the expense of the additional wire.

Ques.—(4) Would a 1½-inch iron pipe, 20 feet in length, buried in moist soil 1½ feet in depth be all right for a lightning ground?

Ans.—(4) If it is proposed to lay this iron pipe lengthwise in the earth it could hardly be said to be an efficient earth connection for lightning. If, however, the gas pipe were driven legthwise to a depth of 20 feet in the earth it would be considered efficient for the conduction of lightning discharges. Zinc or copper plate are often used for this purpose and should have about 150 square feet of surface buried to some depth below the earth to insure the plate being in moist ground throughout the season.

Ques.—(5) A says a brass or copper ribbon ½ inch in width and 1/32 inch in thickness is correct for a ground wire (not lightning ground) and for connecting the sending and receiving apparatus, because high frequency currents travel on the surface of a conductor. B says there would be so much loss of energy at the sharp edges that ribbon should not be used. Which is correct?

Ans.—(5) A more specific case must be cited for comparison. The losses from the sharp edges of the copper wire will be pracically nothing, and we might advise farther that it is not necessary to use copper or brass strips for connecting the circuits of a radio transmitter. Stranded wire will serve the purpose very well and the brush discharge will be less than with copper strip. The brush discharge from copper strip is only serious when very high voltages are employed. The connections in the closed oscilatory circuit of the average amateur set should be made with No. 4 or No. 6 standard copper wire.

* * *

S. T. Gilman, Illinois, writes:

Ques.—(1) Can two ordinary ½ k.w. transformers be connected up in some way to be used as a 1 k.w. transformer? If so, please give instructions.

Ans.—(1) There is no reason why they cannot be connected in this manner, and they are often so employed at commercial stations. If the secondary voltages of the two transformers are identical they may be connected in parallel; otherwise they should be connected in series. It might be advisable to connect the two primary windings in parallel and the two secondary windings in series, the secondary connections being shifted until it is certain that the electro-motive forces in the two transformers are not opposing each other. It is desirable for amateur work that the secondary voltage of the transformer be rather high, somewhere in the vicinity of 15,000 or 18,000 volts, and if the two transformers described have the secondary voltage of the average amateur transformer, namely, about 8,000 volts, the series connection affords a satisfactory method of obtaining high voltages.

Ques.—(2) What is the natural wave-length of an aerial consisting of four wires 45 feet in length, 45 feet in height at one end and 70 feet at the other?

Ans.—(2) The wave-length of this aerial is about 175 meters.

Ans.—(3) The loading coil, as described, will raise the wave-length of your aerial to about 1500 meters.

* * *

G. C., Moscow, Idaho, writes:

Ques.—(1) Would it be advisable to make a loose coupler out of an old tuner with a winding space of 10 inches, the tube being 5½ inches in diameter? With what size of wire should the secondary be wound? What should be the length and diameter of the secondary winding? What would be the wave-length of a coupler of this size?

Ans.—(1) You are evidently not familiar with the principles of receiving apparatus and we should have to know from what stations you expect to receive, before giving you a design for a receiving tuner. This is a matter that should be decided before entering into the construction of a receiving tuner; furthermore, the builder should be guided by the power and wave-lengths of the stations in his vicinity. It is entirely feasible to make a loose coupler with a size of tube as you suggest, but it is difficult to give advice as to how many turns of wire should be used unless we know the dimensions of the aerial with which it is to be employed. We suggest that you read the February, 1915 issue of THE WIRELESS AGE, which contains full instructions for the building of tuning coils of definite wave lengths.

* * *

G. M. C. G., San Francisco, Cal., writes:

Ques.—(1) What is the most efficient density in line per square inch for a silicon steel core of a transformer to be operated on 500 cycles?

Ans.—(1) 15,000 lines per square inch.

Ques.—(2) What is the highest allowable flux density per pole for the poles of a 500-cycle generator? The poles are made of silicon steel laminated.

Ans.—(2) The same as in the case of the transformer, namely, 15,000 lines per square inch.

Ques.—(3) What is meant by a "capacity coupled" transmitter or receiver?

Ans.—(3) As far as we are aware no definition has been given for this term, but it refers, in the case of transmitting apparatus, to a set where the closed oscillatory circuit is electrostatically coupled to the antenna circuit; in other words, a large plate of copper is connected in series with the antenna and a similar plate in series with the closed circuit. The plates are placed in inductive relation to each other so that the electrostatic field of the plate in the closed circuit will act upon that of the open circuit. Often a condenser is connected in series with the antenna, which is also an element of the closed oscillatory circuit. This type of circuit is sometimes referred to as being one employing electrostatic coupling, but it is rather a misuse of the term. In any oscillation transformer, whether used for transmitting or receiving purposes, there is a certain amount of electrostatic coupling, namely, a capacity effect between the turns of the primary and the secondary circuit, and, of course, a small amount of energy is thus transferred.

Ques.—(4) Is a closed or open core type of transformer the most efficient for wireless work, using a quenched spark gap?

Ans.—(4) It is entirely a matter of design. Either type of transformer is efficient and will serve the purpose, provided it is properly constructed. The closed core transformer is generally cheaper to build and takes up less room, but it is not any more efficient than an open core transformer.

Ques.—(5) What is the real difference other than that it lasts longer between the "Hudson" filament and the standard tantalum filament as used in the audion detectors.

Ans.—(5) The "Hudson" filament is supposed to be more sensitive and for the reception of undamped oscillations the statement is quite true. Used in the ordinary manner, there is little to be said between the two types of filaments. It is very noticeable with the "Hudson" filament that the vacuum of the bulb steadily increases and it is necessary from time to time to add additional voltage in the local battery circuit or, of course, the vacuum may be reduced by the application of a small blow or alcohol torch.

* * *

S. F. L., New Rochelle, N. Y.:

We have read your communication carefully and advise that it is impossible to build a receiving set which will have an efficient range from 180 meters to 7,000 meters. You should construct two distinct receiving tuners, one to have a range of from about 100 meters to 1,000, and another to have a range from 1,000 up to 7,000. As a matter of fact, a receiving apparatus suitable for 7,000-meter work is not even the proper equipment for 1,000-meter work. A tuner for the longer wave-lengths should begin at about 4,000 meters and can be efficiently operated between wave-lengths of 4,000 and, say, 12,000 meters. Unless you have extremely sensitive receiving apparatus a small aerial having a natural period of 180 meters is not large enough to be operated on a wave-length of 7,000 meters. The receiving tuner referred to in your communication, in connection with the aerial as described, will give a wave-length adjustment in the secondary circuit of about 3,000 or 4,000 meters and in the primary circuit from 2,000 to 2,200 meters.

* * *

R. S., Pittsburg, Pa., writes:

Ques.—(1) Can you tell me if there is an account in any of the back numbers of THE WIRELESS AGE in reference to the invention of a wireless aerial that does not require a great height to bring good results?

Ans.—(1) In the lecture delivered before the New York Electrical Society in 1912, by Guglielmo Marconi reference was made to the use of aerials laid over the surface of the earth by the Italian army in the Sahara Desert. There has been no distinct "invention" made along this line, but it is a fact that for receiving purposes the aerial need not be so high as for sending purposes.

* * *

R. E. R., Kansas City Kans.:

You can secure information on the construction of a Tesla coil in a book entitled "Tesla High Frequency Coils," by Haller & Cunningham. Communicate with the Book Department of THE WIRELESS AGE; the price is $1.25.

* * *

H. C. S.:

Ans.—(1) The loose coupler (the inductively-coupled receiving tuner) is preferable for your work. For a loading coil a single coal with a multiple point switch is quite sufficient.

We do not know the cause of the undertone in KET'S spark.

The KPA (Seattle, Wash.) station of the Marconi Company is equipped with a 500-cycle transmitter.

The wave-length of the KSS (South San Francisco Poulsen station) is about 8,000 meters, and the NPL (Point Loma, Cal., Poulsen station) about 6,000 meters.

We have no record of the stations with the prefix "X" which you give, but it is likely they are Mexican stations located either on the Carribbean or Pacific coast.

* * *

E. D., Scranton, Pa., asks:

Ques.—(1) How many feet of wire are required to make a loading inductance to boost the following described aerial to a wave length of 5,000 meters? The aerial is 75 feet in length by 35 feet in height, consisting of four wires. The wire for the inductance is to be No. 32.

Ans.—(1) You require a loading coil 5 inches in diameter by 24 inches in length, wound closely with No. 20 or No. 22 S.S.C.

wire. No. 32 wire is entirely too small for this purpose.

Ques.—(2) On what wave-length does the Wanamaker station send?

Ans.—(2) Twenty-one hundred meters.

Ques.—(3) What is the wave-length of the aerial described. The lead-in is 15 feet in length.

Ans.—(3) The wave-length is about 190 meters.

Ques.—(4) Can I receive from the Key West Naval station with the aerial mentioned, the equipment consisting of an inductively-coupled receiving tuner adjustable to 1,000 meters, Blitzen variable condenser, Murdock detector and 2,000 ohm head sets; the ground connection to be made to the steam pipe and the gas pipe?

Ans.—(4) If the receiving tuner has a maximum wave-length adjustment of only 1,000 meters your apparatus is not in resonance with the Key West station, the normal wave-length of which is 1,600 meters. The wave-length of this station, however, can be attained by connecting a loading coil in series with the antenna. This loading coil should have dimensions similar to the primary winding of your receiving tuner. The signals for Key West will not be heard at your station in daylight but at night time, only, and during the colder months of the year.

Ques.—(5) What detector besides the vacuum valve is the most sensitive?

Ans.—(5) The vacuum valve detectors are considered the most sensitive of all. A double or triple vacuum valve detector will, of course, be more sensitive than a single valve. Galena or cerusite are next to the valve detectors in the matter of sensibilty.

* * *

Lieutenant F. M. H., Cornwall-on-the-Hudson, N. Y., asks:

Ques.—(1) What should be the natural period of my aerial? It is 68 feet in height, 85 feet in length, consisting of six wires on 11-foot 6-inch spreaders; the lead-in is 40 feet in length and the ground lead 43 feet? I have seen several articles on wave- lengths of four wire aerials but none on six wire aerials. How much difference should there be?

Ans.—(1) There is not a great difference in the wave-length of an aerial between four and six wires; it, of course, depends largely upon the spacing of the wires. The natural wave-length of your aerial is about 305 or 310 meters.

Ques.—(2) Please tell me what effect the shape of the ground lead (and lead-in) have on the effective range *i.e.*, the effect of three angles, one of them being greater than right-angles?

Ans.—(2) If this aerial is used for transmitting purposes these sharp angles will have no bad effects unless very high potentials are employed at the transmitter. For receiving purposes the losses are not sufficient to consider. One thing, however, is important—the primary winding of the receiving tuner in a receiving set should be as near to the actual earth connection as possible.

* * *

Ques.—(3) How should the work of the aerial described, as a receivng aerial, compare with that of a single wire about 500 feet in length, the average height to be at least 50 feet? Would I be able to get amateurs, using a series condenser, as well as I now can with a few turns of my tuner?

Ans.—(3) The first described aerial is by far preferable for receiving from amateur stations. The single wire aerial, 500 feet in length, is suitable for reception of the longer wave-lengths, say from 1,600 meters up; but it is entirely too long for the efficient reception of amateur signals.

Ques.—(4) With the aerial described, Murdock oscillation transformer, rotary spark gap giving 720 sparks per second, a 1 k.w. Thordarson transformer (secondary voltage 20,000), 6 sections Murdock molded condenser in parallel, what should my average sending range be? Is the condenser capacity correct and should I not use series parallel connections to stand the voltage?

Ans.—(4) On the basis that the capacity of the Murdock condenser unit is .0015 microfarads, 6 sections in parallel will give the correct capacity. We do not believe, however, that these condensers will withstand 20,000 volts and you should therefore employ a series parallel connection. You thus require 24 sections, 12 in parallel in each unit and the 2 units connected in series. Your sending range is about 80 miles.

Ques.—(5) I have a Type RJ-4 vacuum valve and have been trying to get a diagram of connections for amplifying the signals from a crystal detector. I know this is possible as I have visited several stations that used this method and I know that a 1 to 1 transformer is essential. Is this the same transformer used for amplifying the signals from one vacuum valve by another and what is the diagram of connections? I believe this diagram appeared in THE WIRELESS AGE some time ago, but I searched all my old copies for it without success.

Ans.—(5) The January, 1914, issue of THE WIRELESS AGE contained a complete circuit diagram for amplifying from a crystal or from one vacuum valve to the second vacuum valve. The 1 to 1 transformer employed may be the same for either method. A little experimenting will give the best results. It is not necessary to wind a transformer especially for this purpose; the secondary winding of an induction coil or power transformer may be used. If you desire to amplify the signals from a crystal detector, care should be taken that there is sufficient voltage in the local battery for the crystal to overcome the resistance of the 1 to 1 transformer. The issue of THE WIRELESS AGE referred to will help you.

* * *

I. D., Council Bluffs, Ia.:

We do not answer questions by mail, but in reply to your several queries we advise that none of the circuit diagrams you provided for use with the vacuum valve amplifier, are cor-

rect. We suggest that you secure a copy of the January, 1914, issue of THE WIRELESS AGE, and read the article, "How to Conduct a Radio Club."

The 1 to 1 transformer described in your second query is inoperative. Instead of building a special transformer you might employ the secondary winding of a spark coil or transformer.

The degree of incandescence of the filament, for the best results with an amplifier, can only be ascertained by experiment.

Dry battery carbons are not satisfactory for the electric arc. Standard arc light carbons are much harder than those used in dry cells.

* * *

J. M., Hartford, Conn.:

There have been no articles published in THE WIRELESS AGE on the construction of a loud-speaking telephone. The latter may be purchased from the Western Electric Company, New York City.

* * *

J. S. D., Brooklyn, N. Y.:

Ans.—(1) WCY (Cape May, N. J., station) sends press on a wave-length of 550 meters.

With a 200-meter aerial and a ¼ k.w. set operated on 60 cycles source of energy you need not expect more than 1½ amperes in the antenna circuit.

Ans.—(3) The transmitter of the wireless telephone should be connected in series with the earth lead connected to the secondary winding of the oscillation transformer.

We do not know what station it is that you hear on 600 meters, but we believe that you have made an error in interpreting the call. The call letters of the stations you hear are probably HD and DY, which are British cruisers lying at anchor outside of Sandy Hook.

The letters and figures which you hear from Arlington previous to the wind reports are abbreviations which indicate the general weather conditions at various points on the Atlantic Coast and Great Lakes. In the Queries Answered Department in previous issues of THE WIRELESS AGE these abbreviations have been fully explained. A pamphlet covering the subject can be secured from the Department of Agriculture.

* * *

F. C. S., Bridgeport, Conn.:

Unless you provide a circuit diagram showing the actual connections employed when your receiving detector is disconnected from the receiving circuits, we cannot give a definite reason for still hearing the signals. Comment was made on this subject in previous issues of THE WIRELESS AGE in the Comment and Criticism department, but no definite conclusions were arrived at.

* * *

A. D., Port Townsend, Wash.:

We should not advise you to attempt to put additional turns on the 1 k.w. Clapp-Eastham transformer without consulting the designers. A potential of 8,400 volts is rather low for work on 200 meters. A transformer for amateur purposes should have a secondary potential of between 12,000 and 15,000 volts. Of course you will be able to make use of this transformer, but not at its full rated power on a wave-length of 200 meters. Using a rotary spark gap with 60 cycle source of energy in connection with this high potential transformer, it is doubtful whether you could make use of more than ½ k.w. at the extreme. This is due to the fact that the condenser of the spark gap circuit is limited in size by the wave-length desired.

* * *

H. W. B., Kingston, N. Y.:

The data given in your first query are insufficient to solve your problem. It is a fact that stations outside of the daylight range of a given receiving station often fade out during the reception of signals for reasons other than the local conditions at either the sending or receiving station, but inasmuch as the arc light induction and the telephone induction disappear simultaneously with the strength of signals, we are inclined to believe that there is a loose contact somewhere in your aerial system or that your wires are swinging and actually touching other wires. Perhaps the difficulty may lie in the galena detector, which is rather difficult to keep in adjustment.

Ans.—(2) The Wanamaker stations generally work at a speed of about 30 words per minute. The wave-length of the New York station is 2,100 meters.

WSK is the Marconi Commercial Station, located at Sagaponack, L. I.

The Year Book of Wireless Telegraphy for 1914 contains a complete map showing the wireless stations of the world.

* * *

F. W. K., Superior, Wis., asks:

Ques.—(1) I have had considerable trouble regarding the fading out of the signals from my set. Does the fact that there are a range of 700 feet hills at Duluth just north of me, iron ore beds eighty miles north and copper mines 150 miles north-east, have any bearing on the matter? I have a very good earth connection which is in moist clay.

Ans.—(1) Without doubt these hills have a detrimental influence on the radiation from your station, but inasmuch as we have not all the facts in the case it is difficult to reply definitely. Are the receiving stations, which copy your signals, within the daylight range of your station? If so, there is something radically wrong at your transmitting station. Perhaps the antenna wires swing near to other wires and cause leakage, there may be a loose connection in the lead-ins or the earth connection may not have sufficient area. The iron ore beds eighty miles away or the copper mines 150 miles in another direction will have little influence on your local work. There seems to be leakage somewhere in your set.

Ques.—(2) What number of amperes will "blow" 5 No. 34 German silver wires in parallel?

Ans.—(2) It depends to some extent upon the length of the wires, and the specific resistance of the German silver, but speaking generally, these 5 wires in parallel should carry about ½ ampere.

RADIO RAVINGS

Conducted by D. Phecriff Inslater

It was in Jacksonville that the most dignified key manipulator in the Marconi service bought a handful of ballads from street venders who were bawling out their contents to a gaping audience. Proceeding on his way, he noticed as he neared the dock that he was followed by a dozen or more urchins, their faces beaming with expectation. "Well, boys, what is it?" said he.

"Huh!" said one, his voice tinged with disappointment, "that's one on us! After coming all this way, too."

"But what are you waiting for?" said the astonished operator.

"Waiting for! Why, ain't you going to sing, mister?"

* * *

Oh, Sparks was a gallant young Mr.,
And he loved his girl so that he kr.
She said, "Here, now, you
Stop that P. D. Q.,
I can love you but as a sr."

Take it from old Frank Adams and every new operator on the sea, these submarines should all be named C-6.

* * *

Haven't the faintest idea who makes up the cash account for Hatteras, but George insists that if this mysterious individual caught the measles he would be a spotted adder.

* * *

Lemuel is wrong about our editor. He's still quite sprightly and chipper. That he hasn't fallen for any of Lem's contributions is no sign that he's reached his declining years.

* * *

Never ask questions like that, Lem.

* * *

Ask, f'rinst'nce: Who's his girl?

* * *

You do ask, eh? . . . well (quietly now)—Ida.

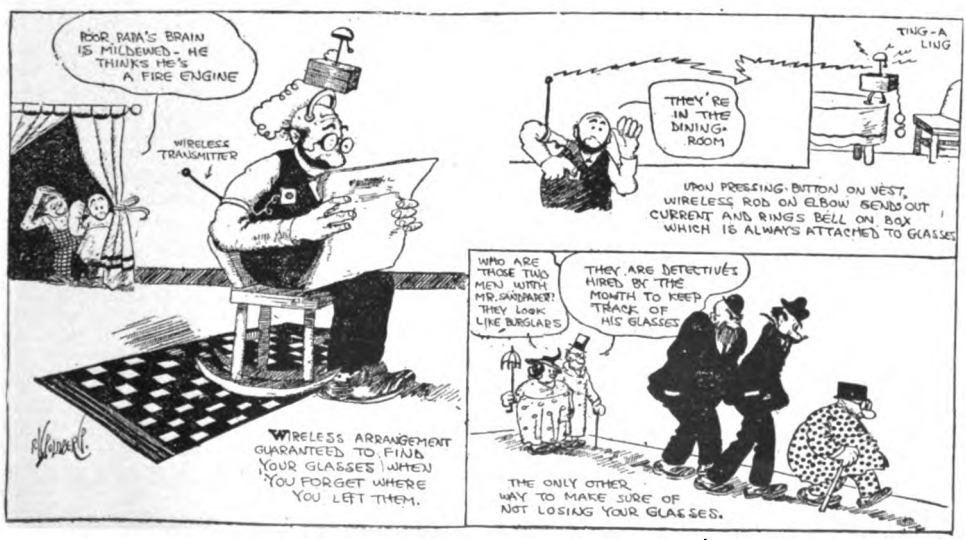
* * *

Ida who?

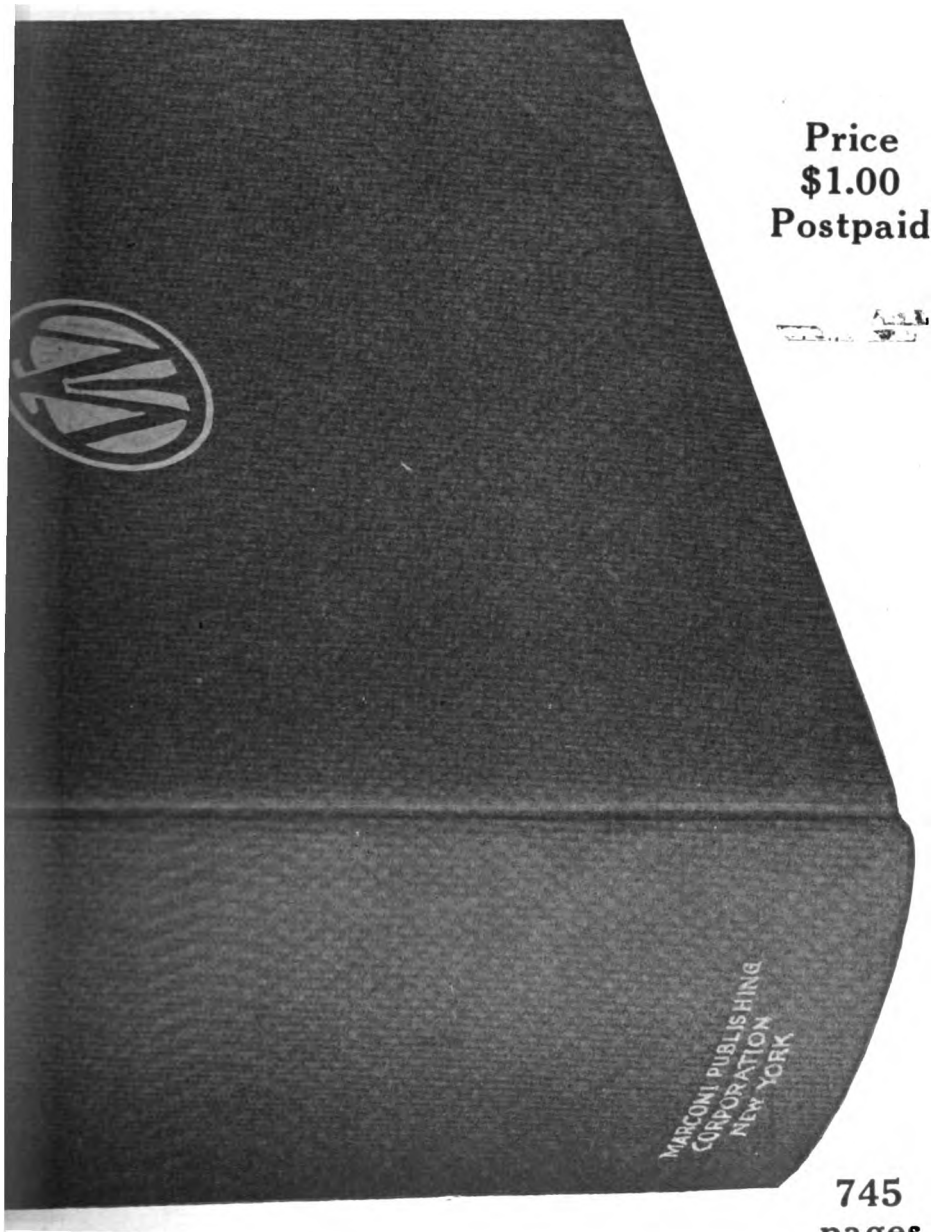
* * *

Ida know.

R. L. © GOLDBERG'S IDEA OF HOW TO FIND YOUR GLASSES



YOU NEED!



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Advertising under this heading is accepted at 5 cents a word. Remittance must accompany order. Advertisements for the July issue must reach us not later than June 15th. As an inexpensive means of reaching PROVEN SPENDERS THE WIRELESS AGE is the most valuable of all classified advertising mediums. We give our circulation by the number of copies actually sold, not an estimate of "readers." Every single person who buys THE WIRELESS AGE is interested in wireless matters—is an *interested* reader. At five cents a word classified advertisements appearing here bring big returns. This issue is 7,750 copies. We prove this.

WIRELESS

FOR SALE—Transmitting set, two-inch coil, etc. Geo. H. Barnes, Stanbridge East, P. Quebec, Canada.

ONE-HALF K. W. open core transformer, $12. Antenna switch, $2. Complete equipment for experimenter's chemical laboratory, $15. Halstead Terry, Lake Mills, Wisconsin.

THREE K. W. Type E. Clapp Eastham transmitter complete for sale or trade. F. C. Bigelow, 123 Chapel St., Saylesville, R. I.

GUMMED LABELS

GUMMED LABELS. 3,000—$1.00. Catalogue, 2c. MacTaggart, 1235 Arch St., Philadelphia, Pa.

PATENTS

PATENTS SECURED OR FEE RETURNED. Send sketch for free search. Latest and most complete patent book free. George P. Kimmel, 249 Barrister Building, Washington, D. C.

PATENTS without advance attorney's fees; not due until patent allowed; send sketch for free report; books free. Frank Fuller, Washington, D. C.

IDEAS wanted—Manufacturers are writing for patents procured through me. Three books with list 200 inventions wanted sent free. Advice free. I get patent or no fee. R. B. Owen, 44 Owen Bldg., Washington, D. C.

C. L. PARKER, Patent Attorney, 8 McGill Bldg., Washington, D. C. Inventors' hand book, "Protecting, Exploiting and Selling Inventions," sent free upon request.

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The Marconi Ideal

Courtesy Among Ourselves and Towards the Public

Courtesy means respect, politeness, kindliness. It is synonymous with good breeding.

The reputation of any public utility rises or falls on the friendship of the public. An act of indifference to a patron, though it be from the humblest employee, is a reflection on the whole organization.

The spirit of the Marconi Company will be known to the public chiefly as it is reflected in the acts and attitude of its employees. An inquiry, no matter how trifling it may seem to the employee, may be of relatively large importance to the questioner and should be met with respectful interest. That man is approaching closest to the Marconi Ideal, who, in the performance of this or any other service, behaves with a politeness which relieves the customer of a sense of obligation.

Every reference to "Marconi", whether written or spoken, is a reminder of a great service rendered to mankind. It is our company's privilege to bear a birthright founded on one of the greatest of all man-given benefits to humanity. Let us be worthy of it, and of its ideal, and in so doing, build character for ourselves and promote the fair fame and prosperity of our company.

E. J. Nally,

Vice President and General Manager