THE WIRELESS AGE

FEBRUARY
1916

PREPARING THE THIRD LINE OF DEFENCE

Details of Military Signaling Organization

IN THIS ISSUE

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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.

FEBRUARY, 1916

S O S--Thessaloniki

An Elusive Vessel and the Far-Reaching Wireless

Aristotelis Vranicas, first operator on the Thessaloniki

How the Art Was Employed to Keep Other Craft in Touch with a Ship That Was Saved, Lost, Found and Finally Abandoned. The Devotion to Duty of Three Marconi Operators in Time of Stress and the Rescue Which Followed Days of Hardship and Peril

Kimon Paleologos, second operator on the wrecked ship

PICTURE a wave-battered, leaking ship tossed about in an ocean of heaving waters; on its decks a little band of men waiting for rescue ships to come in response to S O S calls; a fleet of vessels, guided by wireless messages from the hapless craft, searching the wide expanses of the sea to bring succor. This is the setting in which the story of the wreck of the Greek Line steamship Thessaloniki and the devotion to duty of Marconi Operators, Aristotelis Vranicas, Kimon Paleologos, and James Lambros is placed.

Vranicas, the chief operator; Paleologos, his assistant, and Lambros, who was voyaging from Greece to the United States to take up his duties as wireless man on another vessel, first had the distinction of summoning a rescue ship to the battered Greek craft in order to take off her passengers. Then the hawsers with which the Thessaloniki was being towed, parted and the vessel was again placed in peril. For three days the wireless man and the ship's officers and crew drifted about in mid-Atlantic, undergoing hardship and peril. Finally they were rescued by a vessel which had picked up the wireless appeals.

The Thessaloniki steamed away from Piraeus, the seaport of Athens, on October 29, with about 215 passengers, a crew of ninety and a mixed cargo. She touched at Calamata, Patras, Messina and Algiers, made her way through the Straits of Gibraltar and then laid her course for New York.

From the time she cleared Gibraltar the static had been heavy, indicating that stormy weather prevailed. She had engine trouble, too, and made slow progress, arriving at a point west of the Azores on December 21 at four o'clock in the afternoon.

Here begins the real story of the Thessaloniki's voyage, for she had poked her nose into a westerly gale and terrific seas which tossed her about as if she were a toy. The blow continued for twelve hours and at the end of that time the exhausted ship's officers and crew found that their struggle to keep the ship afloat was just beginning; into the engine and boiler rooms the water came in a steady flow—so rapidly, in fact, that it covered the flooring to a depth of several feet although the pumps were immediately placed in operation. The lifeboats, too, had been swept away and the seas threatened to accomplish further damage.

The plight of the vessel was so serious that on the following morning Vranicas sent an S O S, the appeal being picked up by the Italian steamship Stampalia. The latter vessel was informed that the Thessaloniki was leaking dangerously and was able to proceed only at the rate of about two miles an hour. Stirred into action by the tenor of this message, the commander of the Stampalia steamed toward the distressed vessel, arriving alongside about midnight.

He first made an attempt to communicate with those on the Greek steamship by means of signal lights and, this method having failed, the wireless was utilized. By this time the pumps on the Thessaloniki were being operated to good purpose and the commander of the Stampalia was so informed. The Stampalia stood by until eight o'clock the next morning, however. Then he was told that the boiler and engine rooms had been cleared of water and that the Greek ship would not require aid. At that time she was listing to port, but the gale had moderated, and the Stampalia steamed away.

For a time all went well with the Thessaloniki and she proceeded slowly on her voyage. But on December 26, the storm broke again, this time with redoubled fury. Great waves swept over her decks, carrying away the batteries and entering the wireless cabin. The wind blew terrifically also and the aerial, yielding to its force, fell to the deck with a crash. Vranicas, Paleologos and Lambros repaired the aerial, however, and placed it again in position. Power for the set was obtained from the ship's dynamo.

As the hours wore on conditions grew worse instead of better. The pumps went out of commisison and the ship's company with the aid of some of the passengers worked with buckets to bail the ship. The supply of drinking water ran low, too, consequent upon the delays in the voyage, and there was no more meat.

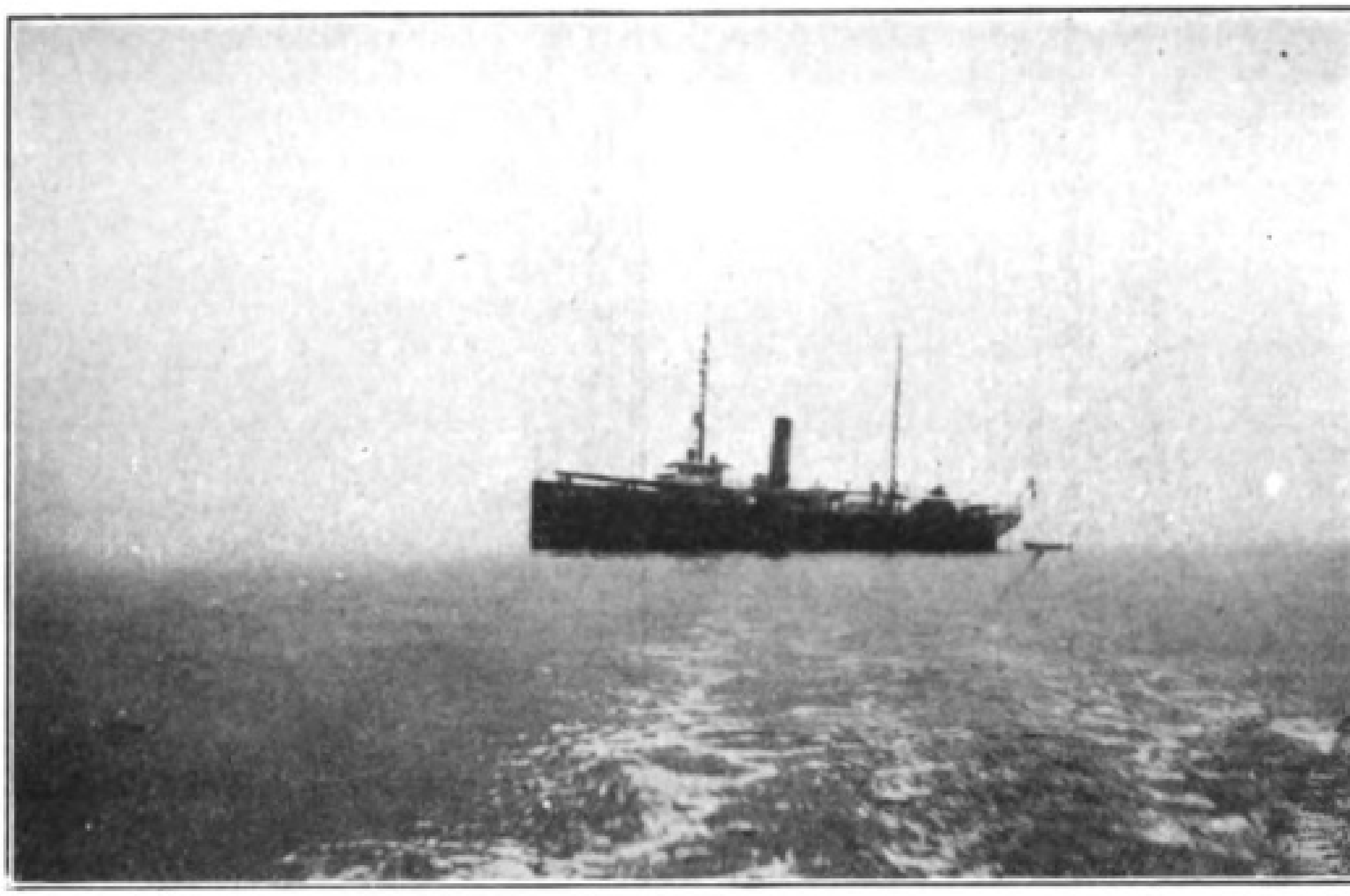
In this crisis wireless was again employed, appeals for aid being sent on December 28 to the steamship Florizel and to the United States revenue cutter Seneca. The Florizel replied that she was steaming to the aid of the disabled steamship with all possible haste and she arrived at six o'clock in the evening three days later. In the meantime, the steamship Patris, which had been informed by wireless of the Thessaloniki's distress, had answered that she was speeding to the rescue. She arrived about midnight. The storm was still raging, but the commander of the Thessaloniki, in view of the fact that the Patris was standing by, notified the Florizel that it would not be necessary for her to render aid.

The seas had subsided somewhat on New Year's morning and the passengers on the Thessaloniki were transferred to the Patris. A supply of fresh water was sent to the former vessel and preparations were made to tow the disabled ship to New York. The Seneca was nearing the scene about this time and she set word by wireless to that effect. On learning that the Patris had arrived, however, she put back to New York.

The Patris began the towing of the

The operators on the Thessaloniki were aided in their work by James Lambros, who is shown in this photograph. Lambros was voyaging to New York to take up his duties as wireless operator on another vessel

Thessaloniki to port later in the day. But she had not proceeded far when the hawsers broke. They were quickly repaired, however, and the voyage was resumed. Toward evening of the next day the vessels ran into a northeasterly gale and the hawsers again parted. Wireless messages were exchanged between the ships in efforts to locate each other, but the darkness and the storm interfered. So the Thessaloniki, once more at the mercy of the waves, drifted and rolled in the trough of the seas. A wireless message from the Patris said that she was attempting to return to her consort, and the men on the Thessaloniki watched and



The United States revenue cutter Seneca which twice responded to the Thessaloniki's S O S. The revenue cutter combed the waters of the Atlantic for many hours when the second appeal was flashed

waited for hours, but she did not appear.

For three days the ship's company on the water-logged vessel faced a situation that seemed almost hopeless. The engines were out of commission and the engine and boiler rooms were awash. The dynamo still remained in operation, however, and the wireless set was consequently not deprived of power. And notwithstanding the fact that the wireless cabin was almost continuously battered by the waves which carried away the door and window of the room, flooded the compartment and thundered their menace at the Marconi men within, the operators unceasingly flashed their appeals for aid. Their calls were answered, ships were rushed to the scene and the waters were combed in an effort to find the sinking vessel, but the storm and the speed at which she was drifting seemed to be unsurmountable stumbling blocks.

The Seneca, with First Operator Brenner on board, was in the Brooklyn Navy Yard when she received the Greek ship's second calls for aid. The steamship United States and other vessels had also picked up the appeals and they sped into the storm to find her. Meanwhile, the ill-fated ship was drifting and tossing on the waste of waters; a few words, at intervals by wireless conveying the intelligence that she was still afloat.

The Thessaloniki's men, battling with the storm to keep the vessel from foundering, were handicapped by cold, fatigue and lack of sleep. The supply of water obtained from the Patris had run low and there was no food except bread. These conditions told severely upon everyone and Vranicas in addition suffered from a slight fever.

From time to time came reassuring messages from the vessels engaged in the search.

"Show as many lights as you can, we are doing our best," flashed the operator on the United States in response to the message, "Come quick," from the sinking ship, on the night of January 4.

Followed a period during which the Thessaloniki's officers and crew peered through the storm and darkness looking without success for a rocket shooting skyward or the lights of the rescue ship. Again resource was had to the wireless and the United States replied:

"Our captain says he hopes to find and save you all. Do not get nervous."

And so another day dawned with no rescue ship in sight. The seas were still running high and the ship was tossing and rolling more violently than ever. The men in the wireless room had picked up a message from the steamship Perugia to the effect that she was speeding toward the Greek ship as fast as the storm would permit, but it was late in the morning when those on the distressed vessel glimpsed a bit of smoke over the white crested waves. At length the funnels of a steamship came into view, then the outlines of her hull and after a time the

Operator Alex Brenner, of the revenue cutter Seneca

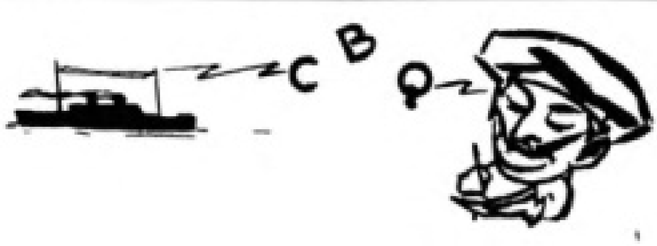
Perugia hove to within a short distance. One by one the Thessiloniki's weary company dropped into the rescuing vessel's small boats and clambered onto her decks. Then the Perugia pointed her bow toward New York. leaving in her wake the foundering vessel.

ORDERING DINNER BY WIRELESS

Giving orders by wireless for dinner is the latest development in the management of modern restaurants. An eating house in New York City has announced that passengers on steamships bound for that city can make arrangements by marconigram to have the table set before they arrive.

For instance, if Tourist Purdy, of Milwaukee, feels a yearning for corn beef and cabbage as the vessel on which he is voyaging approaches the Atlantic coast, he can send a wireless message directly from the steamship to the station on the roof of the restaurant. In order to facilitate the ordering, a list of abbreviations has been prepared, C. B. and Q, being used to designate corn beef and cabbage. If Purdy's taste runs to ham and eggs he will only find it necessary to use the letters, H. E., and the employment of the abbreviation, M. P., will be sufficient to start the chef preparing mince pie.

If his mouth waters for beefsteak and onions, the craving can be satisfied by using the abbreviation, B. and O. The idea that Purdy is fond of omelette can be conveyed by O. N. S., while the chef will busy himself with cooking stewed chicken and mushrooms on the receipt of W. D. The abbreviation B. B. stands for plum pie and C. P. A. for cafe parfait. The danger signal of the abbreviated code is W. A. S., which means, We are starving and is answered by H. E. (ham and eggs), repeated three times in succession. W. A. B. (meaning we are broke) is the signal of distress and is answered by an emphatic K. A. (keep away).



THE DISTINGUISHED PRESIDENT OF THE N. A. W. A.

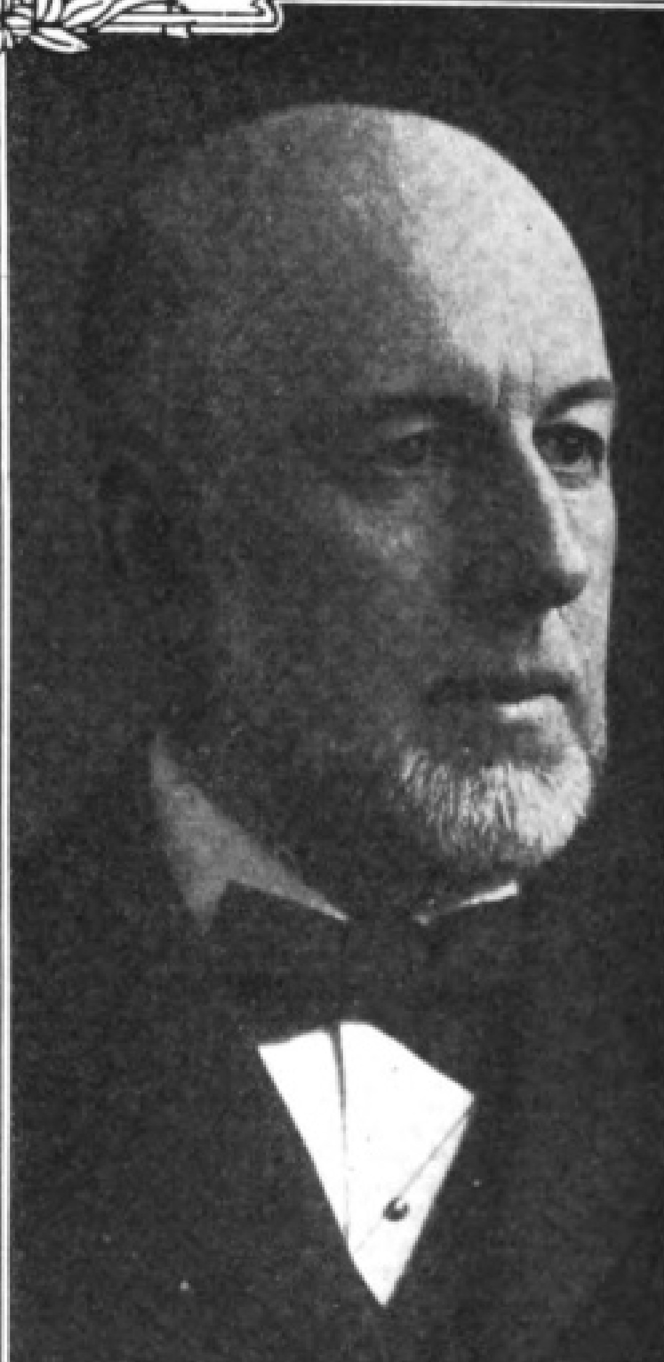
GUGLIELMO MARCONI, PRESIDENT OF THE NATIONAL AMATEUR WIRELESS ASSOCIATION, is known to every man, woman and child throughout the universe as the inventor of wireless telegraphy and the greatest living benefactor of the human race. As the discoverer of the art of radio communication he takes his place as the first amateur in the world and, as the supreme authority in the field, stands as the natural leader of experimenters. Marconi's sympathy with the ambitions of budding scientists is attested by the fact that he himself made his first wireless set when a boy. Since then he has received the degrees D. Sc., from Oxford University, LL.D., from Glasgow. He has been made an Italian Senator and serves that country both as a naval commander and army officer. His acceptance of the presidency of the amateur organization marks the first time he has consented to hold office of similar nature

THE ADMINISTRATIVE OFFICERS

J. ANDREW WHITE, ACTING PRESIDENT, is universally acknowledged as the best infomed individual in the United States on the needs of amateur wireless workers. As editor of the first magazine published on the subject of radio communication, he has been since 1911 the distributor of information which has placed the American amateur in the front rank of the experimental field. In the creation and development of THE WIRELESS AGE he has been the inspiration of countless articles which have revolutionized communication methods and stand for the remarkable progress made in the past few years. He is the author of more than three hundred unsigned articles.

CLAYTON E. CLAYTON, MANAGING SECRETARY, has long been prominently identified with various educational movements and has aided thousands of young men to work their way through college. Ten years of practical experience in handling organizations of nation-wide activity, combined with knowledge of every section of the country gained at first hand, has equipped him for the task of disposing of the countless details which arise in administering to thousands of members scattered all over the continent. Mr. Clayton is also in charge of a bureau established to provide for appropriate and timely information on all important subjects.

NOTED PROFESSORS WHO ARE VICE PRESIDENTS



ARTHUR E. KENNELLY, VICE-PRESIDENT, is also president of the Institute of Radio Engineers and one of the best known scientists in the country. He is professor of electrical engineering at Harvard and holds two degrees from that university, Dr. Sc. and A.M.; he is a past-president of the American Institute of Electrical Engineers and as principal ele[illegible]trical a[illegible]sistant to Edison secured a world-wide [illegible] as an electrical investigator. An [illegible] volume on wireless, of which he is the author, is considered the standard work in its class.

CHARLES R. CROSS, VICE-PRESIDENT, is Thayer professor of physics and Director of the Rogers Laboratory at Massachusetts Institute of Technology, familiarly known as "Boston Tech" and ranking as a leader among the American seats of technical learning. His connection with wireless dates back to 1903, when he was selected as expert to testify in a legal action to uphold one of Marconi's early tuning patents, and may therefore be considered a pioneer in the study of the art. Prof. Cross is Fellow, American Academy of Arts and Sciences.

NOTED PROFESSORS WHO ARE VICE PRESIDENTS

ALFRED N. GOLDSMITH, VICE-PRESIDENT, is considered one of the best informed wireless experts in the United States. He is assistant professor of physics, College of the City of New York, Director of its Radiotelegraphic and Radiotelephonic Laboratory and holds the degree, Ph. D. As editor of the Proceedings of the Institute of Radio Engineers, he is responsible for the accuracy in presentation of technical papers which literally monument progress in the engineering branches of the art. To Prof. Goldsmith's energy and tireless devotion to the subject may be attributed in large measure the standardizing of investigation in the field of radio communication.

SAMUEL SHELDON, VICE-PRESIDENT, has been since 1889 professor of physics and electrical engineering at the Brooklyn Polytechnic Institute, N. Y. He has three degrees; Ph. D., from Würzburg University; D. Sc., from University of Pennsylvania, and A. M. from Middlebury, Vt., where Prof. Sheldon was born. He is the author of several textbooks on electrical engineering and president of the Library Board of the American Institute of Electrical Engineers, which organization he has [illegible]so s[illegible]ed in the past as its president. He is [illegible]now[illegible] be a strong advocate of the inclusion of wireless instruction in the curriculum of all technical schools and colleges.

REPRESENTATIVES OF SEA AND LAND FORCES

CAPTAIN W. H. G. BULLARD, VICE-PRESIDENT, needs no introduction to wireless men. As Superintendent of the United States Naval Radio Service he is the chief executive of the department which supervises the governmental operation of wireless stations on land and sea, the first man to be appointed to that high office. This distinguished officer is a graduate of Annapolis and served in the navy for twenty-six years before rising to his present rank of captain. In 1907 he organized the department of electrical engineering and became its first head. While in this office he prepared the well known "Hand Book for Naval Electricians."

MAJOR WILLIAM H. ELLIOTT, VICE-PRESIDENT, formerly of the 1st Battalion Signal Corps, has long been known as one of the most active militia men in New York serving in the early nineties as drillmaster in the American Guard and later enlisting in and becoming a commissioned officer in the famous 71st Regiment. As Adjutant General of the Junior American Guard he is now devoting his energies to the important work of preparing the youth of the nation to serve the country in event of war. He offers to all N. A. W. A. members an opportunity to secure military training and to perfect themselves as efficient signal officers.

INSTRUCTION AND ORGANIZATION COUNSELLORS

ELMER E. BUCHER, INSTRUCTING ENGINEER, holds the same position with the Marconi Wireless Telegraph Company, training ship operators for service at sea. Mr. Bucher is credited with having constructed one of the earliest amateur plants in the country, a home-made station completed in 1901. Two years later he entered the commercial ranks and made the first United States long distance records overland. He was also among the first to install equipment on ships of the government revenue cutter service. After supervising the construction of several important commercial land stations he was assigned to instruction of operators, and has continued in that capacity since 1909.

HIRAM PERCY MAXIM, VICE-PRESIDENT, is the inventor of the Maxim Silencer for fire-arms and a prominent figure in amateur wireless telegraphy, through his position as Chairman of the American Radio Relay League, organized to establish a working chain of amateur stations throughout the United States. Mr. Maxim is an ardent supporter of all movements tending toward betterment of working conditions in the amateur field and has given active co-operation in establishing and maintaining local clubs for the development of members. To make his recommendations practicable he has installed and regularly operates a 1 k. w. set at his home, and is constantly experimenting with new devices and arrangements of apparatus.

Marconi's Visualization of Future Warfare

Victory Will be Determined by the Bayonet and the Knife. His Impressions After Service at the Front

"IF we could find apparatus capable of producing electric waves powerful enough to produce explosions at a distance we then undoubtedly would see extraordinary sights such as modern inventors tell us we are destined to see—the blowing up of battleships at sea, the causing of shells to explode inside the guns and even in the soldiers' belts. That would bring us back to hand to hand fighting."

This was the statement recently made to the correspondent of a Paris newspaper by Guglielmo Marconi, second lieutenant in the Italian Army, who returned to Rome in December last after an absence of five months in England and at the front in France and Flanders. At the last, he said, hand to hand fighting will prevail with what the Italians designate as the "white arm." In land battles victory will be won with cold steel, the bayonet and the knife, and the fate of empires will hinge upon the prowess of the soldier in the ranks.

Mr. Marconi said that science undoubtedly was one of the principal factors in the successes obtained by the Germans. There was genuine surprise among the forces of the entente countries at the scientific preparation in the armies of the Kaiser, but in that respect the Allies are now equally strong.

"In aviation," he said, "contrary to what had been expected, the Germans also showed their preparations had been on a most efficient scale. They had very fine machines and exceedingly clever pilots. By prompt and energetic action the Allies soon caught up to them and now surpass them in this respect, a fact which is proved by recent bombardments of German towns.

"Another surprise with regard to air machines was the fact that very large air craft equipped with wireless telegraph apparatus of a new kind, were put in the field at the beginning of the war. The French, however, captured a few of these machines; the secret became common property and the benefit which the Germans expected from their invention in this regard was frustrated.

"In the matter of wireless stations also the Germans are inferior to the Allies. The most powerful station of all is one now established in England. Every day the Allies are adding little scientific improvements of a most useful kind and in a great number for wireless purposes. I cannot speak of them, because it is necessary to keep our secrets. I may say, however, that the Germans, who have remarkably well-equipped workshops and laboratories, are in a position to replace all their damaged parts, but the Allies, daily making new scientific progress, already are on a par with their adversaries and soon will have left them behind."

Mr. Marconi believes that in the war of the future science will figure far more prominently than it has in the present European conflict, and fantastic man-killing machines of extraordinary size will be employed to reap death and destruction.

He told another newspaper correspondent that the year just ended was full of bitter disappointments for the Allies. Germany made great headway, although not altogether in the direction in which she wanted to go. But she is in possession of Poland and she still holds Belgium, while Serbia is crushed.

"If Germany could make peace," declared the inventor, "I believe she would be willing to give up Belgium, but she would insist upon holding part, if not all of Poland, and upon getting back Alsace-Lorraine from France and her South African colonies from England. Such a peace never would be accepted by the Allies.

"To make victory sure the Quadruple Alliance must move in precise accord until the end, each making a heroic sacrifice of men and financial sinews. Political upsets only retard the concerted action so supremely necessary. There must be no more mistakes of diplomacy.

"Italy is throwing all her energy into the war. Already she has 3,000,000 men in arms. She will hold Albania and help Saloniki if need be. But I don't believe Italian aid is needed for Saloniki, for the British and French seem capable of holding their own. I don't believe the Germans will get into Greece.

"So the war will have to go on and I fail to see any prospect of the end of it by next winter. From observations I've made everywhere, I'm sure the conflict will be carried on, regrettable as it is, beyond next Christmas."

Mr. Marconi delivered his first speech in the Italian Senate on December 15, his utterances winning for him the congratulations of the other senators. The Italian press also published laudatory comments on his speech and called attention to its practicability and vigor.

A noteworthy feature of his speech was his recommendation that all ships of the mercantile marine of the allied governments be requisitioned and their use fairly divided among the entente countries.

"With reference to the economic operation which, in this war of attrition, must represent a most powerful weapon in favor of the nations of the entente," he said, "serious questions must be taken into consideration which demand careful study on the part of the allied governments.

"I do not believe that the fall in the exchange value of the Italian lira, as compared to the pound sterling, which has attained an enormously high rate of exchange, is entirely justified either by the conditions of our gold reserve or by the balance of trade between Italy and other countries. Ocean freight rates, based on London quotations, which have risen to an extent which does not seem to be justified, raise to a very high figure in Italy the cost of staples indispensable to the nation. The regulation of exchange values and of freight rates is a difficult problem, but one susceptible of an equitable solution if the allied governments will face it with energy and in a spirit of loyal co-operation.

"As to the desired regulation of ocean freight rates, a means of sure effect would result if all the allied governments should requisition the ships of the mercantile marine at equitable and uniform rates for the carriage of the more essential staples, the rates to be decided on by agreement between all the governments concerned."

Mr. Marconi declared that it was the duty of all the Allies to aid one another. He also pointed out the necessity for applying conscription not only to fill the ranks of the army, but also to keep the soldiers in the field supplied with necessities.

"In every national war," he said, "there are two kinds of persons, those who think only of conquering and dying and those who think only of living and making a financial profit. This second category should be transformed into a second grand army, severely disciplined, for the development and production of all that the armies require for warfare and all that the nation itself needs.

"This second army ought to be inspired in all the countries of the Allies with exactly the same spirit of sacrifice as the army fighting in the field. The man who cannot offer his life to the nation can offer to it his labor and his money."

An interesting bit of gossip was put into circulation following Mr. Marconi's return to Italy. It is to the effect that he will be promoted to the rank of colonel in recognition of his services. He wore mufti instead of his uniform while in Italy.

Wireless in the Northeast Passage

BEYOND the uttermost outpost of Siberia, between the bleak white plains that stretch southward to the Arctic Circle and the ice-pack grinding down from the Pole, lies a little gray steamer huddled close under the black cliffs of Cape Chelyuskin. Out of the twilight that precedes the six months of polar night comes the song of the spark—words of cheer and goodwill flash across the leagues of floe and frozen mountains and two hardy explorers, Captain Otto Sverdrup and Captain B. A. Vilkitski, have established communication.

Vilkitski, an officer in the Russian Navy, and the second man in 300 years to sail from Bering Sea to Archangel, Russia, through the Northeast Passage, left Vladivostock in July, 1914, in command of two small ice-breakers to explore the northern coast of Siberia and attempt the Northeast Passage. With the same vessels he had the year before discovered Nicholas II Land—a large rugged island lying between Cape Chelyuskin and Franz Joseph Land.

Although the two steamers were fortunate enough to round Cape Chelyuskin, they were caught by the pack on the western side and forced to seek shelter for the winter. Nevertheless, they had accomplished a notable feat, for the cape has always presented a most formidable obstacle to Arctic exploration. Dominated by high and forbidding mountain ranges pointing straight north, half way between the Circle and the Pole, this promontory has ever been one of the most difficult and perilous in the Arctic.

Meanwhile, Sverdrup, a veteran of Nansen's expedition, had been dispatched from Norway in search of Lieutenant Brussiloff, a lost explorer who then lay dead on the coast of Franz Joseph Land. Trapped, like Vilkitski, by the closing pack, he had prepared to winter in an inlet some eighty miles south of the Russian's refuge.

The wireless operator of the Vilkitski forces tapped out call after call in the hope that it might reach someone somewhere. Down the desolate coast swept the message and Sverdrup received the communication of his fellow-explorer. As a result the two captains, in spite of storm, cold, ice and darkness, joined forces.

Wireless Equipped Barges for the Mississippi

Contract for Equipment of Thirty-Six Power Vessels With Marconi Apparatus Part of Revolutionary Plan for Inland Water Transportation

THAT navigation on an extensive scale will be restored to the Mississippi River this year, is indicated in the announcement that the Marconi Wireless Telegraph Company has completed with the Inland Navigation Company one of the largest contracts for wireless equipment and operation ever made. The contract is the largest known except for that by which the Marconi Company equipped the Standard Oil fleet.

The navigation company, a $9,000,000 corporation, is building thirty-six power barges varying in capacity from 1,600 to 5,000 tons, which will travel on regular schedules between Minnapolis and New Orleans, with stops at • all important points between these two cities on the Mississippi River and its tributaries. The first barge is now nearing completion at the Howard Shipyards, Jeffersonville, Ind., and the company expects to have a number of the barges in actual service by next March.

This promised restoration of traffic on the Mississippi River on a large scale comes after years of agitation, in which business men of New Orleans, St. Louis and other cities have sought the realization of some such plan as that of the Inland Navigation Company. For a long time the efforts for this achievement were directed toward the deepening of the river by Federal appropriation, so that vessels of deep draught might go up as far as St. Louis, but Congress declined on several occasions to make the necessary appropriation. The necessity for deepening the channel of the river, it is said, has now been avoided by the plan of using barges that will draw only a few feet of water, and will therefore be able to navigate without danger or difficulty.

The idea of using wireless equipment is a striking feature of the plan; for never before has wireless been called into service on an extensive scale for inland navigation. Each of the barges will be equipped with 2 k.w., 500-cycle panel type Marconi quenched gap sets, which will give a continuous communication range of 400 miles or more. Marconi operators will be aboard the barges, and service will be supplied between the barges and between each barge and land station as at present in ocean navigation.

The wireless apparatus is expected to be of particular value in keeping shippers advised of market conditions and directing the transshipment of cargoes to take advantage of favorable developments. For example, if a shipper sends a cargo of wheat, or any others product, down stream consigned to New Orleans, and learns, after shipment, that his cargo can be more profitably disposed of at some other market, he will be able to communicate with the barge by wireless and direct a change in destination.

By the wireless also the operating officials of the navigation company will be able at all times to know the exact location of any barge. Through this knowledge they can keep shippers and receivers of freight informed of the time of delivery of any cargo. If, too, a barge runs aground at any point in the river, or suffers other mishap, a hurry call for assistance can be sent out without delay. The importance of this is evident when it is realized that accidents to barges are likely to occur in desolate regions at points miles distant from cities and towns.

The proposal of the navigation company is to compete directly with the railroads. The idea of those financing the company is to facilitate the movement of the crops of the West and Middle West and of the cotton and other products of the South. Shipments of wheat, apples, etc., will be taken down the river for delivery to river ports or for reshipment at New Orleans to New York or through the Panama Canal to Pacific Coast ports. Cotton and other products will be carried upstream.

Not only will the freight rates be lower than those of the railroads, it is said, but the company promises to guarantee a speed in transportation unusual in inland water traffic. Each barge is to be equipped with four 80-horsepower engines working separate propellers. There will be an express and a slower service, the express barge being built to make eighteen miles an hour upstream and twenty-four miles an hour downstream. The slower barges will go eight miles an hour upstream and twelve miles an hour down.

NEW OFFICERS OF THE INSTITUTE

At a meeting of the Institute of Radio Engineers held January 5, at Columbia University, Professor A. H. Taylor presented a paper on "Variations in Nocturnal Transmission," prepared in collaboration with A. S. Blatterman.

The following officers will be in charge of the Institute during 1916: president, Professor A. E. Kennelly; vice-president, John L. Hogan, Jr.; treasurer, Warren F. Hubley; secretary, David Sarnoff.

The list of managers follows: To serve until January 2, 1918, Louis W. Austin and John Hays Hammond, Jr.; to serve until January 3, 1917, Robert H. Marriott and Guy Hill; to serve until January 1, 1919, Edwin H. Armstrong and Captain W. H. G. Bullard; to serve until January 3, 1917, Lloyd Espenschied, John Stone Stone and Roy A. Weagant.

Professor Alfred N. Goldsmith was appointed editor of publications and Louis G. Pacent, advertising manager.

HONOLULU-JAPAN SERVICE TO START SOON

The Japanese government has notified the Marconi Wireless Telegraph Company of America that the new wireless station at Funabashi, near Tokio, is completed and will soon be ready for transpacific communication. Experimental work between Honolulu and Funabashi is now going on and the reports indicate that the system is working in splendid fashion at both terminals, which are separated by a distance of 3,400 miles. The Funabashi station is equipped with Marconi apparatus, but is owned and operated by the Japanese government.

The exact date of the commercial opening of the service is yet to be announced, but for the fact that Japan is at war the service would probably already be in operation, it is understood.

NESCO SUIT DISMISSED

Judge Mayer dismissed on January 7 the wireless patent infringement suit brought by Samuel M. Kintner and Halsey M. Barnett, receivers of the National Electric Signaling Company, against the Atlantic Communication Company, which operated the Sayville wireless station. It was complained that the defendant had infringed two claims of a patent granted in April, 1909, to Reginald A. Fessenden, and four claims of another patent of the same man which applied to the manufacture of wireless apparatus.

"The musical note" emitted in using the wireless was one of the points upon which it was claimed that the Fessenden patent had been violated, but Judge Mayer pointed out that he could not hold that Fessenden had been the original discoverer of its value. As he was working out his idea De Forest was actually operating commercial stations with it, and was working at the method in his own way.

The Missing Submarine

By Giles Lebrun

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Of course the incidents dealt with in this stirring fiction story never occurred, probably never will. But that it is within the realm of possibility—particularly because of the development of submarines which will be revealed after the war is over—is one of the reasons why we print it. The story's author is a naval man and thoroughly informed as to the limitations of submersibles, also their possibilities. He has written this under an assumed name, as he expresses it, solely "for entertainment."

LIEUTENANT COMMANDER BELDING, of the United States scout cruiser Vidette, attached to the North Atlantic fleet at maneuvers, received by wireless the command to report at the earliest possible moment on board the flagship Pennsylvania.

Though it was no part of the wireless operator's business, the man mentioned that he had heard the same urgent message addressed to the commanders of the two other scout cruisers off the New England coast, as well as to each of the dozen newest and swiftest destroyers.

"It probably means only a change in the plan of maneuvers," said Belding. "But the Pennsylvania's calling the ships from both sides."

"I noticed that," nodded Gregory. "Also that order came in the regular [illegible]vy cipher, you see; not in the code for maneuvers."

"Something's happened, to call maneuvers off!" said Belding, and he set the engine-room dial for full speed ahead, as the quartermaster at the wheel, put the swift ship about in its course.

The commander, staying upon the bridge, watched with impatience the sea slipping past as his turbines rushed the sharp cruiser on. Streaks of smoke, staining the blue on both sides, soon told him that the other scout ships and destroyers were converging hastily toward the position of the flagship; the order evidently had impressed other commanders as urgent, immediate, an emergency.

Under the smoke streaks, now the long, lean lines of the fleet's flyers appeared; and ahead, as the goal of all, loomed up the leaden bulk of the battleships. Flags from the peak of the Pennsylvania painted in gaudy colors against the sky the confirmation of the wireless orders: "Comanders of scout cruisers and destroyers report aboard instantly."

The knife-prowed vessels cut in close and drew up, vibrating with engines reversed, a few lengths apart; as they stopped, a boat dropped from the davits of each, and they bobbed in a line beside the big battleship as the commanders of the auxiliary ships climbed aboard.

As Belding reached the flagship's deck, he saw from the demeanor of the enlisted men that something real, indeed, was in the wind. Secrecy was spelled in the glances of the lieutenants and captain of the flagship and most particularly in the admiral. Belding watched him closely as he welcomed the young commanders into his cabin and ordered the doors closed.

"Gentlemen, I have called you here for an extremely delicate duty—the destruction of a vessel of war of a power with whom we are at peace."

"Sir?" escaped from some one.

"You have all heard, I assume, of the loss last week of the French submersible Corday? Well, what do you—for instance—know of it, Mr. Belding?"

"It went out from Brest on Tuesday of last week, as I recollect, sir," Belding replied. "It was making maneuvers with a division of the French fleet. It went from the harbor and proceeded afloat for some time, and then ran submerged, as expected. Nothing was thought of its being missing till several hours passed, and it failed to rejoin the fleet. It had often run submerged for more than a day. It was not till Thursday, I believe——"

"Correct; that was eight days ago," the admiral confirmed. "Proceed, Mr. Belding."

"——that serious anxiety was felt. But then when it still failed to return to Brest and was not reported elsewhere, a search was instituted. That was rather useless, as, if the Corday went down, it might have disappeared anywhere within several thousand square miles at sea, as it had a submerged running radius of some hundreds of miles. Nothing was found of the Corday; and, after the time expired during which men aboard could have remained alive under water, she was announced as lost."

"For the sake of the public peace of mind, gentlemen, and at the behest of the English and Amertcan as well as the French transatlantic lines," said the admiral.

"The truth of the matter, as made known to our government by the French navy department to-day, is that the Corday never was lost."

"Not lost, sir!"

"For the benefit of the gentlemen who may not have kept informed on recent French submarine development, I may recall that the Corday was—or, rather, is—the latest of the French designs. She has a speed, when fully submerged, of some twenty knots, quite equal to that of most transatlantic liners. She carries oxygen and fuel which makes her capable of running submerged for some forty hours. Running on the surface or occasionally submerged, she could, of course, cross the Atlantic, and by this time probably has done so."

"Sir?"

"The French have information which makes it certain the Corday did not disappear by accident. After submerging off Brest, the crew mutinied, killed the officers, probably thrust their bodies—weighted—through the torpedo tubes, and brought the Corday out into the North Atlantic steamer lanes, where a conning tower of a submersible, running awash, was sighted by an English passenger vessel. The captain told the passengers that it was either one of ours or a British submarine maneuvering; but the submersible was running awash in order to put a wireless aerial above the water to inform Englishmen that it was the Corday and, on its return trip, would sink the liner unless the steamship line paid a certain demanded sum—some million francs—to a man who would identify himself at their offices to-day; also, two ships would be blown up if the man was afterward molested or attempt was made to follow him."

The lieutenants stared at their senior officer.

"Unquestionably this seems strange, gentlemen. However, you may estimate the opinion of the French government of the character of the men aboard the Corday. To-day the French guaranteed to the line the payment of the amount asked, and requested our navy department, together with the English, to co-operate in the search and capture or destruction of the Corday.

"Your instructions, therefore, are immediately to patrol North Atlantic steamer lanes to protect all ships. You will capture or destroy the Corday, when found, as dictated by circumstance, and so far as possible keep the cause of the patrol secret to prevent panic on the ships now at sea."

No sign of the Corday was reported by the captains of the crowded liners bound for Queenstown, Southampton, Cherbourg, Rotterdam, or the ships from those ports to New York.

This was the notice the captains posted on the bulletin board beside the saloons of the liners for the pasengers to read:

Maneuvers are going on.

The English and American navies are practicing protection of commerce.

Then from a Cunarder this was flashed:

Sighted what looked like conning tower of submersible running awash S. E. Sable Island. Caronia.

And swiftly upon the silencing of the ticking of the message in the wireless receivers of the listening ships, corroboration came:

Independent vessel Corday confirms observation of Caronia. The Cunard line, at their London office, to-morrow meets demand of our agent, or Mauretania, sailing New York to-day, will never reach Europe. Suggest Caronia examine starboard side.

Belding, standing in the wireless station, waited in suspense while the operator strained at his instruments.

One of the other ships demanded impatiently:

What did you find?

Then came the Caronia's reply:

Torpedo, evidently with dummy head, struck us amidships. No damage done.

And from the Corday came this curt postscript:

None due—yet.

After that communication, as far as the submersible was concerned, ceased. The captain of the Britannic, the senior British commander within wireless radius, flashed out a general call; he appointed intervals at which all the ships within possible striking distance of the submarine would report themselves in rotation. So the great vessels on the North Atlantic lane steamed on, each flashing out its safety to the others in its turn, each waiting in suspense for the next one's call, each with lookouts doubled below and aloft.

Belding, on the Vidette, returned to his bridge. "I'll stand the next watch. I'll get what sleep I can now," he said to Gregory. "Call me at once, of course, if any ship ceases to report and cannot be picked up by wireless."

He went below to his cabin but could not sleep. It was not possible that the Independent Submersible—as the Corday styled itself—was yet within striking distance of ships on the Vidette's station, but Belding could not dismiss its imminent menace from his mind. The rows of deck lights of the French and English liners, which passed, glowed to him across the water. The passengers on those ships were not yet alarmed. "Maneuvers" still satisfactorly explained the sight of the war vessels. The commander of the Vidette stirred and tossed about his bunk. He had not undressed; he arose and went into the wireless cabin.

"Call the Britannic; tell the captain I advise all ships within three hours' steaming of Sable Island to extinguish all but navigation lights."

The wireless receivers recorded the accepting and carrying out of the suggestion. Then, suddenly, the liner Utrecht called and announced:

Extinguished all lights but port and starboard lanterns and masthead lights at nine-forty. At ten-five, noise was noticed close to port alongside but nothing sighted. Without other warning, large ball was thrown from water upon deck, which burst into flame, but burned harmlessly with red flame until got overboard.

Then came the wireless call curtly in the now distinctive style of sending of the operator of the Independent Submersible:

Holland-America line pays over at Rotterdam amount demanded to-day or next ball contains nitroglycerin.

Belding went to his bridge, to be almost immediately recalled y the news that the St. Paul did not report! The wireless call for the ship went out and repeated; then the calls ceased to permit the other ships to report themselves at their interval. All within wireless radius reported themselves in the routine arranged; a gap for the St. Paul; calls for it; then the roll of the reporting ships again:

The Britannic flashed this:

Volunteers to make for last reported position of St. Paul!

A British freighter, close up, responded. The war vessels already were rushing full speed ahead. Somewhere, a few miles forward of the Vidette, was the destroyer Albemarle.

Then the St. Paul itself was heard from. This was the message:

St. Paul undamaged! Mine exploding alongside damaged adjustments radio installation; panic on board, but no fatalities.

And immediately the Independent Submersible commanded:

See that million is paid to-morrow in New York!

Belding wrote instructions swiftly for his wireless operator:

Naval defense against submarine attack is to zigzag in course; put ship to right and left sharply, each time changing duration of course in any direction.

Immediately, came this fearsome message from the submarine:

U. S. cruiser Vidette. Pick up survivors of destroyer Albemarle about fifty miles east of your announced position. It was zigzagging.

"Do you get the Albemarle? Belding demanded of the operator.

"No, sir."

"Try again. Ask other ships for interval to get Albemarle."

"Yes, sir; no response."

"What's that?"

"The Christiania, sir—reporting boats filled with men."

"Tell her not to stop; we'll pick up the boats," Belding bid.

Dawn was coming; a greasy, gray light was over the ocean. "Boats ahead!" the forward lookout hailed. The officers on the bridge now could see them clearly; under the glass, they showed to be the sea boats of a destroyer, and between the two they bore the full number of the Albemarle's commander and crew.

Young Darrell, the sublieutenant of the sunken ship, came aboard the Vidette last, and white with anger.

"They did it so darned exasperatingly," he cried. "They gave it to us, and as we were going down they came up alongside and asked if they'd injured anybody. The man speaking—in the crazy French apologies—said he personally would be desolated if he had killed us. It would be such a shock to his professional pride. He tried to figure the torpedo charge just enough to sink us; besides, he said he always avoided killing, when possible, on Sunday. They were running with conning tower awash and with the top up and he had his head sticking out. I got so mad I took a shot at him; but I missed. Some one in the submarine was going to take a shot back at us, but the first fellow stopped him. He yelled: 'Méchant! Méchant!' at me, and then put down the top of his conning tower, and sank. What did that mean?"

"Naughty, naughty!" Belding translated.

Except for an English cruiser just coming into sight, the sea was clear of ships; the passenger vessels which had kept to the lane were past and the others now were scattered far apart over the North Atlantic.

"Submarine running awash on right beam!" a lookout hailed. The American and English cruisers came about together, their quick-firers rattling into a volley. The gray, funnel-shaped and hooded conning tower of the submersible which had been moving on the surface, slipped lower, and disappeared. Instantly the cruisers separated and circled, steaming at the highest speed of their turbine engines. But the submersible either disregarded them both or failed to come close. Smoke to the east signified the nearing of a large liner westward bound from Europe; the wireless told that it was the great Gigantic. The cruisers steamed for it, met it, and escorted it each half a mile off on each side. Where the submersible lurked under the surface of the sea no one could know. The great passenger steamer, crowding its mighty engines, ran the swift scout cruisers a race to keep up; the Gigantic was trying to get into port with its passengers as swiftly as possible.

Of course, the operations of the Independent Submersible no longer could be concealed from the public ashore. The alarm leaked first, probably, through the hundreds of private radio installations along the coast of New England and Nova Scotia; also, wireless operators of ships at sea spread the news to papers for the sake of certain rewards. In all official places, both in America and abroad—at the government bureaus and navy departments and in the offices of the transatlantic lines—the lie direct was given to the reports which swiftly became current. The conservative newspapers also for a while denied the news; but the yellow press screamed new extras through the streets each hour, anonuncing more alarming and convincing details to confirm the first general reports.

It was learned that at Havre a man had been paid a large sum of money by the National Bank—a sum said to be a million francs. The fellow strutted the streets spending the money, demanding and receiving escorts of police or soldiers when it pleased him, and defying any one to molest or arrest him. He announced that, after three days, he would return for a similar payment to that just made him; or perhaps he would require twice as much; he could not say. The man was French, and recognized as a deserter from the navy who had served with those now known to be aboard the Independent Submersible.

In London, another French navy deserter demanded and drew a hundred thousand pounds on order from English steamship lines upon the Bank of England. He pocketed the bank notes and strutted the Strand, likewise elaborately defiant and unmolested. The Holland Bank, at Rotterdam, paid almost as heavily to a Gascon recently released from a French military prison; in New York, the representative of the Independent Submersible conferred, with exaggerated politeness and deprecations of regret, with the officials of the three banks where the American and European lines carried accounts; and, as shown by the moving-picture films, he left each financial institution showing marked satisfaction.

And the officials who at first denied that payment was made to these men, now took to advertising that satisfaction had been rendered. The public clamor for safety of those at sea overwhelmed all else. Governments, banks, steamship lines must pay any price to prevent disaster; relatives of those at sea demanded it; powerful individuals proclaimed contributions to subscription lists to pay the blackmail to the men of the submersible; the wireless brought from rich men at sea orders to make any promise to pay, in order to secure their safety. Hourly the newspapers printed lists of the ships at sea which were within wireless communication, and could be reported. Ships speeded into port a day ahead of schedules, discharging nerve-wrecked and excitement-exhausted passengers to swell the stories of alarm. Thousands now had seen the Independent Submersible suddenly break from the water beside the ships, insolently threaten, menace, then vanish.

In Havre, Rotterdam, Paris, London, and New York, the band of deserters and ex-convicts from the French navy made their defiant rounds of the shipping offices and banks almost daily; no one dared molest them; but now, after a week, they were put off when they demanded more money. The first terrors and excitements were dying down; the Independent Submersible had not been seen recently; moreover, as the public more coolly counted up the total damage done, it consisted of United States destroyer Albemarle, another American torpedo vessel, and one small English cruiser sunk. These had been destroyed in making attacks upon the submersible. The Corday had directly assailed no other ship except by threats; and now seemed to have left the steamer lanes. The transatlantic lines grew bolder, and advertised that the danger was over. But the cancellation of cabin reservations for all but absolutely essential business trips on the part of the public told another story; and the trebled and quadrupled marine insurance rates repeated it.

It was useless to renew the orders to the navies; war fleets of four powers patrolled the Atlantic lanes. Hydroaeroplanes, accompanying the cruisers, flitted back and forth over the sea from their platforms on the decks of the ships. Submarines with trusted crews took to the sea to aid in the search; but a submarine was almost worse than useless as a search vessel for another submerged ship; and these submersibles, when seen, either renewed terror on decks of passenger vessels or drew the fire of the war vessels. The submersibles were sent back to their docks in order that no ship should have to wait its fire for recognition of the target when a conning tower broke the surface of the sea.

The steamship lines faced ruin, with hundreds of millions of dollars' worth of ships idle beside the docks or sailing empty and profitless. The condition could not continue. The Independent Submersible, if it could not be destroyed, must be bought off once and for all. The maritime interests of five nations got together; not another dollar would be paid in tribute for the safety of ships voyage by voyage; together they would make up the price necessary for buying the giving up of the Independent Submersible. In Holland, France, England, the United States, the price was asked of the French deserters. In anticipation of the event, in the five countries the same figure was named—a hundred million dollars and full pardon and guarantees of protection for all the Corday's company and their agents. A war indemnity! The terms were impossible.

Lieutenant Commander Belding, on his bridge with young Gregory and Lieutenant Darrell, late of the destroyer Albemarle, learned the decision by wireless as it was flashed to the warships. It had been about noon in London when the terms had been refused; so it was still morning below the Grand Banks of Newfoundland, where the Vidette still turned on its patrol.

Evidently the Independent Submersible had been off to resupply from some secret source near Newfoundland or to meet some tramp steamer which would give it guncotton and gasoline. No ship of the patrol had reported the Corday for forty-eight hours.

This was a clear morning, sunny, mild, and beautiful. A few small fisher smacks rose and fell on the long, easy swell of the ocean; except for them, no other ship was in sight. The Vidette, pacing its beat, moved slowly and in familiar waters, but men with glasses searched the sea each moment ahead, astern, and on both beams; gun crews lounged beside loaded quick-firers, and the hydro-aeroplanes which accompanied the cruiser swooped and circled tirelessly about.

The wireless ticked in the receivers strapped over the ears of the operator at the Vidette's radio station.

"The Promethean," he named the newest and largest liner, "is coming. They've asked if everything here seems clear."

"As far as we can see," Belding directed the response. "That means, as deep as we can," he added grimly to Darrell.

The Vidette swung to meet the approach of the great new liner. A British torpedo boat skirmished ahead of it; on one side the English cruiser Terror, on the other side the American Black Hawk convoyed the great liner to the limit of its patrol where the Black Hawk would turn and the Vidette continue the convoy with the torpedo craft and the Terror. Above the mighty passenger vessel swooped the aeroplanes which were attached to the Black Hawk and the Terror. On came the gigantic vessel, with its six long decks and five funnels, steaming swiftly, majestically through the smooth sea. A few passengers, obliged to cross the ocean, stood at the rails gazing over the untroubled waters; in the holds below, as the naval officers knew, the Promethean bore the bullion and coin required to correct bank balances between America and Europe.

Suddenly the wireless crashed into the radio room of the Vidette:

S O S! Promethean sinking! S O S! Promethean.

The operator, tearing his receivers from his ears, rushed to the bridge.

"Sir!" he shouted. "S O S, the Promethean!" Then he stammered and choked. Before his eyes the great vessel was coming on powerfully, majestically, peacefully. "I got the S O S call a minute ago, sir," he explained sheepishly. "It said the Promethean was sinking——"

"Water broken ahead!" hailed the lookout from the foremast.

"Where away?"

"There, sir!" the man pointed and shouted. Between the destroyer and the oncoming Promethean a light mast stuck from below the sea and rippled up a wave as it ran rapidly with the speed of the ship below the surface of the water. There was no time for the operator to rush back to the wireless cabin to cry the warning; no need for the signalman to flutter the alarm with his flags. The quick-firers on the forward deck of the Vidette burst into action; instantly the shells from the other cruisers ricocheted over the ripples on the water. The monster passenger vessel trembled in its course as the helmsman desperately threw his rudder to right and at the same time the engines reversed. But both actions were too late. The submersible, having taken one sight running awash, had dived. The firing from the cruisers ceased as the splash of the shells merely confused the sight of the men in aeroplanes, who dashed to the surface to try to follow the course of the submersible below. The Promethean still swerved out of its course; but the change meant merely offering the side of the great ship instead of its bow for a target. The submarine was below it by this time.

Belding and young Darrell, with the others on the Vidette, could only watch while they waited helplessly.

"That must have been the Corday that sounded the S O S in advance," Darrell said. Belding nodded, then twinged.

"There's their torpedo forward!" he cried.

Before he could have seen the splash of the explosion below the great passenger vessel, he sensed the shock to the ship.

"There goes another aft!" Darrell called; and at the stern of the Promethean a surge of white water rose at the detonation of a second naval torpedo. The liner, stricken fore and aft, staggered and stopped; on the decks panic, pandemonium, the crush and rout of terror-borne passengers. The warships, closing up, rushed to the rescue, piping crews to their boats. The hull of the giant Promethean, now drifting slowly as it settled, swayed and rolled with the smooth, easy swell of the sea. The torpedoing had been done in masterly manner, fore and aft. The bottom was blown away so that the great ship was going down gradually, evenly, not damaged more either at stem or stern; it would sink, till it was below the water, without diving. The naval officers, seeing this, sensed the intention in it; somehow the same sense that no murder had been meant seemed also to spread to the decks of the liner and to reassure those scrambling into the boats. The lifeboats filled in better order; and now about the sinking ship, the cutters of the war vessels plied with crews trained and cool. Slowly the cruisers circled the sinking wreck, halting to pick up boats which came alongside, and then steaming on around and around. Men lifted up passengers from the boats and bore them to the cruisers' decks; but at the quick-firers, the gun pointers and crews steadfastly kept their eyes alike away from the sinking ship and from the boats rowed from its side.

"But it's no use," said Gregory, as he and Belding and Darrell stood tense on the bridge watching the sea with the gunners. "The Corday's done it now and can get away—under the water five fathoms till they get two hundred miles off in any direction or it's night."

"They can; exactly," Belding agreed. "But they won't."

"You mean?"

"When they did a thing like this, we ought to get them. They were safe, as long as they could keep just threatening; but now we've got them, if we're any good."

"Why?"

"Because they're human; and they've got to see what they've done!"

"They've got to see it?"

"Yes; and see it now. A sinking ship isn't something you can come back to see after every one else is gone. They've got to see the ship they've sunk; and they've got to see it now. They'll come up, and come up close. No view through a periscope tube from below the water will do them."

"Right, sir!" young Darrell agreed. One of the hydroaeroplanes, flying about, skipped on the water beside the Vidette. The young lieutenant of the lost Albemarle scrambled down, and, shouting for the man beside the pilot to come away, Darrell climbed into the bomb gunner's seat between the planes.

"We think they'll come up close to the Promethean, not far off!" he shouted to the pilot as the propellers roared with their revolutions and the machine rose into the air again. It circled and swooped close over the heads of the little boats rowing away from the liner; the other planes, signaled from the ship, closed in with it. Like great cormorants they soared and swooped over the water, watching for their fish to rise from below to pounce upon it.

Lower and lower in the water the mighty Promethean was settling; the liner's boats, loaded once, had got away; the cruisers' cutters now plied without passengers. All but the captain and a few of the crew were away. These delayed and now bore down to the last boats, beside the sinking ship, bags of bulk and great weight. They lowered these carefully into the boats—the gold and bullion of the Promethean's cargo. The boats pushed from the doomed vessel and rowed swiftly toward the English cruiser, nearest. But, as if this was the moment awaited, suddenly before those little boats and so close to them that the gunners at the warship's quick-firers dared not shoot the guns they sighted, a gray, funnel-shaped form broke from the water; the top tipped back, and men with revolvers confronted the unarmed boat crews with the bullion.

The captain and another officer attempted to resist, but their men struck their pistols from their hands and saved them. The French in the submersible waved their derision. The conning tower of the submarine, filled with armed men, drew closer toward the boats. It was almost upon them when suddenly and without warning either to the men in the rowboats or in the submersible, there was a whir and flash of white-clothed planes in the sun above; a swift shadow swept over the water; and an aeroplane, passing over the boats, circled, swooped, and dove. Straight at the open conning tower of the submersible it steered, and dashed so close that the men from the sea jerked down as they turned and fired their revolvers vainly into the air. So swiftly the aeroplane passed over them that it seemed nothing was done; but, as it went over, the arm of the bomb gunner dropped. The aeroplane was past; but within the ship from the sea there flashed a flame, a great puff of smoke, an explosion roared, and then the thud of a deeper detonation below the water.

The wave of this washed over the little boats weighted with bullion near by and swamped one of them and spilled the gold into the sea. Then the wave passed, and except for the other row-boats and swimming men from the first, nothing showed above the surface.

Beyond the Promethean settled a little deeper toward the bow as its top decks came even with the swell of the sea; the ship slipped lower more swiftly, cabins crashing out and bursting from the pressure of air pent up inside. And now, at last, the great ship dove; its last deck disappeared, its funnels, the top of its masts; great bubbles burst to the surface in the maelstrom of swirls and eddies; a last sobbing suck of the sea; then slowly, in little lots together, up floated deck chairs, cushions, game boards, bits of rope.

A little way off, where a few moments before the submarine had stuck its tower above the sea, other splinters of wood, a sailor's collar, a ribbon came to the surface with the last bubbles from below. A boat, rowing by, picked up the ribbon and read upon it, under the French insignia, the name of the submersible Corday.

Already the steam whistles of the cruisers were blowing; flags were flying at the tops of the masts; the wireless was spreading the news through the ether, to be borne from ship to ship to shore.

Promethean sunk, but all people saved; Corday, with all hands destroyed; the sea is safe again!

A glimpse of a few of the forty companies of the New York Division on the march to the parade ground

Something About the Junior American Guard

The Purpose of the Movement What It Has Accomplished

Some Endorsements from Leading Military Men of the United States

By Major William H. Elliott

Adjutant General Junior American Guard, Vice-President National Amateur Wireless Association

ALTHOUGH the Junior American Guard is barely more than six months old, it comprises forty companies of boys, and others are joining as rapidly as they can be accommodated. This is the record of achievement of a recent step for adequate national defense.

To guide boys to patriotism, self-sacrifice and devotion to the high ideals of the service is the purpose of the Junior American Guard. Military instruction which gives systematic training to the mind and body is good for the boys, good for the school, good for the country. Drill develops the whole boy—mentally, morally and physically—straightens his back, shapens his mind, stiffens his upper lip. The entire two months of the summer vacation can be advantageously spent at the Guards' encampment in hiking, swimming, boating, military instruction and rifle practice under competent instructors. Special subsubjects—field engineering, first aid to the injured, field sanitation, signaling, field telegraph and wireless—will be taught.

The Guard was organized in May, 1915, by Brigadier General Andrew C. Zabriskie, with the counsel and support of Major-General Leonard Wood, U. S. A.; General John F. O'Ryan, commander of the New York National Guard; Lieutenant Commander L. N. Josephthal; Major Francis L. V. Hoppin and Lieutenant Maunsell S. Crosby, all of the Governor's Staff; Major Frank B. Keck and Lieutenant Colonel Charles Elliott Warren. The Guard is non-sectarian and there are no dues, or charges paid to the national headquarters, as this is supported by voluntary contributions. Membership is open to boys between twelve and eighteen years of age, but the commissioned officers must be eighteen or over. In signal corps battalions, on account of the technical knowledge required, particularly in wireless telegraphy, the age limit is extended up to twenty-one years for privates.

The organization is divided into battalions and companies. Each battalion is commanded by a major and each company by a captain. A company consists of forty boys, including officers, and the battalion numbers not less than three nor more than eight companies, with a major and staff.

The uniform, obtainable through headquarters at No. 52 Beaver street, New York City, consists of a neat and serviceable khaki coat, cap, trousers, leggings, haversack and cap, the cost being $3.25. For about the same price a cadet rifle is furnished. It is very desirable, although not required, that boys be uniformed when they are mustered in. Experience has shown that they show much greater enthusiasm in their work when provided with the proper uniform.

The wireless work of the Guard in New York is at present under the supervision of Captain C. F. White. One radio company is now organized with headquarters at the armory of the Twenty-second Regiment, New York City. As rapidly as wireless squads and companies are completed, they are attached to Capt. White's command or placed under competent officers for their own special work. While those who wish to join the regular infantry of the guard should send their applications to No. 52 Beaver street, wireless amateurs desirous of entering or organizing radio signaling units may register with Clayton E. Clayton, managing secretary of the National Amateur Wireless Association, No. 450 Fourth avenue, New York. The Association has indorsed the work of the Guard and has offered to co-operate with it in every possible way.

It will probably interest the readers of this magazine to learn how prominent military men of the country have expressed themselves on the organization with which the National Amateur Wireless Association has affiliated. To this end are reproduced extracts from letters which have been received at headquarters. The first is from Major General Leonard Wood. He says:

"The purposes of this organization seem to be thoroughly worthy and warrant the encouragement and support of our people. The training which you propose to give the boys will tend to better them physicaly and morally and is a worthy step in the direction of training them to discharge their military obligations to the nation in case of need.

"Wishing you the largest measure of success, I am

"Sincerely yours,

Another from Col. Edwin F. Glenn, of the General Staff reads:

"I wish to commend most heartily your movement known as the Junior American Guard.

"The success of our modern industries depends more than ever upon teamwork. This can most surely be accomplished by thorough training of the individual through which he acquires a healthy body that responds promptly, accurately and effectively to his will as to the will of another in authority.

"Military training, when properly imparted, insures the best physical development of which boys individualy and collectively are capable. It makes them appreciably better producers. It inoculates respect for constituted authority whether of the home or of the state. It makes the boy the very best type of citizen and adds not less than five years to the average expectancy of life of those who are subjected thereto.

"If every able-bodied boy in this country were thoroughly trained and organized along accepted military lines this country need have no fear of invasion by any other nation or combination of nations.

"Universal military training and organization of our boys is one of our greatest national obligations, not only on account of the physical benefits accruing to the boy and future citizen, but because it is a fact that all wars are waged by boys from sixteen to twenty-five years of age. We owe it, therefore, to them as a sacred duty to train them for the proper performance of this obligation and through such training to develop from among them skilful officers who cannot only successfully lead them in action but protect them from diseases incident to camp life.

"Finally, this is the only method known through which adequate results can be secured with the greatest economy and with an entire absence of what is known as militarism. I earnestly hope, therefore, that your organization may reach every able-bodied boy in this country and impart to him a military training that is both thorough and effective.

"Very sincerely,

Colonel, General Staff, Chief of Staff.

Major General John F. O'Ryan, commander of the New York National Guard, endorses the organization in the following words:

"I want you to know that I am very much interested in your movement, and if there is any way in which I can serve it, please command me. I am one of those who believes that if history teaches one thing it is that wars are fought and won by the youngsters. Therefore, I believe that in the formulation of a big, broad plan to produce reserves for war, we should not rely so much upon those who have had service in the military and who have contracted many civil and family obligations, but upon the youth of the country, who have the enthusiasm so necessary for the success in war, and who are free from the obligations imposed upon older men. If the boys of the country could be organized and disciplined and taught the elements of military training and of routine life in the open, they would constitute a very formidable and effective reserve.

"Sincerely yours,

Major General.

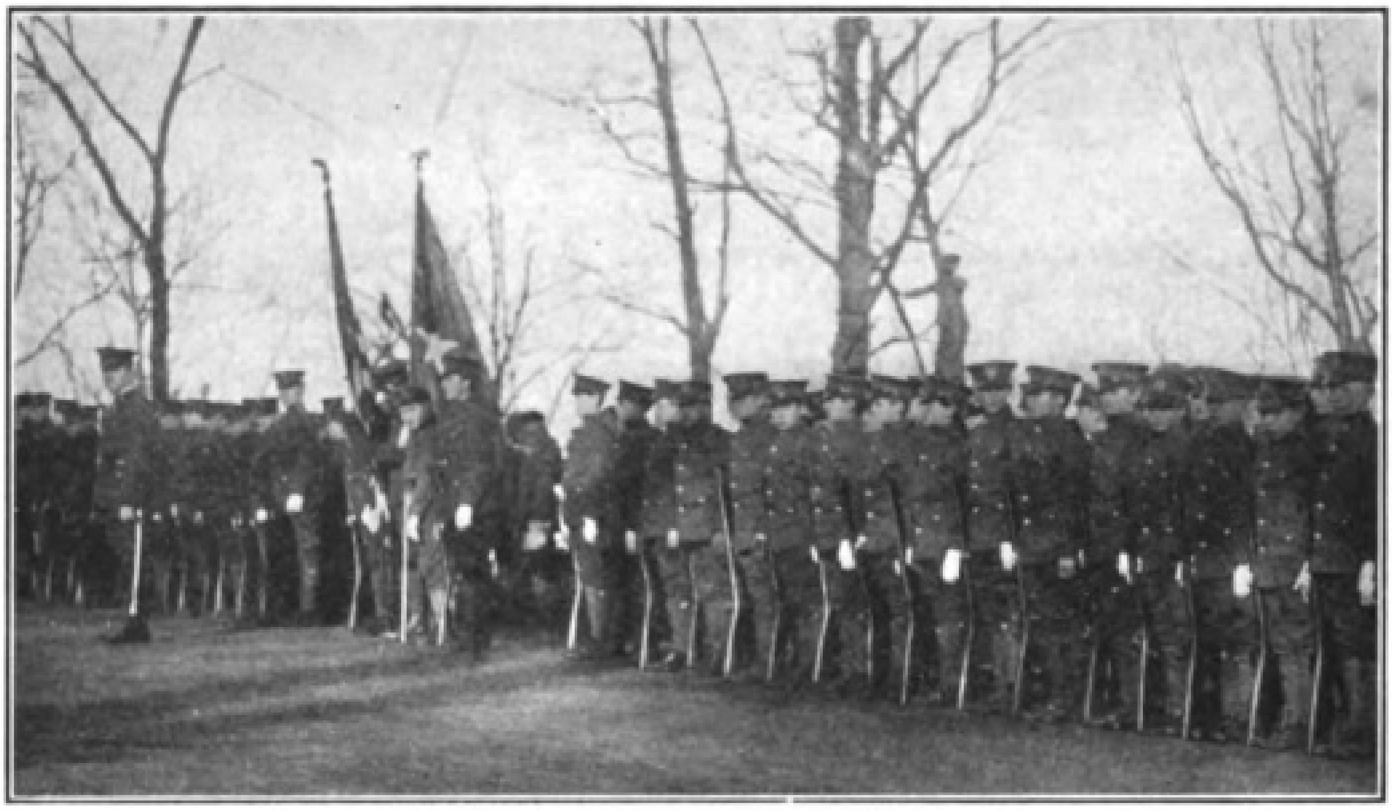
These testimonials speak for themselves and require no further comment.

Among the readers of this magazine there are hundreds who could qualify as lieutenants and non-commissioned officers of signal corps. Skilled wireless men cannot be found at a minute's notice and excellent opportunities for efficient service may be had by those who enroll under the flag in time of peace and prepare themselves to meet whatever emergency may arise.

NEW PACK SET FOR SIGNAL CORPS

Methods of communication between armies and units of armies in time of war are important considerations, especially as the armed forces of today are growing in size and are operating over vaster distances. The Army and Navy Journal says that the Signal Corps of the United States Army is now building a new high power wireless set which can be knocked down and shipped in packages of not exceeding 350 pounds each

Although these sets can be carried on the backs of mules or even by men they will have a sending radius of more than 250 miles. In shipping wireless outfits by rail, the set can be packed in a box car or shipped on top of a flat car, and can be set up on top of a flat car or large wagon and operated successfully. It is believed that this outfit will be particularly suited to manœuvers over mountainous country. Its parts can be carried in pack trains and can be attached to mountain artillery.



A battalion of the Junior American Guard lining up for a parade recently held in New York

Preparing the Third Line of Defense

An Outline of the Principles Governing the Organization of a Signal Corps and the Opportunities Given to Members of the National Amateur Wireless Association

By J. Andrew White,

Acting President National Amateur Wireless Association

IN the December issue, under the heading, "A Word With You," I outlined our need for preparedness and made a blanket suggestion as to how our young men can serve their country. I assumed that there were many patroitic Americans among the members of the National Amateur Wireless Association, and anticipated that a number would display initiative in the matter of organizing local signal corps. The response to the suggestion carried at the end of that brief communication has far exceeded all expectations. From the inquiries received it is evident that by the time our outdoor season arrives there will be in existence at least a half dozen well-equipped battalions trained for emergency and ready to take up practical field work in the summer camps.

Nearly every letter which has been received, however, asks for general information. The patriotic spirit is in evidence in all; but exact knowledge on the subject of signal corps, their functions and equipment, is lacking. With a view to clearing up the general questions, I shall give a bare outline of the work of the signal corps and a suggestion or two on organizing a company, and later a battalion.

The basic principle upon which signaling companies operate is to provide for transmission of information and orders from commanding officers to their subordinates and returning information from these subordinates to the commanders. Signal corps troops are required in event of war to be fully equipped with efficient men and material to carry out the orders of the commanding officer, regardless of adverse conditions. Uninterrupted communication must be maintained by visual or electric signaling with headquarters, no matter how often the location changes. In a phrase, the commander expects, demands and depends upon this branch of the service to keep him fully and continuously informed as to the progress of a battle, the position of his troops, hospitals, trains and supply departments.

The necessity for thorough training is therefore at once obvious. The members must be technically trained in time of peace and must be physically prepared to cover long distances quickly, overcoming all difficulties and obstacles and always keeping in touch with commanders. There is no branch of army service more important than the signaling corps, none upon which more exacting demands are made. Every man is expected to thoroughly understand all classes of signaling, know how to repair the equipment and know by extensive practice how to establish and maintain lines of communication over widely varying types of country. Drilling by the manual is but a small part of the requirements; instruction in time of peace is expected to afford officers and men practice and experience in dealing with the situations and difficulties which are likely to arise in time of war.

Raw recruits are practically valueless in an active campaign; careful training alone will make a signal corps man efficient. If war comes to this country, the *prepared* men of the National Amateur Wireless Association are the ones that can take the field at once and be of real service.

There is room in a corps for every man in a local club, the full complement of a company consisting of seventy-eight privates and thirty-five officers. Companies may, of course, be started on a smaller scale, and, where additional men are required to fill the ranks, these may be obtained from the young men of the town who are not necessarily of the wireless fraternity. No difficulty will be experienced in securing recruits, I can assure you. Once a uniformed company begins drilling—as I have seen them in New York during the past week—the difficulty will resolve itself into finding room for the many applicants.

The company, when organized, is formed into wire sections and wireless sections. A wireless section comprises all the men assigned to the establishment and maintenance of a wireless station. A pack wireless section consists of one first-class sergeant, who is chief of section; one sergeant, two corporals, operators, antenna men and messengers. A wagon wireless section consists of one first-class sergeant, who is chief of section; one sergeant, two corporals, the engineer, the wagoner, operators, antenna men, guy men and messengers.

The wire section has a first-class sergeant as chief of section, one sergeant, two corporals, operators, linemen and messengers.

Signal corps troops are required to carry out the orders of the commanding officer, regardless of adverse conditions. Visual signaling is resorted to only when electrical means of communication fail, but every man is expected to thoroughly understand all classes of signaling

The men are permanently assigned to sections and are transferred by order of the captain only.

Two sections make a platoon, the chief of which is a lieutenant.

Threee platoons form a company, which is commanded by the captain.

The senior lieutenant is assigned as chief of the first platoon, the lieutenant next in rank as chief of the second platoon and so on.

The first four sections of a field wireless company are pack wireless sections; the other two are wagon wireless sections.

Electrical means of transmission include the wireless telegraph, buzzer and telephone; these are supplemented by visual means, such as the heliograph, lantern, rockets, etc., or by messenger. Visual signaling, however, is used only when atmospheric conditions or lack of equipment preclude the possibility of electrical signaling. In such emergency the flag or heliograph are used during the day, the lantern and rockets at night. Messengers are used only when other methods have been found impraticable or have suddenly failed.

Every member of a signal corps is expected to know the code thoroughly. That is one thing which members of the National Amateur Wireless Association may perfect themselves and instruct others, without further delay. If you have determined to organize locally along military lines and find that the process of organization takes time, you can do good service right away by preparing yourselves and your prospective company members in this important requirement. Practice in transmission from miscellaneous books or newspapers is strongly recommended. Hand written manuscript also affords valuable experience; the ability to read all kinds of copy—good, bad and indifferent—correctly at sight is most valuable.

Learn to read the code by sound. Two persons practicing together, taking turns at reading and writing, sending and receiving, each correcting the faults of the other, is the best method. The sounds of the code letters must first be learned separately and then short words chosen; these must be written very slowly and distinctly at first, and the speed of manipulation of the key increased as proficiency in reading is attained.

The code thoroughly mastered, equipment may be considered. The wireless equipment of the companies must depend largely upon the circumstances governing each individual case. Portable sets have been designed by our readers and descriptions of these equipments have appeared many times in issues of The Wireless Age. Any efficient set which can be easily transported and quickly set up will do at the start; special equipment will later be designed for this purpose by the staff of experts serving the National Amateur Wireless Association as officers, and these will be published in this magazine. One function of the wireless must not be overlooked in considering equipment; the signal corps is expected to keep parallel columns in communication while on the march, and possibly to intercept messages sent by the enemy—or even "jam" enemy stations when they are sending—thus the equipment selected should be both mobile and powerful,according to amateur standards.

When signal troops are in the field, whether on the march, in camp, or in combat, the detachments must be near the commanding officer with whom communication must be maintained. Signal corps officers must be more than usually efficient, therefore, and be able to effect a distribution which will best secure this result without interfering with the function of other troops. The signal officer's position is usually with the commanding general; from this point he gets a grasp of the situation and is able to direct the operations of his platoons and sections to the best advantage.

You who are members of local clubs can start your military activities whenever you choose. First, appoint a committee and decide what you can provide in the way of men and material. Then seek a man who has a military record; every town of any importance in the United States has at least one retired military officer or active militia man who is willing to head a command made up of the younger generation. Let the committee explain to him what it purposes doing, show him the article in this issue written by our vice-president, Major Elliott—and no urging will be necessary to have him accept the position. The properly qualified military instructor should then present his credentials in writing to the National Amateur Wireless Association and, if found acceptable, he is officially appointed captain of the proposed company. He then selects his officers, and through the local radio club, newspaper publicity and personal effort, secures recruits in sufficient number tc start the local organiation.

If for any reason it is found expedient to organize independently, or to affiliate with some established church or school military company, this may be done. Preference is given to the Junior American Guard, however, because it is a nation-wide movement, supported by men of standing and organized along strict military lines. The National Amateur Wireless Association is in close touch with this organization and has an intimate acquaintance with the work accomplished and to be completed in the near future, and recommends the affiliation because of the standardized instruction which will result.

On the all-important question of financing your local company, a few suggestions are given which may be of service in solving the problem. These suggestions are not expected to be taken without whatever modification may be necessary to meet local conditions, but are to serve only as guide posts.

When official recognition has been given to the experienced military man who consents to head the company, a finance committee of three or five should be appointed. The members of this committee should be drawn from citizens of good standing in the community. It will be the duty of this committee to care for the funds of the company and, if necessary, even secure the sum necessary to give each member a uniform—costing $3.25, as explained in our vice-president's article—and to provide the signaling equipment, which may be modest or elaborate, as circumstances permit. It is not necessary to purchase rifles; signal corps members are provided only with revolvers.

This illustration shows a sham battle in progress on Washington Heights, New York, and gives some indication of the instruction in time of peace which is expected to afford officers and men practice and experience in dealing with the situations which are likely to arise in time of war. The commander of infantry troops such as these depends upon the signal corps to keep him continuously informed as to the progress of a battle

If the individual members can provide, from their own pockets, the small sum necessary for the purchase of equipment, this is the best and most dignified thing to do. It may be, however, that the parents of a few young men cannot afford the modest sum required. In this case the deficiency may be made up by the members in better circumstances, or, if this fails, the finance committee should be required to provide a way of securing whatever funds are necessary to complete the organization.

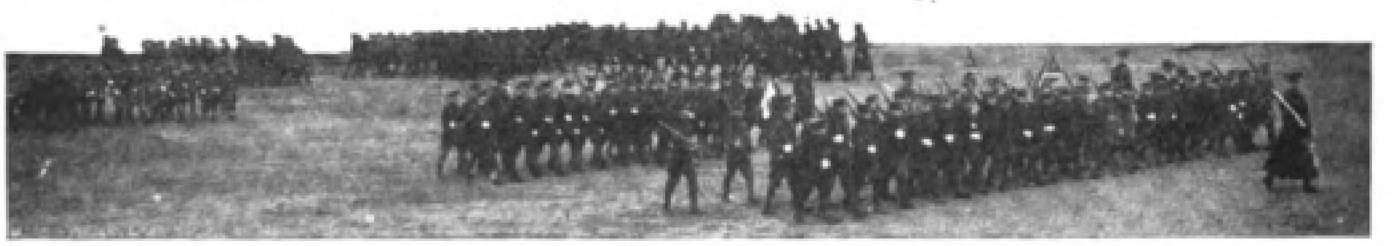
There are several ways in which the result can be accomplished. Local merchants and prominent men of the town, if properly approached and assured that the committee is composed of responsible people and the captain a capable officer, will readily give tangible evidence of their patriotism by furthering a worthy cause. If contributions are solicited, however, the organization must have established a definite standing in the community and secured a bank connection or recommendation that will set at rest any doubts as to the sincerity of purpose. Young men should not undertake solicitation of funds—even though the amount be small—unless they first secure the written endorsement of three or more of the most prominent men in the community.

Another way in which the equipment may be secured is through the church. A number of companies and battalions of the Junior American Guard are maintained by New York churches, the members of the congregation taking great interest and pride in the careful training secured under proper instructors.

A signal corps is also a logical project for the schools to further. Principals of private, and even public, institutions are influential men and can easily create a local organization, if their support can be enlisted.

There are, of course, many other ways in which the financing of the corps may be accomplished. But the best way of all is for the members to do it themselves by each individual providing his own equipment. The main issue is to get started; then initiative and resourcefulness of those really desirous of preparing themselves in event of war will solve the problems as they are encountered.

New York is certainly setting a pace that other sections of the country will have difficulty in following. So well have the organizations progressed here that plans are now being made for a monster review within a few months, a parade in the spring and a great summer camp and field maneuvers later in the year. The National Amateur Wireless Association is extending active c-ooperation in the signal corps work and is well equipped to serve in similar advisory capacity its members scattered all over the nation. Major Elliott wishes me to personally extend to all association members a cordial invitation to join the preparedness movement, together with assurances that prompt attention will be given to all applications from men who wish to qualify as captains.



THE GROWTH OF THE DEFENCE MOVEMENT

The national defence movement in which wireless telegraphy is playing an important part, is showing a marked development in northern New York. Among the up-state cities, Buffalo reports more than 1,500 recruits, practically a full, war-strength regiment. In Rochester the Headquarters' Staff of the Rochester National Defence Contingent reports an enrollment of 250 at the first meeting, with good prospects for a much longer muster roll before spring. An opportunity will be given those who wish to take a course in wireless practice in addition to regular drill. A. M. Lindsay, Jr., has donated his service as instructor in the art.

The Lloyds Register for 1914-15 says that there has been a steady growth in the number of vessels equipped with wireless and submarine signaling installations. There are now on the Lloyds registry of the world's merchant marine 2,939 ships fitted with wireless sets and 947 equipped with the submarine apparatus.

How to Conduct a Radio Club

(Specially Prepared for the National Amateur Wireless Association)

By Elmer E. Bucher

ARTICLE XX

BECAUSE there is little or no retransfer of energy from the antenna to the spark gap circuit, the quenched spark discharger is considered the most efficient of modern gaps for the handling of small powers. Some amateurs, ambitious to obtain the maximum degree of efficiency from their transmitters, fit their stations with gaps of this type, but the results obtained are frequently somewhat disappointing. Considerable misapprehension seems to exist regarding the adjustment and use of the quenched spark discharger and this article was written with the object of bringing about a better understanding regarding the subject.

To be efficient, the quenched spark type of transmitter must be uniformly designed throughout; that is to say, the generator, the transformer, condenser and gap must be constructed along certain definite lines before the apparatus can be expected to produce results. It is not within the scope of this article to discuss the design of a complete commercial quenched spark type of transmitting apparatus, but directions will be given which will enable the gap to be employed in connection with any type of existing amateur apparatus with increased flow of antenna current. The adjustment of the quenched spark transmitter, even when properly designed, is somewhat difficult and it is due to the absence of the necessary controlling devices for obtaining closeness of regulation of the various circuits that the amateur meets with discouragement.

As is well known, the plates of the quenched gap are made of copper, carefully ground and perfectly milled, with sufficient heat dissipation surface to take care of the required energy. In addition, the individual plates of the gap are separated by insulating washers of the correct thickness, so that when compressed the sparking surfaces will be separated by no more than 1/100th of an inch. It is particularly important that the space between the sparking surfaces be airtight. To this end the insulating discs or washers are treated with a special insulating compound, such as varnish, paraffin, etc. Under the heat of the gap this compound will soften and when the plates are tightly pressed an air-tight joint results.

It is customary to allow 1,200 volts per gap; hence the number of gaps to be employed in a given set can be readily calculated from the applied voltage. It should be kept in mind, however, that it is not the voltage of the transformer alone that is taken for computation; it is the available potential when the condenser is connected in shunt to the secondary winding that is taken into consideration. This value of potential can be calculated by the sphere gap method, the tables for which are usually given in the appendix of electrical hand books. Briefly, this method involves the use of two spheres or balls of a certain diameter, which are separated by a micrometer adjustment with a corresponding scale. These discharge balls are connected in shunt to the source of high potential and gradually separated until the spark ceases to discharge. The length of the gap is noted and reference made to the table for the corresponding value of voltage. It should be kept in mind that these tables generally give the maximum voltage per cycle and not the R.M.S. value.

The writer conducted a number of experiments with quenched gaps on sixty-cycle amateur apparatus and found that with the proper precautions increased flow of current in the antenna circuit could be obtained. As a result of these tests it was immediately observed that the capacity of the condenser in the closed os-

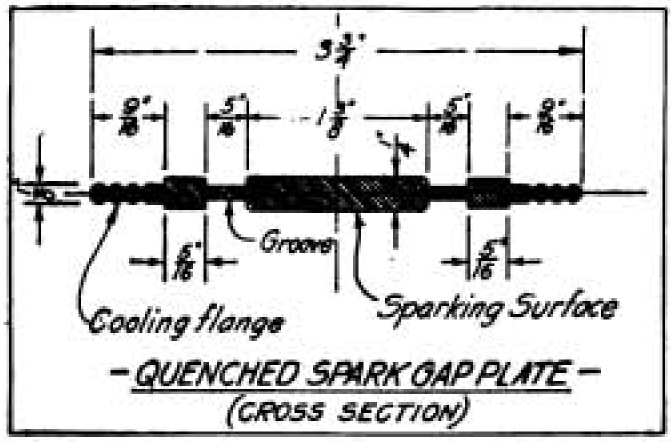


Fig. 1

cillatory circuit must be reduced below that value employed with the plain type of spark gap.

An additionally important factor in connection with these dischargers is the pitch of the note. To secure a clear tone it is necessary that the voltage applied to the high potential condenser should be very carefully regulated. When the source of current supply is a motor-generator, the voltage of the transformer may be readily controlled by means of the generator field rheostat. However, when current is taken from the city mains, it may become necessary to construct a transformer fitted with variable tap-offs in the secondary winding in order that the correct value of voltage may be obtained. With certain transformers the proper reduction of voltage may be secured by the insertion of a reactance coil in series with the primary winding, but this method is not found to be as efficient as the one where tap-offs are taken from the secondary winding.

Some experimenters believe that the mere fitting of a quenched gap to a radio transmitter will give a high spark note. This is not true. But if properly adjusted this gap will tend to smooth out the pitch of the note regardless of the applied frequency. High pitched notes are only obtained within the higher range of spark frequencies (from 240 to 500 cycles).

It is essential in connection with the quenched spark transmitter that the inductance value of either the primary or secondary circuits of the oscillation transformer be continuously variable, *i. e.*, fitted with a sliding contact in order that turns may be added or subtracted by fractions of an inch. It is preferable then to employ an oscillation transformer of the pancake or flat spiral type in order that sliding contacts may be fitted for variation of the inductance. Again, the coupling between the primary and secondary windings must be very closely adjustable, and if possible the oscillation transformer should be constructed so that the inductance of either the primary or secondary winding and the coupling between these windings can be varied simultaneously.

At this point it should be kept in mind that the quenched spark discharger permits a closer degree of coupling between the primary and secondary windings than is possible with the rotary disc discharger or plain gap. On this account an increased flow of antenna current takes place and in addition the energy is

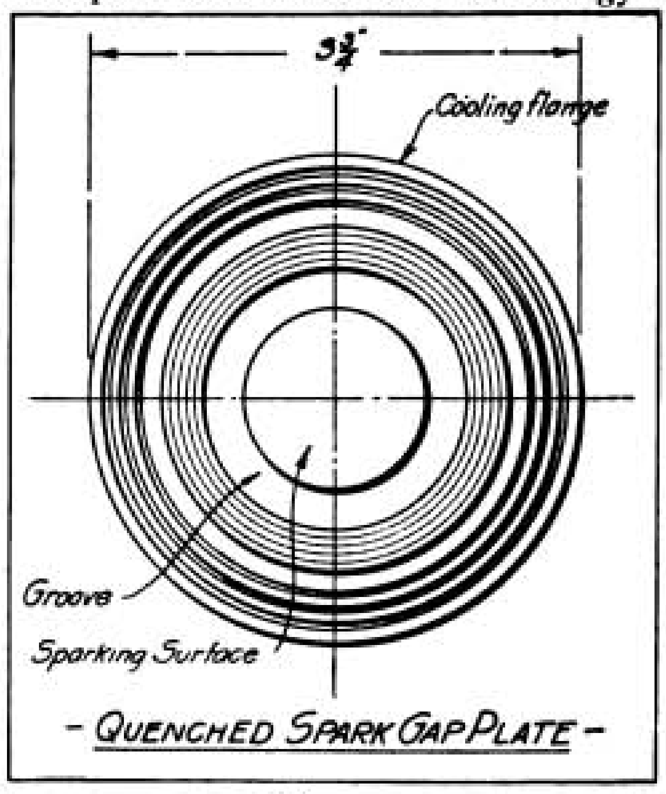


Fig. 1-a

emitted at a single fundamental frequency.

The high potential transformer for a quenched gap system should possess a certain amount of magnetic leakage. The open core transformer naturally possesses this characteristic, but if a transformer of the closed core type is employed

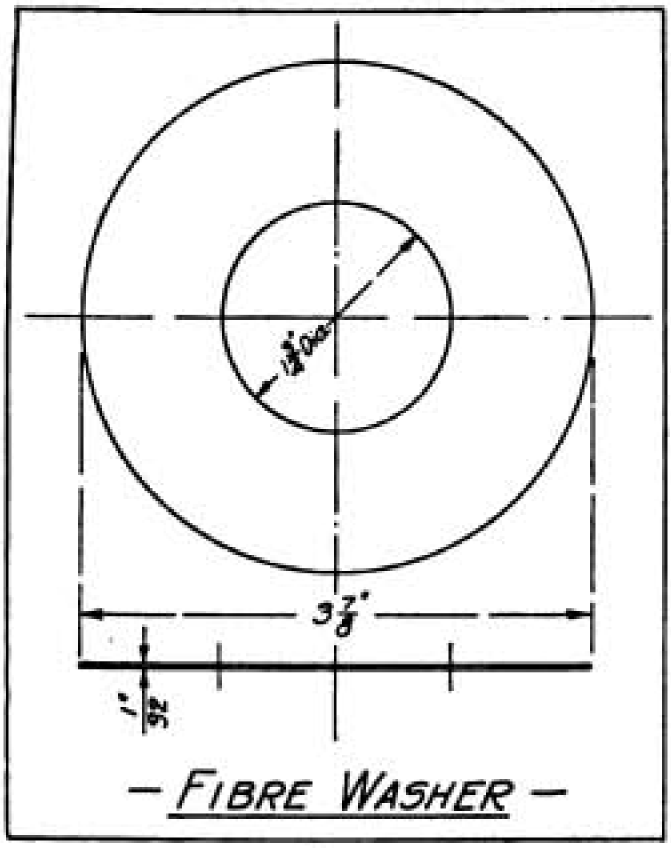


Fig. 2

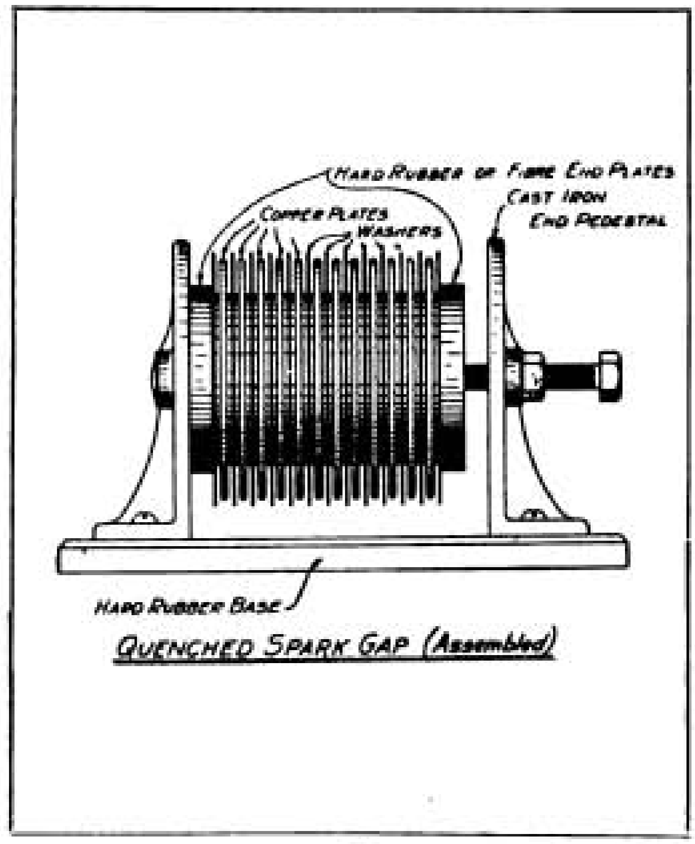


Fig. 3

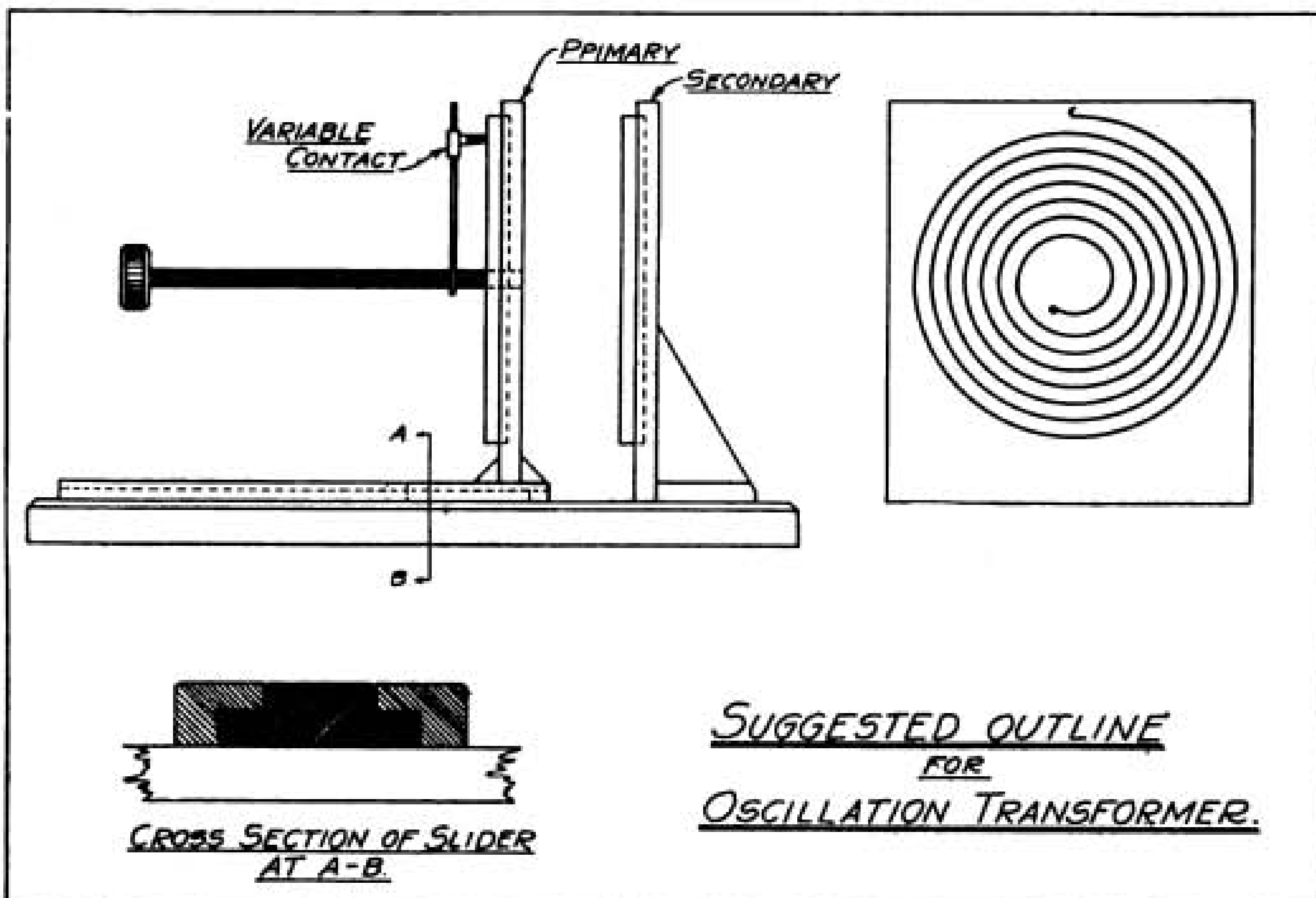


Fig. 4

it should be fitted with a magnetic leakage gap.

The average amateur transmitting set supplied with a ¼ or ½ k.w. transformer, requires from 8 to 14 copper plates for the quenched gap, which may be designed from the sketch shown in Fig. 1, a plan view of which is shown in Fig. 1-A. As indicated, the actual sparking surface of the plates is 1⅜ inches in diameter, surrounded by a groove 5/16ths of an inch in width by about 3/32 of an inch in depth. It will also be observed that the outer rim, upon which the insulating fibre rests, is ⅝ of an inch in width by 1⅝ inches outside diameter. The complete plate, including the cooling flange, is 3¾ inches in diameter.

The plates of a quenched spark gap cannot be constructed in a slipshod manner. They must be cast in a solid piece and very carefully molded. In fact, it is not sufficient that these plates be smoothly cast. They must be placed in a lathe or milling machine and ground to a smooth surface with extreme accuracy. If the sparking surface is uneven the spark discharge will take place at the highest point and finally short-circuit the gap.

After completion these plates must be carefully mounted in a containing rack and placed under great pressure. The junior experimenter is accustomed to stack these plates between two insulating slabs and draw them together by means of iron bolts. It is impossible to compress the plates evenly in this manner. As a matter of fact, efficient results cannot be expected unless the plates are mounted in a cast iron frame, properly insulated from it and pressed together by means of a large set screw on the end which acts directly upon the center of the plates. In this manner a great pressure can be exerted, making the intervening spaces airtight.

The dimensions for the insulating washers are given in Fig. 2, the suggested outline for the design of a gap container in Fig. 3, and a simple sketch of a suitable oscillation transformer in Fig. 4. Complete constructional details of the oscillation transformer are not given, but for amateurs' information it can be stated that they are generally constructed of strip copper, placed in slots cut in spiral form on a slab of hard rubber bakelite or other insulating material.

For operation at a wave-length of from 200 to 600 meters the oscillation transformer for a ½ k.w. set may have the following dimensions:(The primary winding has eight turns of flat copper ribbon placed on an insulating support edgewise, the copper being ⅜ of an inch in width by 1/16 of an inch in thickness. The outside diameter of the winding is 10 inches and the inside diameter about 4¾ inches. The turns should be placed ¼ of an inch apart. The secondary winding of this oscillation transformer may consist of nineteen or twenty turns of ribbon of the same size, also spaced ¼ of an inch apart, with a copper strip of the same dimensions. The outside diameter is about 14 inches and the inside diameter about 4¼ inches. It will be observed from Fig. 5 that the inductance of the primary winding of the oscillation transformer is altered by a

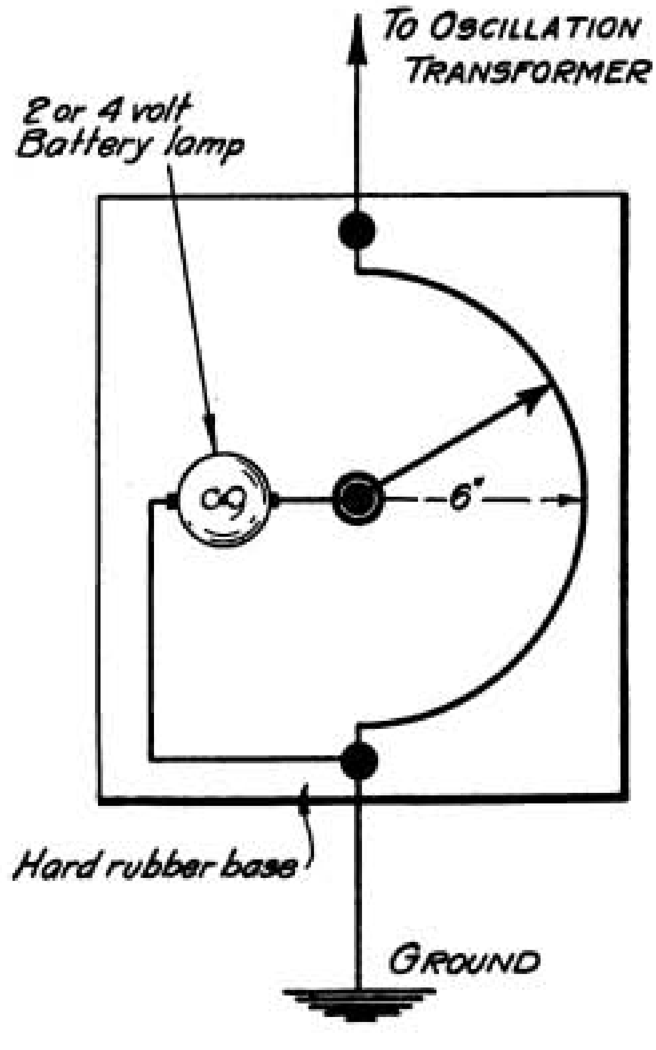


Fig. 5

sliding contact operated by the handle, h. In addition, the primary winding is mounted on the base so that it can be drawn away from the secondary winding for variation of the coupling.

A radiation indicator suitable for determining conditions of resonance between the spark gap and antenna circuits is shown in Fig. 5. It is, of course, preferable that a hot wire ammeter be employed, but in the event that it is found too expensive the indicator will fulfill the requirements. It consists merely of a two or four volt battery lamp, shunted by a semi-circle of copper wire with a sliding contact, so that the inductance and resistance of the shunt can be regulated by fractions of an inch. When this indicator is connected in the antenna system, experimental trials must be made and the shunt set at the correct value to prevent the lamp from burning out. A diagram of connections for the complete quenched spark gap system is shown in Fig. 6.

Assuming that the experimenter has constructed a quenched gap along the lines described and that the plates are properly mounted in the containing rack and made airtight, if the following procedure is carried out efficient results will be obtained.

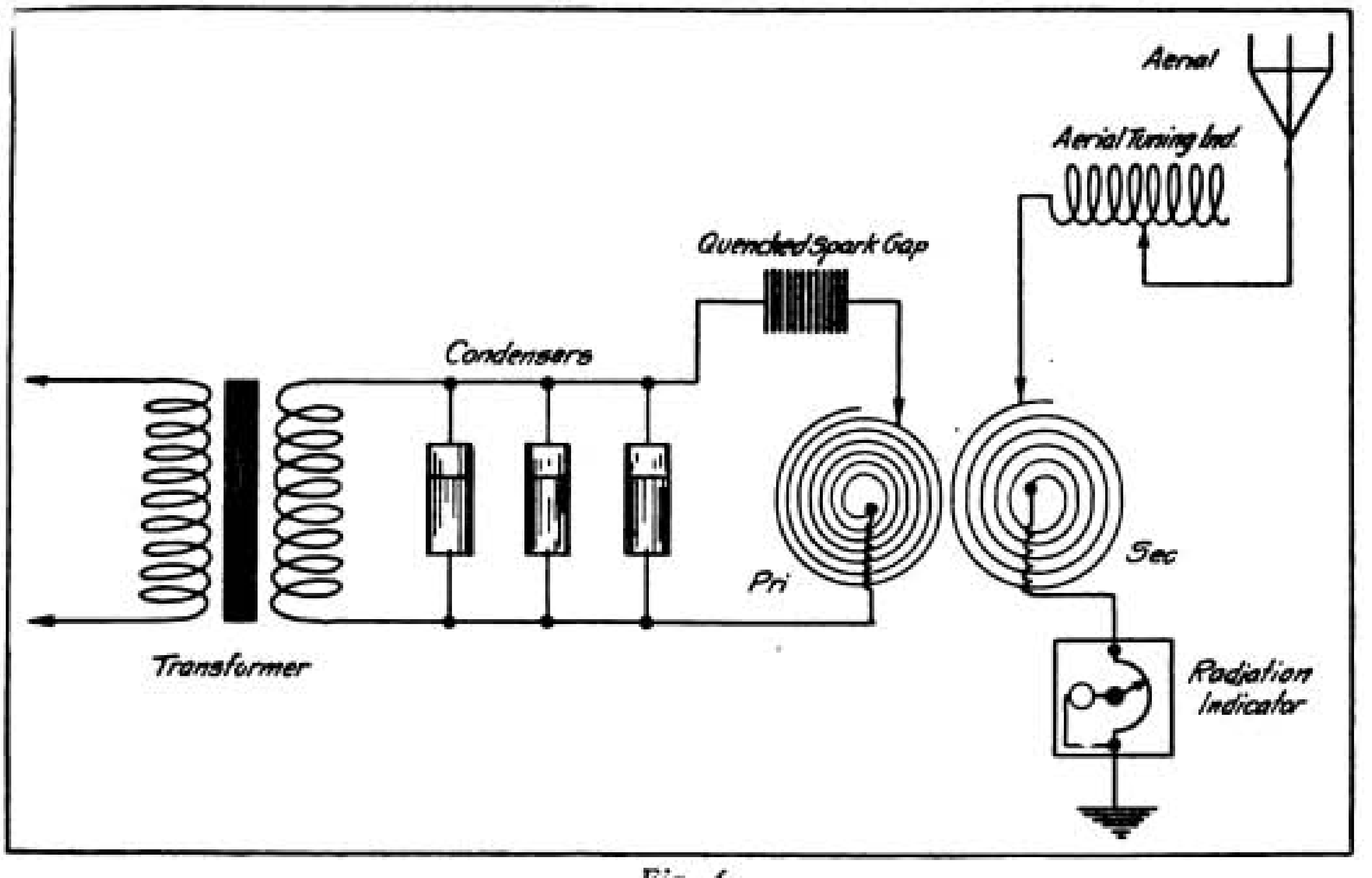


Fig. 6

As remarked previously, the capacity of the transmitting condenser should be reduced and corresponding careful regulation made of the number of gaps in use as well as the applied potential. Here it should be remarked that when first assembled the quenched gap is not in condition for immediate use. The spark should be allowed to discharge for at least two hours to remove the accumulated gases. After being treated for this period the primary winding of the oscillation transformer is placed in close inductive relation to the secondary winding and extremely careful regulation made of the inductance of either winding; at the same time the antenna current indicator should be noted to determine when the maximum flow of energy is obtained. When this point of adjustment is reached, the coupling between the primary and secondary winding is reduced with simultaneous small changes in the inductance values of the primary winding with the idea of ascertaining whether increased antenna current can be obtained. During this adjustment the pitch of the spark note can be observed by listening in on the telephones of a wavemeter adjusted to resonance with the set, or by connecting into the circuit the secondary winding of the receiving tuner. Careful adjustment of the transformer voltage is made and the corresponding note observed in the telephones.

It is important that the plates of the quenched spark gap be properly cooled. It is customary in commercial apparatus to effect this by a small motor blower mounted directly on the same base with the quenched gap which supplies a constant pressure of air to the outside surface of the plates. Similar results can be obtained by using a small electric fan arranged to direct a blast of air upon the cooling flanges. A slight rise in temperature has the effect of increasing the efficiency of the gap, but if excessive the plates will be ruined. After a few hours' use it is found necessary to gradually take up the adjusting screw in order that the plates may be kept airtight.

It will readily be understood from the foregoing explanation that the oscillation transformer of the conductive or inductive type employed at the amateur station is unfitted for use in connection with the quenched gap system. While it is possible by a tedious series of experiments to locate the proper values of inductance, it is far more preferable to build an oscillation transformer after the type suggested.

The writer feels assured that if the experimenter will adopt the foregoing suggestions he will not discard the quenched spark discharger as useless, but will be loud in praising its efficiency.

(To be continued)

BRIDGEPORT NAVAL SET INSTALLED

The wireless equipment of the National Guard received a valuable addition recently when the Bridgeport battalion of the Connecticut Naval Militia installed its radio apparatus in the State Armory. The antenna was strung above the roof from front to rear.

Four members are already excellent operators. With the exception of the tuning coil the receiving set is entirely home-made, and the sending set, while made up of regular stock parts, was assembled by the radio class. This work, while encouraged by the Navy Department, is optional.

Previous to the armory installation the battalion set was in use at its club house, where communication was established with a number of stations along the Atlantic coast. With the new equipment, a larger class and better results are expected.

EXAMINATION FOR RADIO INSPECTOR

The United States Civil Service Commission held a competitive examination on January 19 to fill vacancies on the force of radio inspectors and their assistants in the offices of the Radio Inspectors of the Department of Commerce in New York and San Francisco. The salaries for these positions range from $1,200 to $1,600 a year, depending on the candidate's qualifications, as shown by his examination. The examination was open to men of twenty years and more.

As most of the readers of THE WIRELESS AGE know, the duties of the inspector are to aid in the enforcement of the government wireless regulations through the inspection of ship and shore stations, to insure their compliance with the law. They may also be called upon to examine radio operators. As the inspection work requires the assistant to carry thirty or forty pounds of testing and measuring instruments, a good physique is a prime necessity, and a medical certificate of fitness was required of each applicant.

COST OF PEACE SHIP MESSAGES

The first member of the Ford expedition to return to this country was Robert Bastian Bermann, of Washington, D. C., who was engaged to supervise all copy before it was sent out to Kings, Presidents and other distinguished persons.

Mr. Ford's staff consisted of twelve stenographers, four multigraph operators, five dictaphone operators, seven publicity men and six messengers, according to Mr. Bermann, who said that the staff was kept busy getting out messages which were dispatched by Marconi wireless continuously.

According to a newspaper interview, as many as 40,000 words were sent in one day, Mr. Bermann asserted, and he had to read and correct them. Mr. Ford sent a message of 600 words to each of nine rulers of belligerent nations at 50 cents a word, and the bill paid at Kirkwall for the total wireless amounted to $50,000, the wireless editor declared.

Vice-Presidency of National Association Accepted by Capt. Bullard

Superintendent of Naval Radio Service Added to Distinguished Advisory Board Expresses Desire to Aid in Uplift of American Amateur Experimenting

LAST month this magazine, as the official organ of the National Amateur Wireless Association, had the privilege of announcing that Secretary of the Navy Daniels had approved the organization and requested that a list of members be prepared so that they may be communicated with, and those willing to serve as volunteers in event of war, registered in the government records. Close upon this comes another indication of the high esteem in which the government holds the Association—an acceptance of a vice-presidency on the Advisory Board from Captain W. H. G. Bullard, Superintendent of the Naval Radio Service.

In the letter which announced this important decision, Captain Bullard clearly expressed his willingness to give his personal support to the uplift of the wireless amateur.

He said that he felt "honored in being associated with so many distinguished gentlemen in the proposition directed towards the uplift of the amateur wireless man, to the end that both commercial and governmental interests would be safeguarded, and the amateur himself placed in a position of responsibility." He added that he trusted his connection in an official capacity would "redund to the credit of the Association."

The letter closed with an expression that will be of particular interest to every amateur in the country: "I shall do all that is proper to bring about the desired result, and I've no doubt that my efforts will be successful."

This communication to members might well be said to mark an epoch in the history of American wireless telegraphy. The strong endorsement contained therein vindicates the contention which prominent experimenters have advanced through years: That with proper organization radio investigators could secure Federal recognition as conscientious workers in the field of science, individually and collectively to be aided and encouraged in research of value to the nation. Captain Bullard's expressed willingness to aid the promotion of amateur wireless and his position on the board of vice-presidents is a cause for congratulation; his views, together with those of the eminent scientists who have graciously consented to further the experimental work pursued by members, makes certain that the value of the counsel given to the National Amateur Wireless Association will be the best obtainable.

The administrative officers have urged that every amateur wearing the national emblem be constantly reminded that it is to be looked upon with justifiable pride as representing its wearer's acceptability to participation in the activities of an organization made possible only through the willingness of the leaders of science to aid a worthy cause. Every member is pledged to conduct himself in a manner to reflect credit upon the Association, recognizing that an unusual distinction has been conferred upon the radio field.

A formal expression of appreciation of the additional honor conferred upon the Association in Captain Bullard's acceptance has been made and the current Monthly Service Bulletin sent to members carries special mention of the notable acquisition to the list of officers.

THE WIRELESS MEN

By Walter Willisson Stephen

Our tidings we breathe to the powers of the dark,
 and the demons that dwell in the air;
And unto the flickering fire of the heavens we
 answer the lightning's flare.
We hark to the voice of a comrade that speaks of
 the tempest arising afar
Where the shimmering line of the sky and the ocean
 is under the pale North Star.
We have seen the white glow of the withering moon
 aflame on the tropical sea,
And the palm tree's tracery under the sky on the
 beach of the white sand key.
The winds of the firmament pause to our bidding,
 then hasten their missions again;
And we know in the night when a brother is near—
 for we are the wireless men.

We trust to our towers of the tightened steel where
 the static glimmer clings,
While the hurricane drones through the phosphor-
 bronze with the lay that the storm god sings.
We shatter the peace of a continent's sleep when a
 colleague calls relief,
When the steam is low and the liner's keel is agrind
 on the wave-wracked reef;
And into the murk where the elements mingle and
 madly the furies shriek,
We pilot the sheer Cyclopean prows to the foun-
 dering goal they seek.
And whenever the demons down under the ocean
 refuse to be denied
We can only pray that we meet our God as the
 wireless men have died.

From and For those who help themselves

Experimenters' Experiences.

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

FIRST PRIZE, TEN DOLLARS

The Construction of a Strong Aerial Mast

A problem ever before the wireless amateur is the construction and erection of a satisfactory mast for support of the aerial wires. The mast I am about to describe has withstood three years' service and bids fair to last an indefinite period. Details of construction and erection are give in Figs. 1 to 6. Fig. 1 shows that the complete mast is made up of three sections of clear, straight pine, each section being 20 feet in length. The bottom section is of 3 inches by 3 inches stock, the second section 3 inches by 2 inches, and the top section 2 inches by 2¼ inches. They are lapped at the joints as indicated, being fastened together with two bolts.

It should be noted that the top portion of the lower section is cut out at the joint so that the weight of the upper section will not rest solely upon the two bolts. A brace is placed in the middle of the second and third sections, being fastened in place by screws. The brace wires are passed through holes bored near the end of the braces. The wires permit the use of smaller lumber, thereby decreasing the cost of construction. The guy wires proper are arranged in three sets of three each, making a total of nine wires, as shown in Fig. 2. No. 12 B. & S. gauge galvanized wire was found satisfactory, but the continuity of the circuit to earth is preferably broken up by porcelain knobs at intervals. The guys are fastened to the mast at the joints with eye bolts.

A swivel pulley of sufficient size to take a ¼-inch hemp rope is mounted at the top of the mast. A screw eye bolt is placed about 6 feet from the lower end of the mast and the rope (having previously been pulled through the pulley) is put through the screw eye and tied, making an endless rope so that when the mast is raised the rope will not slip off or out of the pulley. After the mast is up the knot is untied and one end of the rope fastened to the aerial. The other end of the rope passes through the screw eye and is fastened to a concrete weight which will be described in another part of this article. Before it is erected the mast should be given two coats of white paint and two coats of black tar paint on the first four feet of the first section.

The erection of a mast is sometimes a difficult problem, but if the following directions are obeyed the procedure is simple. A hole, 8 inches square by 2 feet 3 inches in depth, is dug in heavy soil. If the builder desires to set the mast in concrete he should pour about three inches of it into the hole and allow it to set; if it is not intended to set the mast in concrete a flat stone slab should be placed in the bottom of the hole. I have found that if the base of the mast is coated with tar paint it will last for an indefinite period regardless of whether it is set in concrete or not.

To facilitate the erection of the mast

a board is placed at one side of the hole, as indicated in Fig. 4. This is intended to prevent the mast from jumping or sliding over the hole while being raised. A pulley, a, is fastened to a tree or shed about 30 feet from the base of the mast. In the event that a tree or shed is not handy a 20-foot piece of 2 x 4 lumber should be erected and properly braced (Fig. 4).

A rope, b, is then fastened to the end of the middle guy wire (Fig. 4). In addition a 2 by 4 piece is constructed, as shown in detail in Fig. 3, and is further indicated at C in Fig. 4. During the process of erection one person should heave on this prop. Station two assistants, one at D and one at E, to hold the guy wires to prevent side sway. In the meantime C pushes on the 2 x 4 prop while one or two boys pull on D; the mast will rise slowly at first but the nearer vertical it becomes the less difficult will be the erection. Before the guy wires have been fastened to the mast they should be accurately measured and the necessary stakes driven about the base of the mast. For one of this construction the stakes should be placed at least 25 feet from the base. They should be constructed to extend about 6 inches above the ground. Care should be taken as the mast approaches the vertical position to make use of the main guys to prevent it from swinging forward because the leverage may be sufficient to tear out the hole at the base.

To keep the aerial wires taut a concrete weight attached to the end of the rope is recommended. It should be molded in a wooden box with a small amount of concrete. Fig. 5 will make clear the method by which the screw eye is fastened to the concrete.

A sketch of a small box to cover the pulley at the top of the mast is shown in Fig. 6. This can be made of ¼-inch stock of the dimensions given. This box will prevent the pulley from becoming frozen to the rope during the winter. Thus when the aerial wires become covered with ice the pulley is free to revolve and the aerial will raise the weight and thus reduce the strain on the mast.

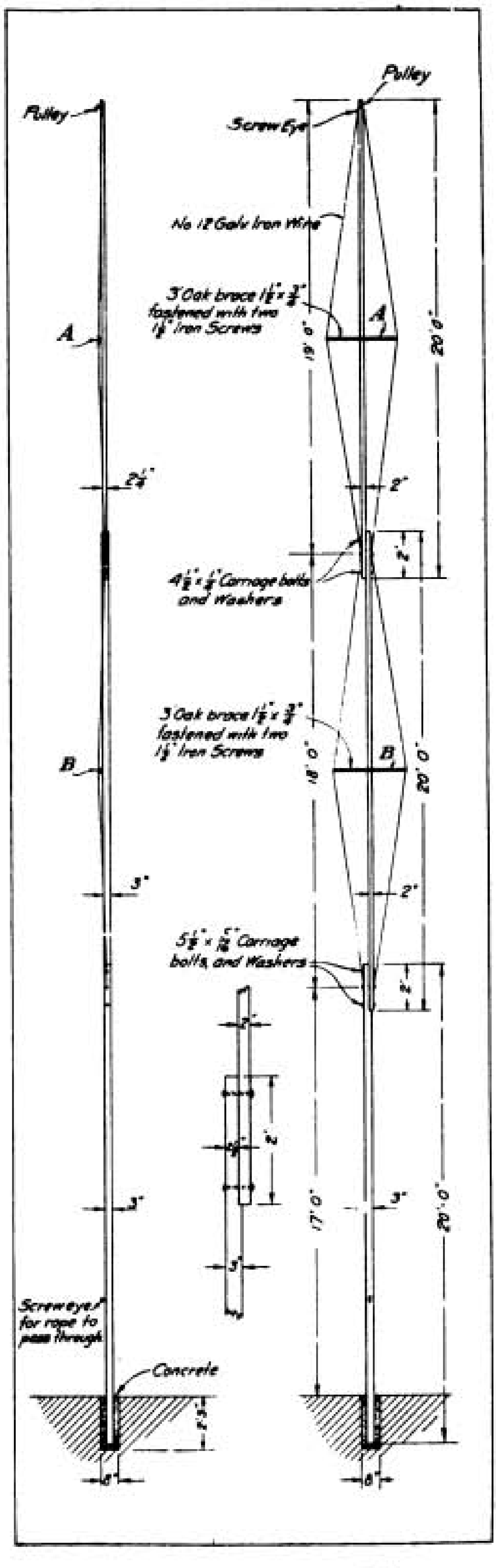


Fig. 1, First Prize Article

I constructed a mast of this type having a height of 54 feet at a cost of $3.

H. E. LANGE, *Missouri*.

SECOND PRIZE, FIVE DOLLARS
A Receiving Detector That Is Easy to Adjust

The designs of receiving detectors vary considerably, but the one shown in the accompanying drawing surpasses any mineral detector with which I have experimented. It is simple in construction, requires small space and is easy to adjust, with the advantage that when the sensitive point is once located, the detector remains in that condition indefinitely. I consider the drawing so clear that no lengthy explanation is needed.

The upright arm and point container are made of fairly heavy square brass rod. The point container may be made from round rod, but I prefer the square rod for appearance. This is drilled and tapped for an 8/32 screw to within a short distance of the end. From this point on the hole is made quite small. The construction of the adjustment screw should be perfectly clear from the drawing and the attention of the builder is particularly directed to the method in which the spring and the phosphor bronze wire point are constructed.

The cup containing the minerals, of which there may be any number consistent with the swing of the arm, is mounted upon a disc of 1/8 of an inch brass or copper, having a knurled hard rubber ring for the purpose of turning the various crystals into position. The size of this disc depends, of course, upon the number of minerals which are to be used. If the design indicated is carefully followed a detector which will be a credit to any amateur station will result. It is recommended that the component parts be mounted on a polished hard rubber or fibre base.

B. B. ALCORN, *New Jersey*.

THIRD PRIZE, THREE DOLLARS
A Rectifying Detector in Use at Amateurs' Stations

It is becoming the custom at amateurs' stations to construct a rectifying detector modeled in some respects after the original Marconi coherer. The advantages set forth are that a sensitive point is more easily located and the detector cannot be put out by vibration or heavy atmospheric discharges. A sectional view of one I designed is shown in Fig. 1, details of the base are given in Fig. 2, and the details of the detector proper in Fig. 3. A side view of the device is represented in Fig. 4 from which it is clear

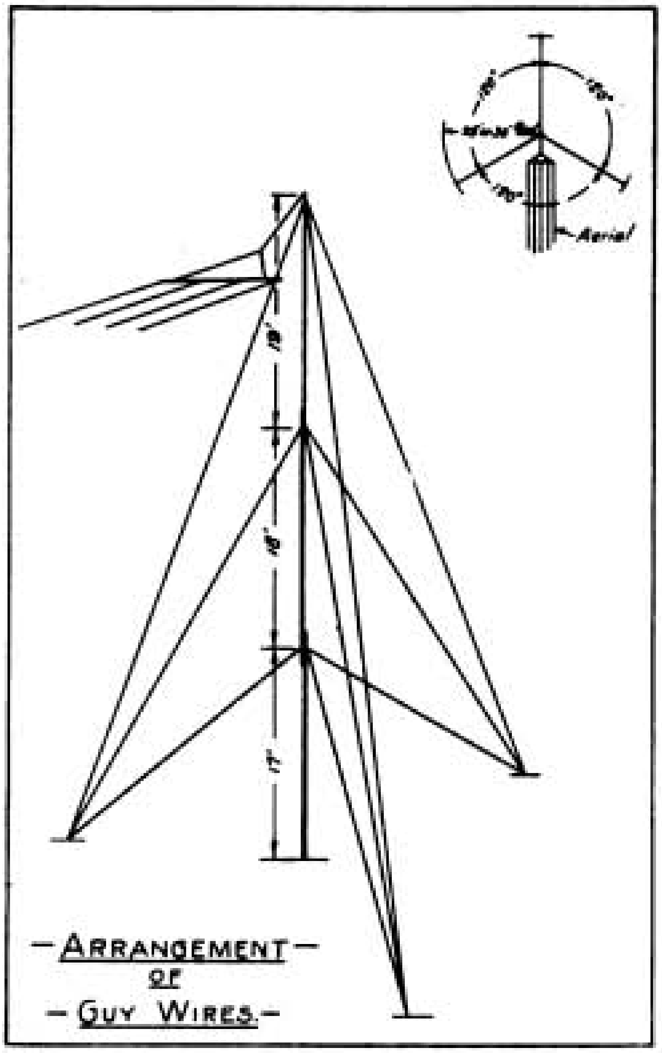


Fig. 2, First Prize Article

that the detector is mounted in spring brass clips so that it can be revolved for purposes of adjustment or readily removed. The details for the clips are fully given in Fig. 5.

It is clear from Fig. 1 that inside the tube there is attached to one of the brass lugs a silicon crystal which may be placed in position by means of soft metal. This crystal makes contact with a mixture of filings made up as follows: Ten parts of pure silver filings, five parts of galena and silicon filings, and one part of nickel filings. While the foregoing proportion of in-

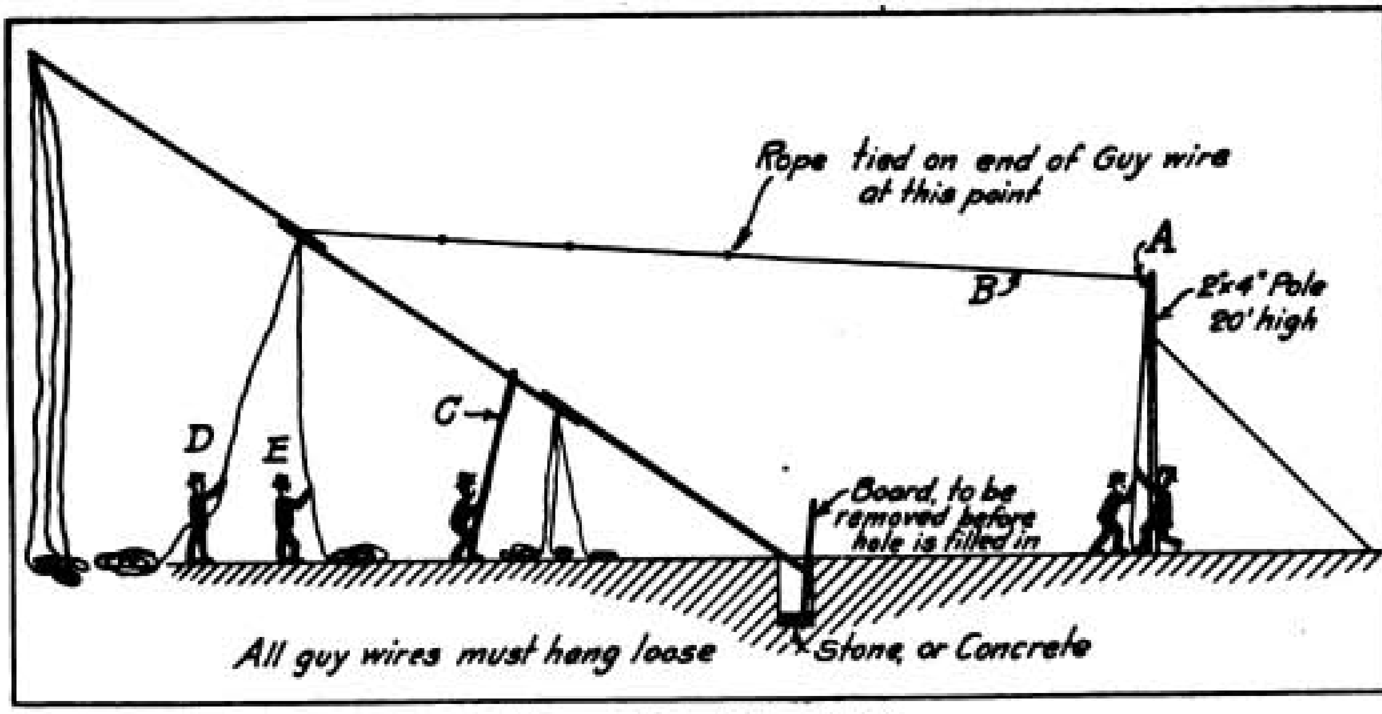


Fig. 4, First Prize Article

gredients has worked successfully, it is recommended that the experimenter try other combinations or proportions until the best results are obtained. It might facilitate the adjustment if the device is constructed so that when one of the brass lugs is turned the other will remain stationary. This can easily be accomplished by making the plug, C, have a little more friction inside of the tube, D, than the opposite plug. It has been found by experiment that a good galena crystal can be substituted for the solid silicon crystal.

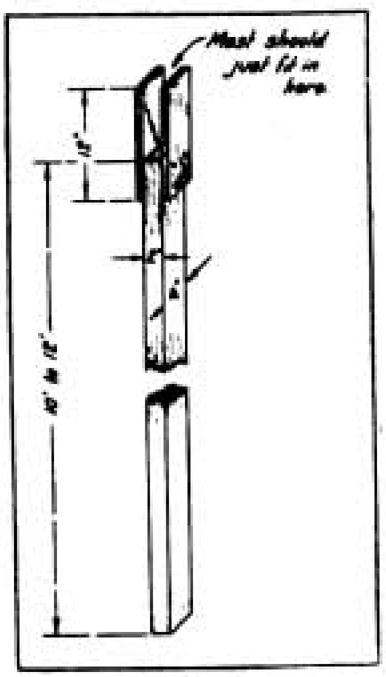


Fig. 3
First Prize Article

When properly connected to a receiving detector circuit the detector may be adjusted either by rotating the tube or by increasing or decreasing the pressure on the brass lug. It is also customary to excite some portion of the secondary winding of the receiving tuner with a buzzer excitation circuit, thereby causing the filings, which seem to automatically select a sensitive spot for rectification, to cohere.

O. COTE, *Rhode Island.*

The editor of this department will be glad to consider articles on the construction and cost of amateur high potential transformers.

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE.

A Rotary Quenched Spark Transmitting Set.

From the standpoint of the amateur experimenter the rotary quenched spark transmitter is one of the most efficient of modern types. In a general way it possesses the efficiency of the conventional quenched spark gap discharger with the additional advantage that a high spark frequency can be obtained from a sixty cycle source of energy. The antenna current from a set of this type is usually rather high and the spark note is perfectly clear and easily read through static or other interference. With the exception of the spark gap and the transformer the set I am about to describe is of the usual type. It will be observed from Fig. 6 that the spark gap is mounted in an air-tight case comprising the following parts: A cast-iron case, a rotating member, two semi-circular stationary electrodes, and a fibre disc upon which the stationary electrodes are mounted.

As shown in the drawing, the rotor is a brass disc, 4¼ inches in diameter, with twenty projections or sparking points on its face. In the construction of this disc it is necessary to make a brass casting and to turn it down on a lathe to the size shown in Fig. 2. Twenty slots, each 7-16 inch in width

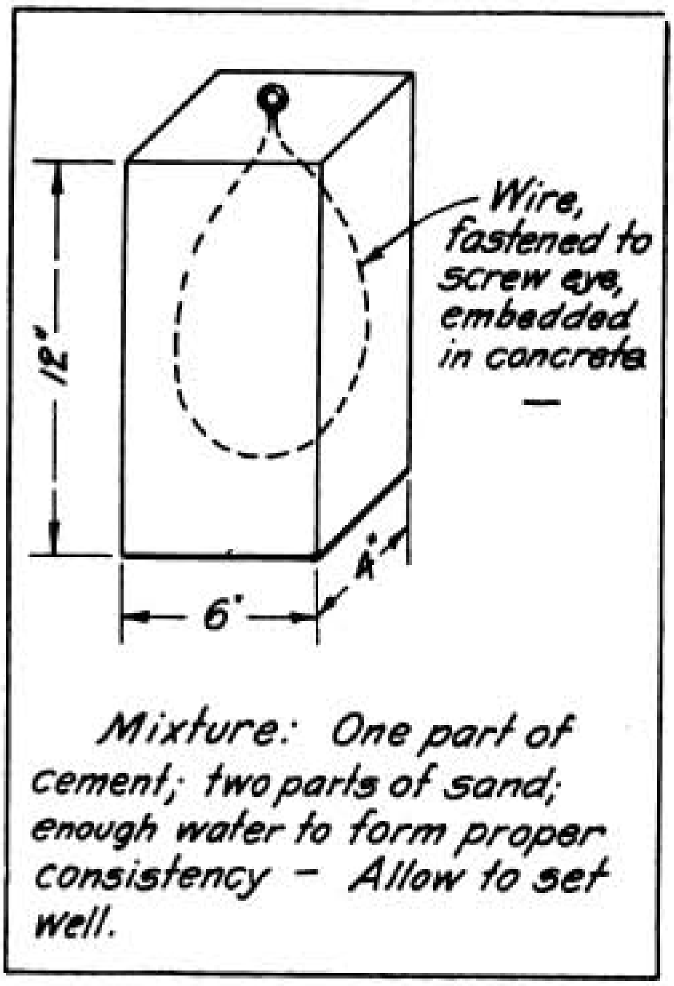


Fig. 5, First Prize Article

by 1/8 inch in depth, are milled on the rim, resulting in the production of twenty wedge-shaped projections on the face of the disc. These are the sparking points. The disc is then mounted on a drill rod shaft, 5-16 inch in diameter by 3 inches in length, and is then ready for use. The driving motor is preferably insulated from the shaft of the motor; a small short section of thick walled rubber tubing is very satisfactory for this purpose.

The two semi-circular stationary electrodes are made from a disc, the construction being similar to the rotary electrodes. After the slots have been milled in the rim, the disc is cut into two pieces, making two flat plates with projecting sparking points, as shown in Fig. 3. Two holes are drilled and tapped for 14-20 screws in each plate. These holes are located on a circle of 1¼-inch radius and are 90 degrees apart. The plates are mounted upon a circular fibre disc, ½ inch in thickness and 4¾ inches in diameter, as per Fig. 8. They are held in place by means of four 14-20 brass bolts, each 1 inch in length. The bolts are provided with hexagonal lock nuts and knurled thumb nuts which serve as terminals. Care should be taken that these plates are mounted with the teeth in line with those of the rotary plates.

Details of the cast-iron case are given in Figs. 5, 6, and 7. As indicated in the drawing, the face of the rim upon which the fibre disc is mounted must be machine finished in order that the joints may not leak air. When the gap is assembled vaseline is used to seal the joints. The disc is attached to the case by means of eight iron screws,

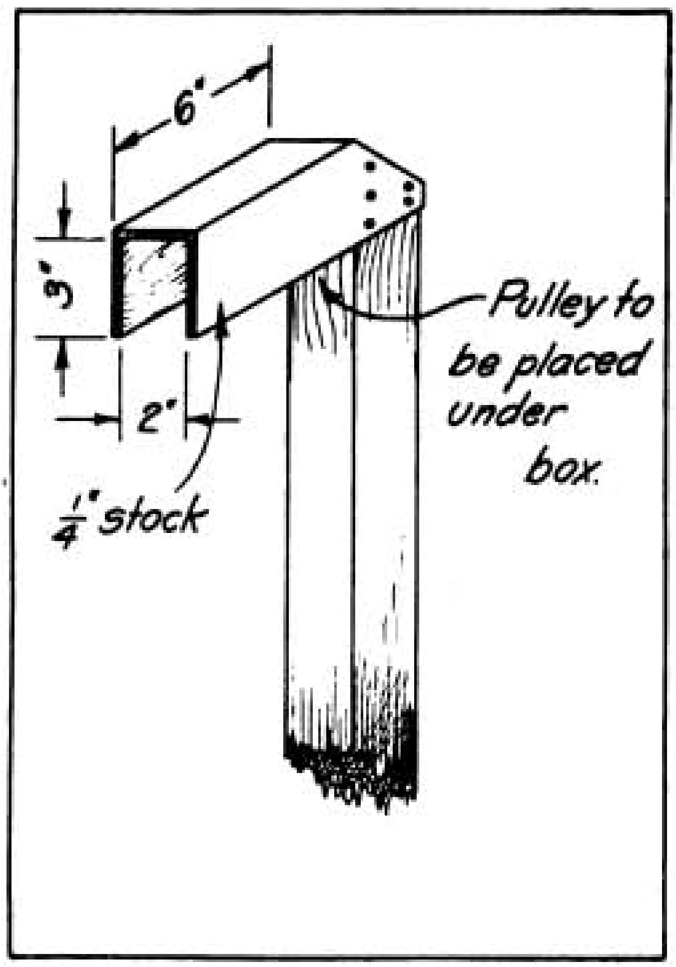
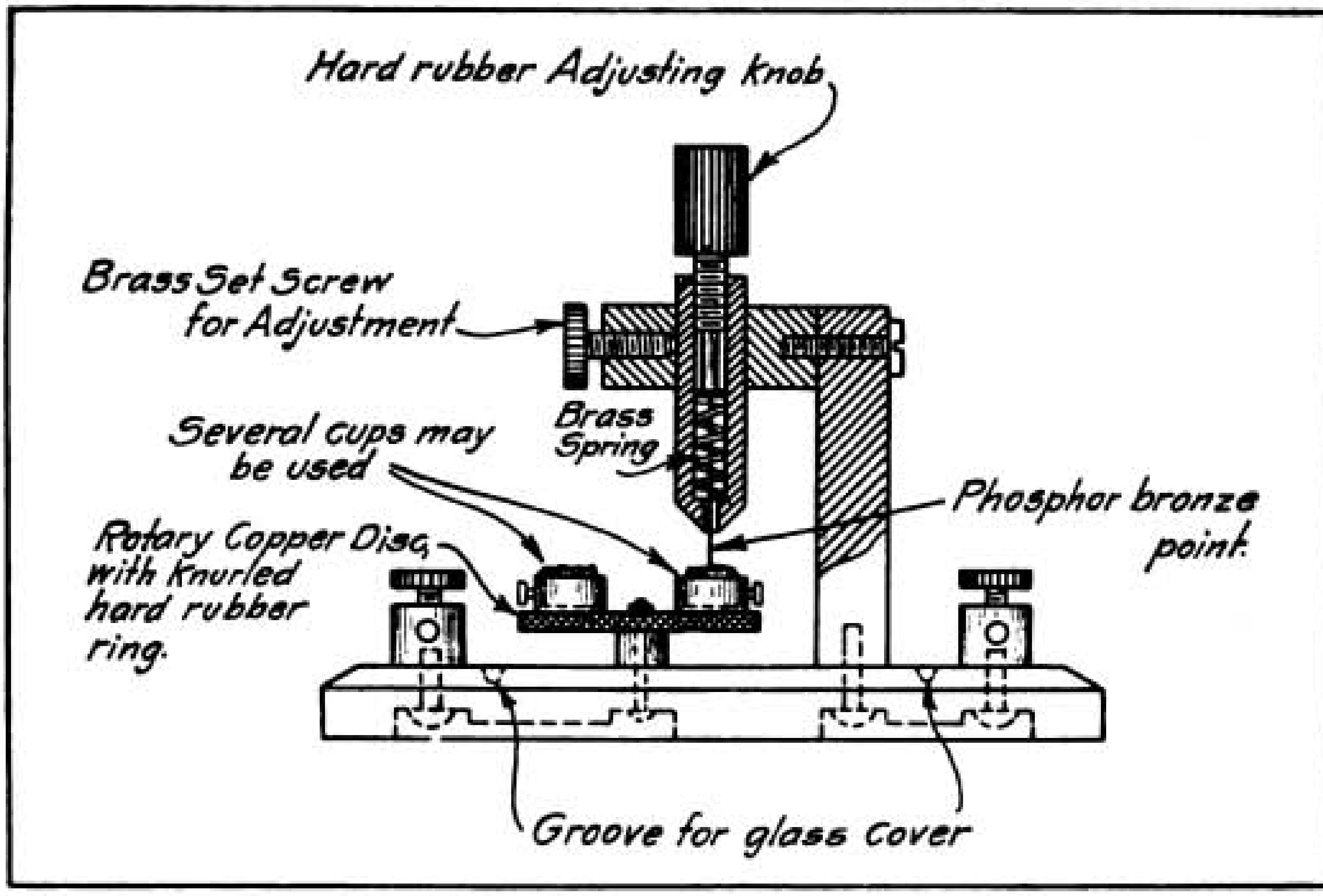


Fig. 6, First Prize Article

8/32 by ¾ inches in length. The holes for these screws are located forty-five degrees apart on a circle of 2¼ inches radius. A bronze bearing, 9/16 of an inch in diameter and 1½ inch in



Drawing, Second Prize Article

length, is fitted into the hub of the case. The oil cup shown in Fig. 6 is of the wick type. The bearing at this point must be a close fit and must be kept well lubricated in order to exclude the air.

The remaining parts of the complete set are of the conventional type, with the exception of the transformer, which has a secondary voltage of 3,000 volts. The apparatus also includes a small plate glass condenser of .02 microfarad capacity, a pancake type oscillation transformer and a motor which is capable of driving the gap at a speed of 5,000 revolutions per minute.

The 3,000-volt transformer has the following dimensions: The core is 12 inches in length by 9 inches in width, with a cross section 2 inches square. It is made of .017 of an inch silicon steel. The primary winding has 150 turns of No. 12 D. C. C. wire and the secondary winding 4,800 turns of No. 30 D. S. C. wire in twelve pies. Each pie is ½ inch in thickness and has 400 turns per pie.

The high potential condenser is made up of sixteen photographic plates, 10 by 12 inches, with a thickness of .05 of an inch, covered on both sides with tinfoil 8 by 10 inches. The plates are all connected in parallel and will give a resultant capacity of approximately .02 microfarad.

The oscillation transformer is of the pancake type, the primary winding consisting of four turns of 1/16 of an inch copper ribbon. The inner turn of the primary is 5 inches in diameter and the other turns 5.5 inches, 6 inches and 6.5 inches respectively. The inner turn of the secondary winding is 4 inches in diameter, each succeeding turn being ½ of an inch larger, the outer turn thus having a diameter of 7.5 inches.

A diagram of connections for this set is shown in Fig. 10. The apparatus is mounted in a mahogany cabinet, as shown in Fig. 9. The inside dimensions of this cabinet are 16 by 12¼ by 8 inches. The material is ¾ of an inch thick. The ends are dovetailed into the sides, the top and bottom being screwed on. Further directions are not deemed necessary as the methods of making and finishing mahogany cabinets are understood by many experimenters. If care is used in building a set of this type, compactness and efficiency will result.

A point in connection with the rotary

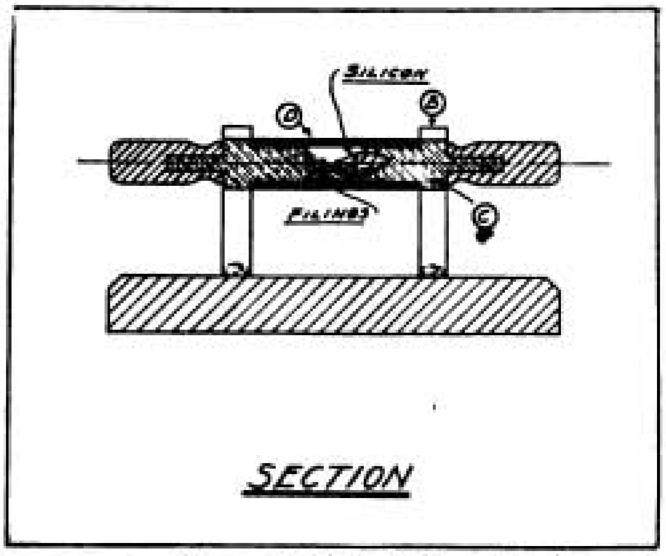


Fig. 1, Third Prize Article

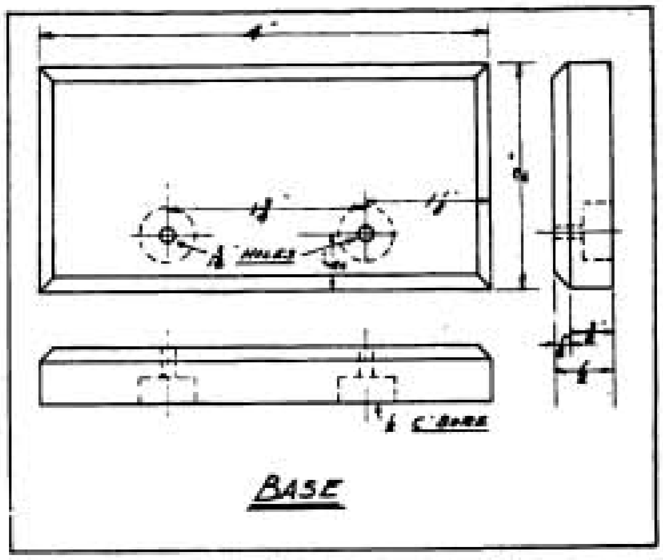


Fig. 2, Third Prize Article

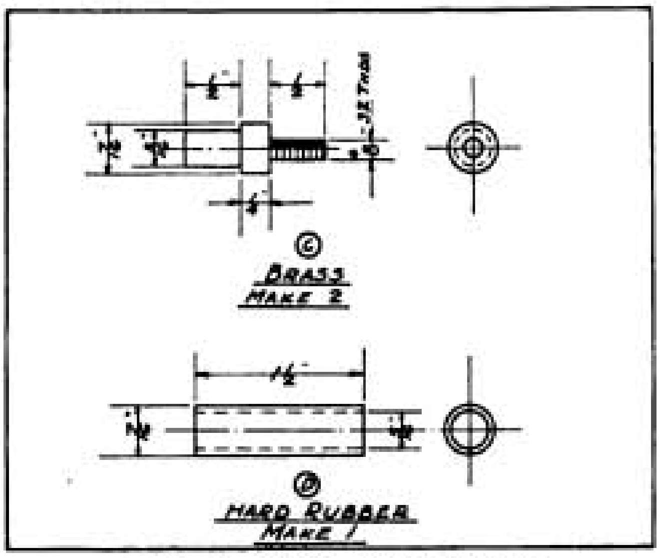


Fig. 3, Third Prize Article

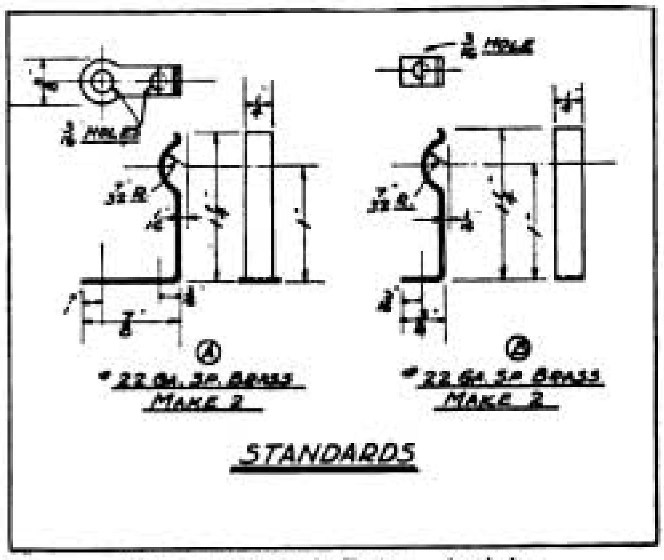


Fig. 5, Third Prize Article

gap that must not be overlooked is that the distance between the stationary electrodes and the movable electrodes must not be more than or of an inch which of course demands that the rotor have no end play.

A. E. Henninger, *Ohio.*

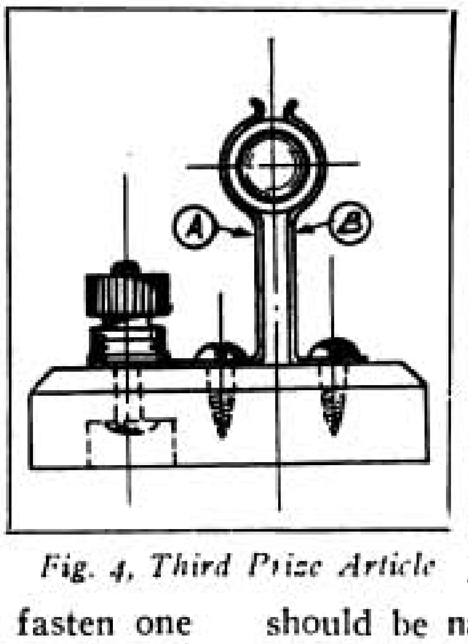


Fig. 4, Third Prize Article

HONORARY MENTION

An Aerial Which Can Be Erected on Top of a House or Barn

The majority of amateurs fasten one end of their aerial to a tree or pole and the other end to the peak or gable of the house. Keeping this fact in mind, I offer a suggestion in the accompanying drawings for a mast which can be erected on the top of a house or barn. The two main supports are built of 2 inches by 2 inches timber. For a mast to have a height of 30 feet, 6 pieces are required, each of which are 10 feet in length. The legs of the mast are spread apart at the bottom by an 8-foot piece of one-inch board, 3 inches in width at the top, nailed or bolted together.

An eye bolt is fastened where the two pieces join at the top to which is fastened the pulley for drawing up the aerial. Spaced by a distance of 10 feet, there should be nailed or bolted a cross piece and between two crosspieces two wires should be strung, as shown in the sketch. These wires may be drawn taut by small turnbuckles which may be secured at any supply house. Two guy wires should be fastened to the top and an additional two in the middle.

During the erection of the mast place

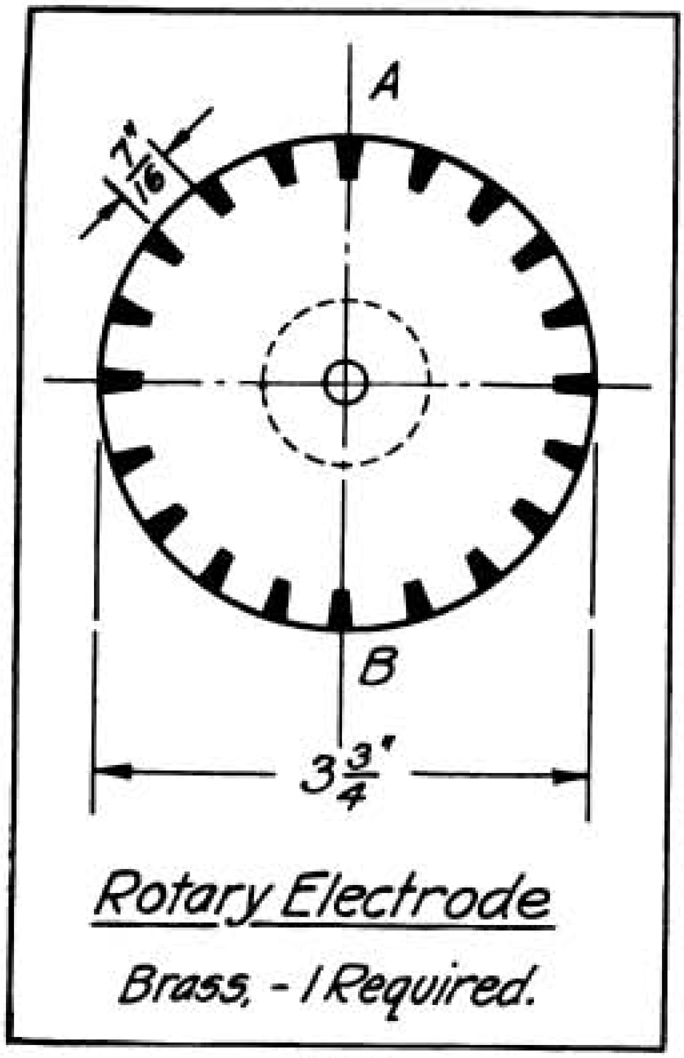


Fig. 1

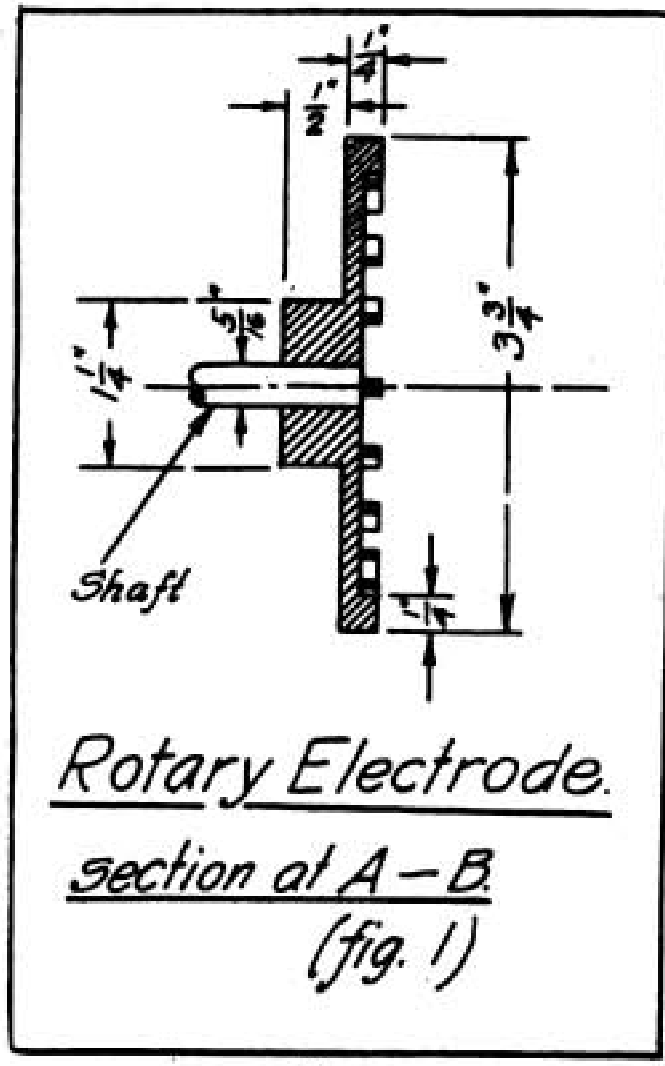


Fig. 2

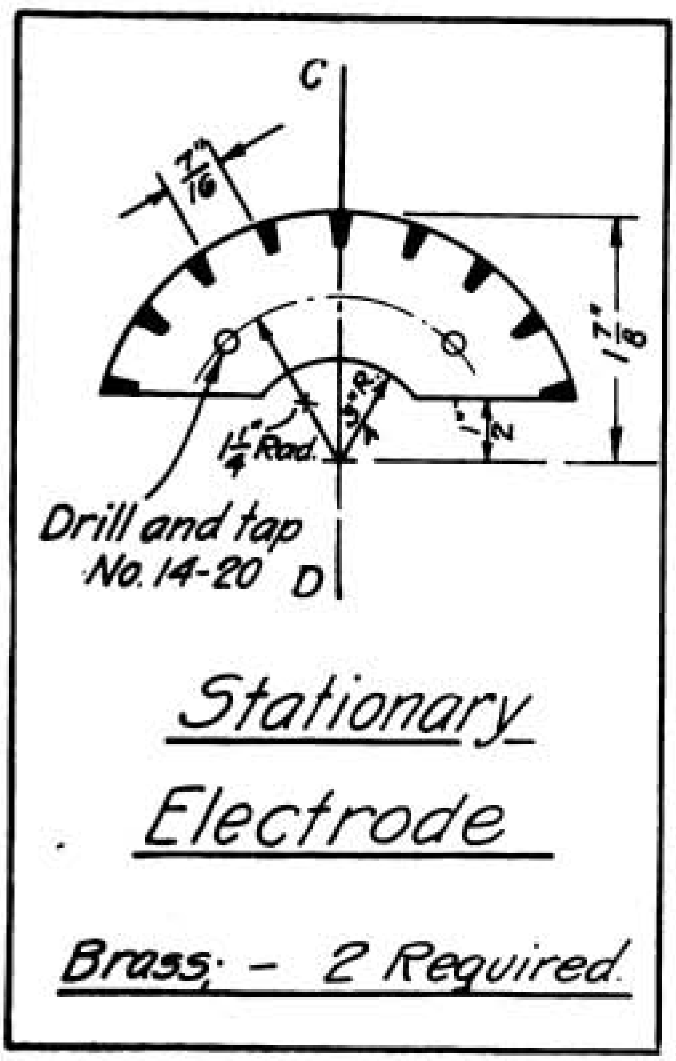


Fig. 3

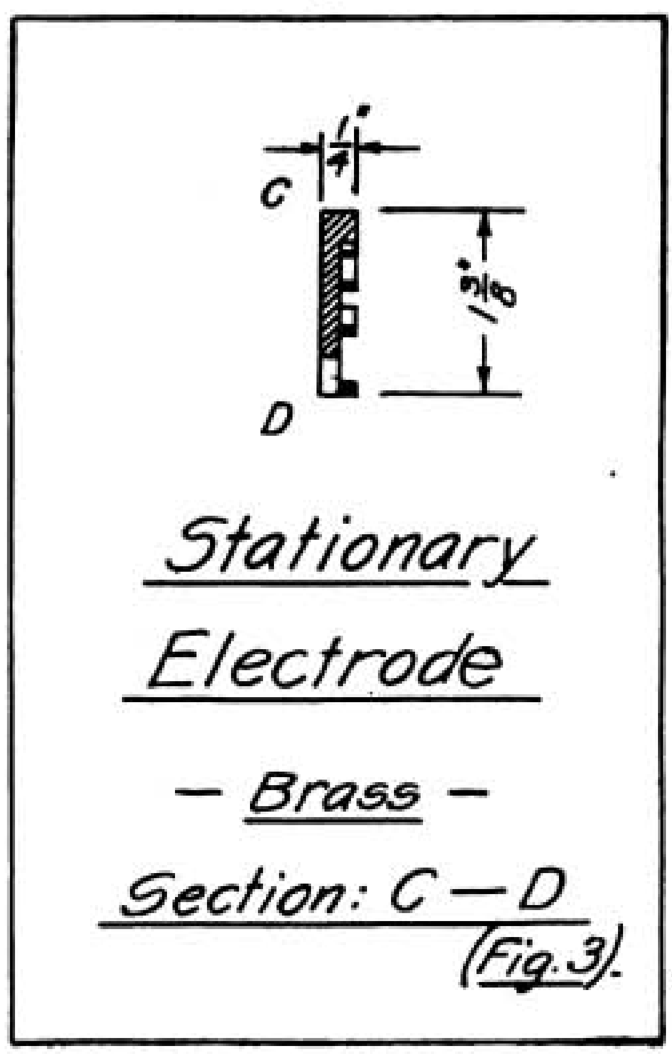


Fig. 4

Drawings, Fourth Prize Article

two cleats on the roof upon which the legs will rest. Before erection be sure that the guy wires, block and tackle are in place. Erection will then be easy. Generally this may be accomplished with the assistance of two other enthusiasts in the neighborhood, who will be able to pull on the top guy wires while another holds the base in place. The guy wires

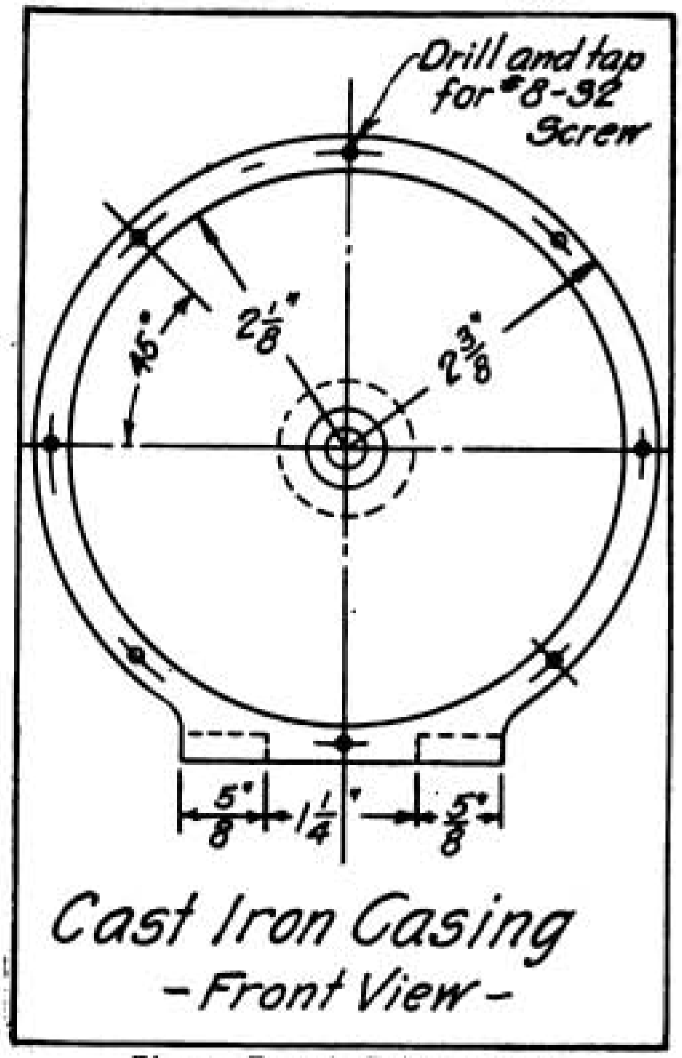


Fig. 5, Fourth Prize Article

may be insulated, as shown in the accompanying drawing, by means of small porcelain knobs.

The amateur who is not allowed to cut a hole in the roof to take a mast of the ordinary type of construction, will do well to construct an aerial support along these lines, as it is readily apparent that the roof will not be injured.

ALLAN LAWSON, *Connecticut*

HONORARY MENTION

Receiving Sets With and Without a Triple Vacuum Valve Amplifier

In answer to a query of S. M. P., of Johnstown, Ohio, appearing in the December issue of THE WIRELESS AGE, there is a statement to the effect that it is extremely difficult to construct a transmitting set, operating on a wave-length of 200 meters capable of transmitting 30 miles, unless a triple vacuum valve amplifier is used at the receiving station. At the time of this writing an amateur set thirty miles away is plainly readable and my telephones are four feet away on the operating table. I use a single vacuum valve bulb for receiving purposes.

There are many amateur stations located in various parts of the United States, the night range of which is in the neighborhood of 600 to 700 miles. My own sending record is 800 miles and I have no difficulty in exchanging messages in the early afternoon with stations 300 miles away. There are about half a dozen other experimenters in the city in which I live who have ranges as great, if

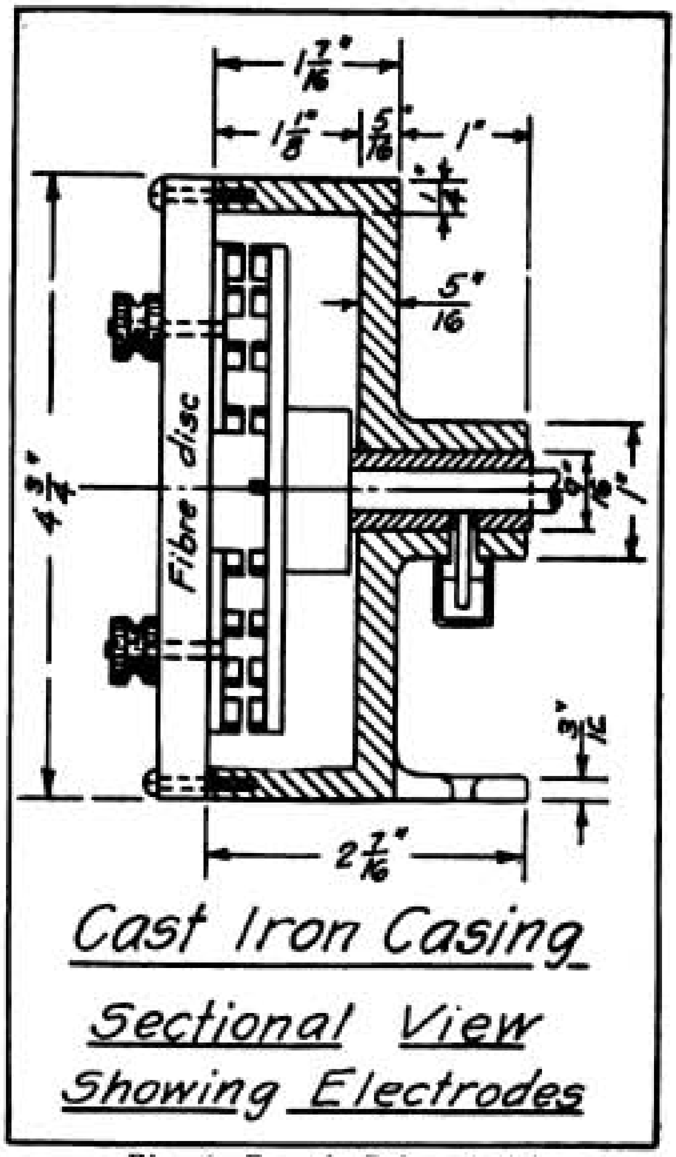


Fig. 6, Fourth Prize Article

not greater, than mine. Every evening we handle messages to and from stations in Ohio, Northern Wisconsin, Nebraska, Kansas, Missouri, Indiana, Michigan and, in a few cases, as far as Texas. I can read 9LO, located in Kansas City, with my phones six inches from the ears,

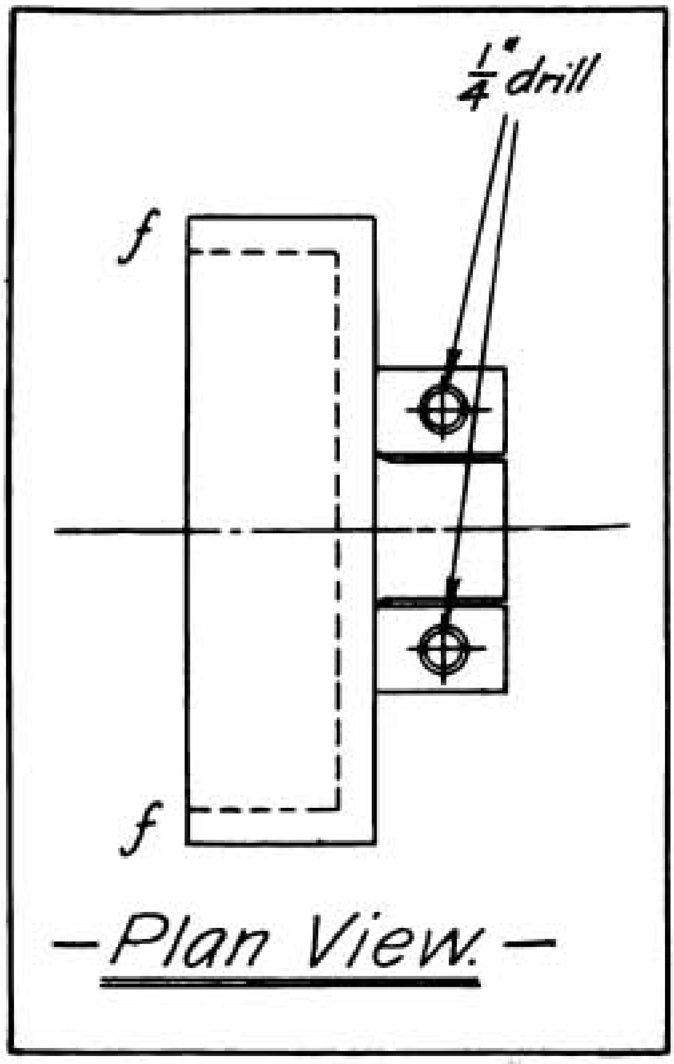


Fig. 7, Fourth Prize Article

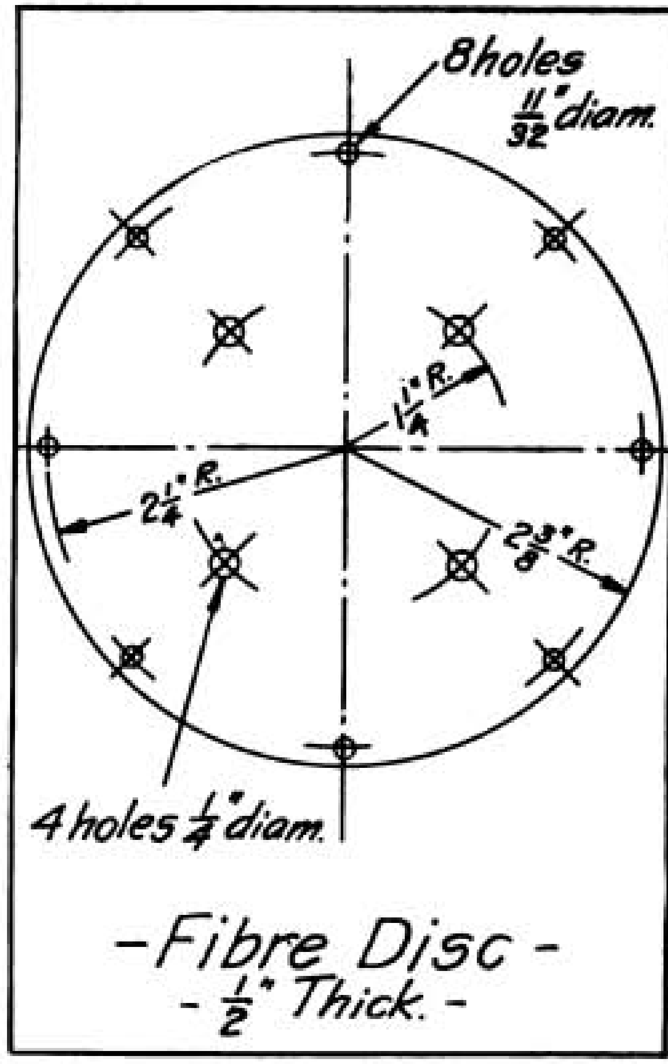


Fig. 8, Fourth Prize Article

and a friend of mine nearby hears this station almost as well on galena.

This is probably freak work, but I think it worth bringing to your attention.

R. H. E. Mathews,
Illinois.

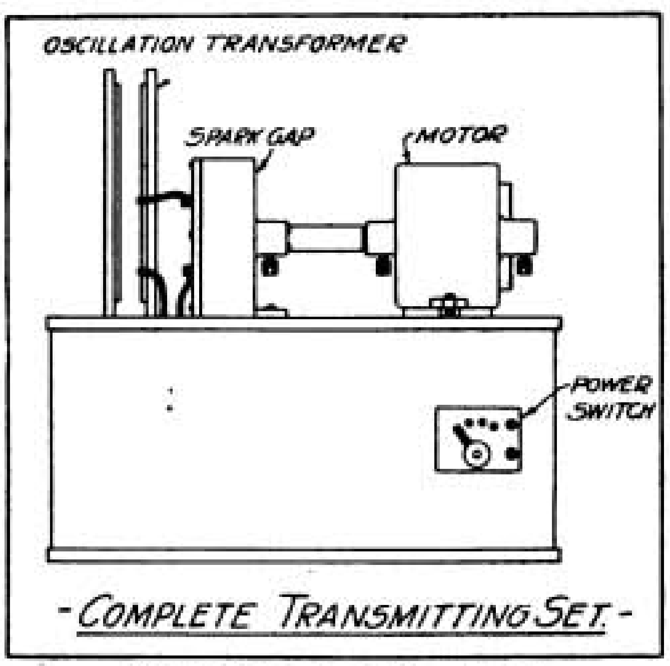


Fig. 9, Fourth Prize Article

Editor's Note.—We are aware that the results obtained by our contributor are possible at night time and during the favorable months of the year, particularly in the district in which he resides. But after investigation it may be found that many of the stations to which he refers do not operate on wave-lengths of exactly 200 meters. Perhaps they use a close degree of coupling between the primary and secondary windings of the oscillation transformer and, in consequence, one of the emitted waves is greater than 200 meters and, therefore, may have better carrying qualities. In the eastern district of the United States distances of this order are only possible with increased wave-lengths and increased primary power. However, a station on Long Island communicates nightly with an amateur station somewhere in Ohio. We still insist that for satisfactory daylight communication under all conditions, particularly those imposed upon amateurs in the eastern part of the United States, a sensitive receiving set is necessary for a range of, say, thirty miles, when the transmitting set is operated at a wave-length of 200 meters. During the night, however, such transmitters may cover several hundred miles, as our contributor states. We shall be glad to hear from other amateurs in the Middle West who have obtained similar results.—Technical Editor.

HONORARY MENTION

A Telegraph Key Suitable for the Handling of Large Powers

A telegraph key suitable for the

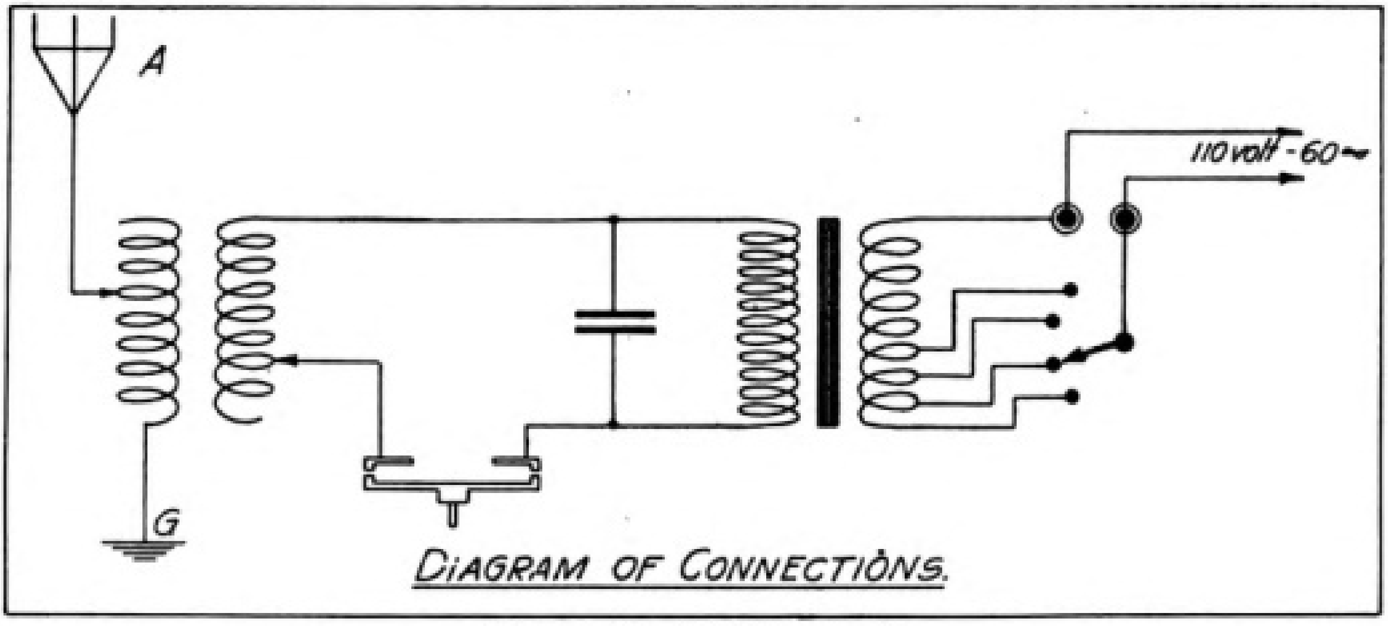


Fig. 10, Fourth Prize Article

handling of large powers such as are employed in radio telegraphic work, can be constructed by the experimenter in the following manner: Take an ordinary telegraph line, or wireless telegraph key, and remove the upper and lower contacts. Remove the conical spring and in place thereof, solder a piece of spring brass, C, to the lever. Connect the other end to one of the binding posts. The upper contact is made of a copper rod, D, of the correct length to just clear the bottom of the metal receptacle, A. It should be about ¼ of an inch in diameter. The metal receptacle is then connected to the second binding post.

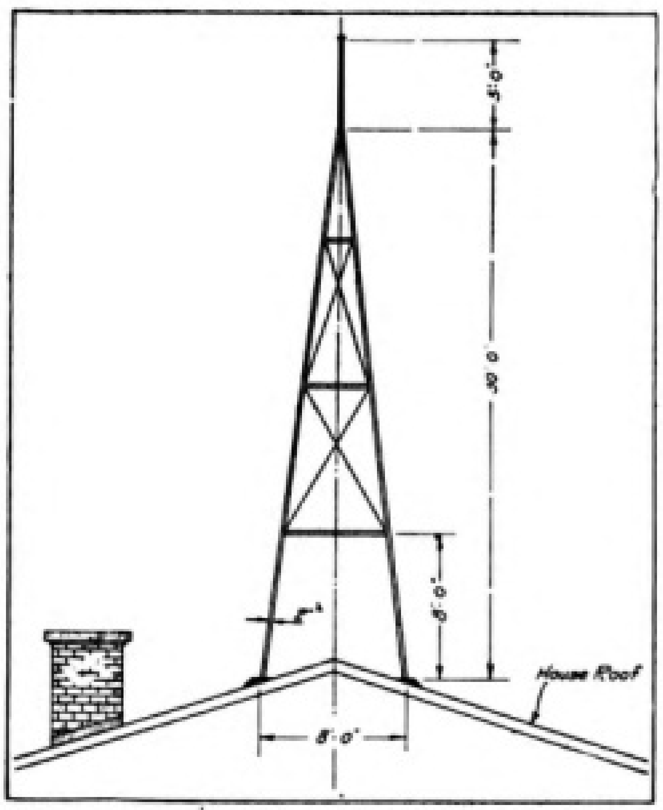


Fig. 1, Honorary Mention Article, Allan Lawson

Pour enough mercury in the metal receptacle to cover the bottom to a depth of ⅛ of an inch and over this pour a quantity of good transformer oil as at B. Regulate the set screws in the lever to give the correct amount of motion.

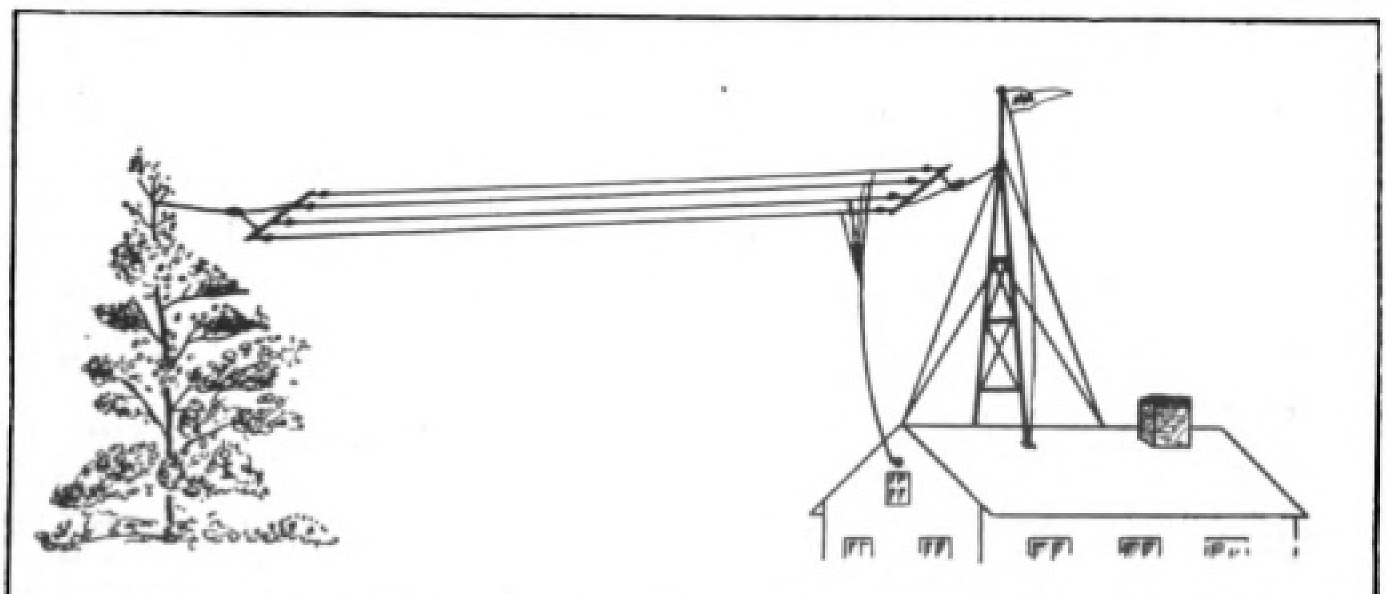
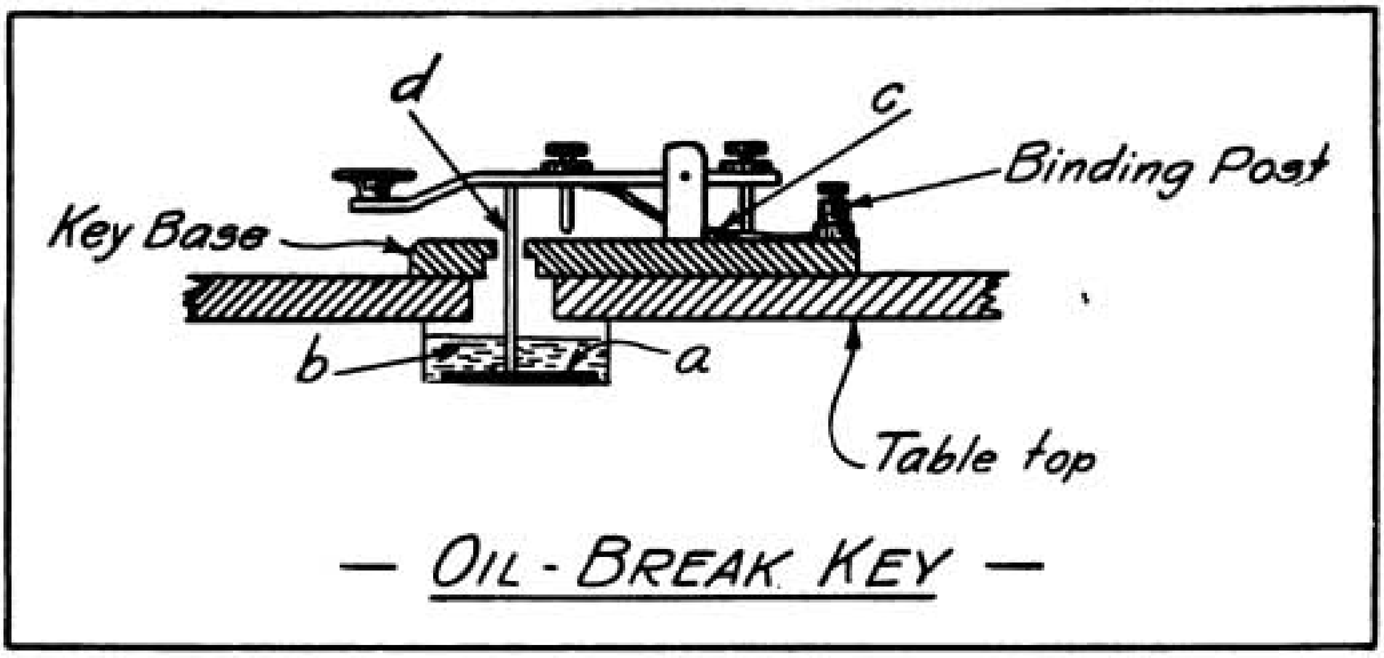


Fig. 2, Honorary Mention Article, Allan Lawson



Drawing, Honorary Mention Article, E. R. Thomas

Properly constructed, this key will handle the current for a 1 k.w. transformer.

The device is an efficient substitute for the usual platinum point contacts which generally cost from $4 to $6 a pair.

E. R. THOMAS, *Pennsylvania.*

NO DUTY ON WIRELESS

A customs dispute between Collector Malone and Kennedy & Moon, dealing with the entry of complete wireless apparatus installed on the government fleet of six Panama steamships, was settled in New York on January 12 by the Board of United States General Appraisers. A decision by Judge Hay held that no duty accrued on the outfits. Although the contracting firm complied with the regulations of the Treasury Department governing such importations, the Collector denied free entry, and took a 20 per cent duty under the tariff's provision for "manufactures in chief value of metal."

The Collector, at the trial before the board, stated that free entry was denied because the wireless apparatus was installed on old boats, and therefore, he maintained, excluded from the free privileges of the subsections of paragraph J of section 4 of the Underwood tariff law. The testimony showed that the new wireless outfits were imported and installed to take the place of other apparatus, which did not give good results.

Judge Hay held that the wireless equipment was as much covered by the tariff's exemption clause as were boilers and engines.

BILL ASKS FOR GALVESTON STATION

A $50,000 appropriation for a medium power wireless station at Galveston, Texas, was asked in a bill offered by Senator Morris Sheppard on December 16. The equipment asked for would be capable of sending messages from 800 to 1,000 miles. Another bill calling for a similar amount provided for two new weather stations on the Gulf coast west of New Orleans to assist the weather bureau and send out storm warnings to shipping in the Gulf.

Residents of Galveston have pointed out that such a plant would be of great service when heavy storms had cut off communication with the main land. It would also be of service to shipping and a strategic value to the government. There is already a high-power station at Brownsville.

A High-Power Plant for Research Work

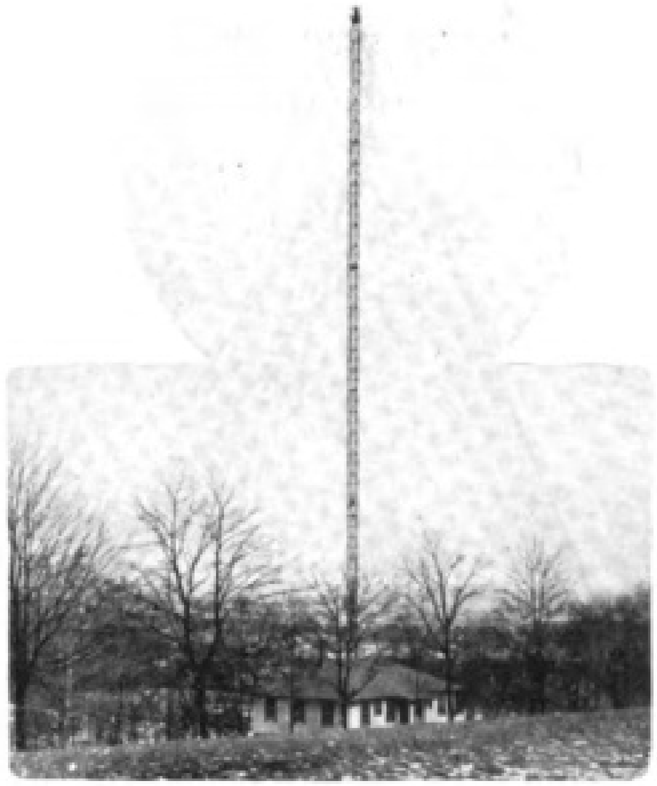
Striking Features of the New Tufts Station

A HIGH-POWER wireless station has recently been installed and placed in operation at Tufts College, Medford, Mass. A noteworthy feature of the station is the great skeleton steel mast, 304 feet in height, imbedded in solid concrete. The tower can be seen for miles, its slender black framework, only three feet six inches square at the base, silhouetted against the sky.

Supported on four specially designed porcelain insulators, which are imbedded in fifteen tons of reinforced concrete, it is constructed of twelve-foot sections of structural steel, and is held in position by twelve heavy crucible steel guy wires, one inch in diameter, secured at different heights and imbedded in their bases in blocks of concrete. The tower is topped by a large antenna from which ten fine wires conduct the electric current to the laboratory below. The mast is described as the highest wireless tower in New England.

A few feet from the tower stands the laboratory, which is built of concrete. To the casual observer this solid looking structure has little significance. In it, however, are a complete outfit of wireless apparatus, machinery and tools of the latest design, testing instruments of a very delicate kind and a perfect set of machinery for experimental use.

It is believed by wireless men that no advantage is gained by placing a wireless station on the top of a hill rather than at sea level. The Hertzian waves follow the contour of the earth and often a better earth connection is obtained at sea level. This is due to the damp soil, where there is more efficient electrical ground. In the case of a hill there is usually excess of drainage; the soil is dry and is therefore not a good electrical conductor. The Tufts station is ninety-six feet above sea level and near the bottom of the hill, but high enough to overcome local obstruction of the waves, such as houses and trees. At the same time it receives the drainage of the hill and the soil is damp all the year.



The tower, 304 feet in height, can be seen for miles, its slender framework silhouetted against the sky

The interior of the laboratory building is finished in smooth white stucco, trimmed with dark green lattice work. The building is practically sound and vibration-proof, allowing the use of the most delicate instruments, a very important factor of the research work now being carried on. Each room was tested with a microphone.

A large assortment of the latest design testing meters is to be found in the laboratory. These instruments are so delicate that the minute current produced by placing the fingers on the contact buttons is recorded. The floors are all double and lined with heavy layers of felt. The doors are double sound-proof. The Tufts Wireless Society will have a room in the building and eventually the plant will revert to Tufts College. Harold J. Power, manager of the Atlantic Radio and Research Corporation, which established the plant, has a specially designed laboratory for his own use. The station will not be used for commercial work. It was designed solely for research.

The equipment of the machine shop is so complete that it is possible to turn out practically anything from a watch spring to an automobile engine. All of the machinery is of recent design. It is equipped with modern safety appliances, among the metal working machines being several of the latest type upright drills, shapers, jewelers' lathes and delicate hand tools of various descriptions.

Mr. Power is a graduate of Tufts and erstwhile operator on various steamships on the Atlantic. Following his graduation he took a course in laboratory research at Harvard. When this was completed he organized the Atlantic Radio and Research Corporation. He decided to locate the wireless plant at Tufts because of the advantages of the site and its proximity to the laboratories of other educational institutions in and near Boston.

Mr. Power began wireless experimental work when the art was first being used in a commercial way. Some time after the results of Mr. Marconi's experiment had become known, young Power managed to construct a crude transmitting and receiving set. His "laboratory" consisted of a shack in the rear of his home. He did not foresee then that twelve years later he would be able to copy a wireless message from Germany as he did recently in the Tufts station.

He undertook his first commercial work when he was sixteen years old. Next he entered the Marconi service,

This photograph shows the interior of the laboratory which contains a complete equipment of wireless apparatus, machinery and tools of the latest design and delicate testing instruments

The Tufts tower is supported on four specially designed porcelain insulators which are imbedded in fifteen tons of reinforced concrete.

being detailed as wireless operator on the Metropolitan line. As he gained experience he was placed in posts of greater responsibility. He was detailed on vessels of the Savannah Line, the Red Cross Line and Colonel John Jacob Actor's yacht, the Noma. He also served on the St. Louis of the American Line and on J. P. Morgan's yacht, the Corsair.

He began to devote his energies to the solution of radio problems in his senior year at Tufts, when he made a complete mathematical analysis of all the highest types of standard receivers and designed a new receiver embodying the principle evolved as a result of his work.

Associated with Mr. Power in the management of the Tufts station are his brother, John F. Power, chief mechanic; Eugene F. Randall, chief laboratory assistant; Harry R. Cheetham, formerly construction engineer for the Marconi Company, who has charge of the tower and antenna, and a number of electrical engineers.

NAVAL CHAIN PLAN RATIFIED

One of the final steps toward linking the United States and its foreign possessions together by a great chain of wireless stations was taken on January 19, when Secretary Daniels of the Navy approved the equipment of the stations now under construction at San Diego, Cal.; Cavite, Philippine Islands, and Pearl Harbor, Hawaii.

Completion of these stations within the next year will pave the way for radio communication from Washington to the insular possessions.

Plans now are being prepared by the Navy Department to increase the power of the existing equipment at Tutuila and Guam so as to make them a part of the main world chain. The intermediate stations at Boston, New Orleans, Point Loma, Chicago, and Guantanamo, Cuba, already have been strengthened and are able to relay messages from ships at sea to Washington via the Arlington, Va., towers.

The new stations at Pearl Harbor and Cavite will be equipped to maintain direct communication with San Diego, the Canal Zone, and the Arlington stations, and be able to sweep the Pacific Ocean from the Philippine Islands to Alaska and the Canal Zone.

At work in the Tufts laboratory. The building is practically sound and vibration-proof, the room having been tested with a microphone

MARCONI MEN REWARDED

The valuation of faithful service which the Marconi Company places upon noteworthy acts among employees is revealed in the sequel to the reports of exceptional work done in the recent Gulf storms.

In a letter to J. A. Pohl, the newly appointed superintendent of the Gulf Division, Traffic Manager George S. De Sousa highly commended the faithful manner in which Mr. Pohl attended to his work and added "It has confirmed the opinion which I have of you—that you are always to be depended upon in any emergency." In further recognition, a substantial Christmas present, authorized by the General Manager, was added. A letter similar in spirit was addressed to J. W. B. Foley, Manager of the Port Arthur (Texas) Station and also accompanied by a special Christmas gift.

In acknowledging the special distinction, Mr. Pohl said: "I am so very glad to know that my services rendered during the Texas hurricane have pleased you. I assure you that my efforts will be in the future as they have been in the past, to do everything possible for the good and welfare of our company. I am very proud of the letter you have written me and consider it my most valued keepsake."

Mr. Foley replied: "On Christmas Eve I was very much surprised, and pleased also, when I received your gift and beautiful letter, which I consider of inestimable value. Words cannot express my feeling of appreciation toward you and the other gentlemen who caused such to come to pass. That letter has inspired a faith in me toward the Marconi Company which I never had for any of my former employers. It simply goes to show that which I have heard, namely—that the Marconi Company has an interest in its employees, keeps itself informed of their actions, and takes proper care of the deserving."

MARCONI COMPANY OBTAINS INFRINGEMENT INJUNCTION

The Marconi Wireless Telegraph Company of America recently brought an action against the American-Hawaiian Steamship Company for infringement of its well-known "tuning patent," which has been the subject of extensive litigation and the use of which by the National Electric Signaling Company, Deforest Radio Telegraph Company, Standard Oil Company, Atlantic Communication Company and others, has been enjoined by the courts. In this suit against the American-Hawaiian Company the Marconi Company obtained an order from Judge Veeder, sitting in the Eastern District of New York, to show cause why a preliminary injunction should not be granted enjoining the American-Hawaiian Steamship Company from continuing the use of certain wireless telegraph apparatus made by the Kilbourne & Clark Manufacturing Company, of Seattle, Washington, and which had been installed on the American-Hawaiian steamship Floridan. Judge Veeder, holding court in Brooklyn, on January 8, entered an order granting the preliminary injunction asked for by the Marconi Wireless Telegraph Company of America and enjoined the further use by the American-Hawaiian Steamship Company of the Kilbourne & Clark apparatus on the steamship Floridian. In order to allow the steamship company an opportunity to replace the Kilbourne & Clark infringing apparatus with non-infringing apparatus, he suspended the operation of the injunction for thirty days.

STORM DROPS SAYVILLE ANTENNA

The German station at Sayville, L. I., now operated by United States naval operators, was out of commisison on December 29, on account of the Atlantic Coast storm. Heavy sleet and high winds brought down the antenna, but it was announced that the receiving apparatus was not interfered with.

The station was repaired and in operation the next day.

The Shelling of the Petrolite

An Operator's Dramatic Recital of What It Means to Be Under Fire By a Submarine

By J. G. Woltal.

TO watch the thin smoke cloud dissolve before the mouth of a cannon; to listen to the crescendo shriek of the oncoming projectile; then to feel the deck leap under your feet when it explodes—this in a few words tells the story of what it means to be under fire by a submarine. My impressions thus summarized were gained when the Standard Oil tanker Petrolite was attacked by an Austrian underwater craft in the Mediterranean.

Operator Woltal, who received lasting impressions of the attack by the underwater craft

Laden with a cargo of oil, the Petrolite, on which I was detailed as Marconi wireless operator, steamed out of New York Harbor on November 7, bound for Alexandria in faraway Egypt. All the way to Gibraltar the steamship wallowed heavily through the green seas and it did not make a stormy voyage any pleasanter to pick up Poldhu calls describing submarine raids along our prospective course. We made Alexandria, however, without accident, discharged our cargo under the guard of police armed with rifles and began the voyage back to New York.

I picked up the Communipaw on the evening of December 4 and was told that the vessel had been chased twenty-five miles by a U-boat, which had just torpedoed an unidentified tramp. As the Communipaw suggested that the survivors were probably still adrift, we altered our course to search for them. No one slept well that night, for none could say what the next day would bring. I, at least, tried on a good life belt and hung it up behind the door of the wireless room. Another I placed near my bunk.

It was 2 o'clock in the morning before I fell asleep and it seemed to me that my eyes had been closed only a short time when there came a cash that made the cabin shake. Hurled out of my berth, I landed in the middle of the floor. Then I jumped to my feet, grabbed one of the life belts and made my way out on deck.

Dawn was just breaking and a light wind ruffled the sea. Our engines had stopped and the vessel was swinging in a wide half-circle, displaying our broadside with "Petrolite of New York, U. S. A.," painted on the black hull. And a short distance to windward was a long, light gray submarine with her conning tower showing in the early light. By using a pair of binoculars I could see a man whom I assumed to be her captain, standing on the bridge, while on the deck below were half a dozen white-clad figures grouped around the breech of an ugly-looking rifle. I noticed that the broad black muzzle was covering the pit of my stomach.

Even as I watched, a puff of thin bluish smoke hid the gun and a sound like the squealing of the brakes on a street car was borne to us by the wind. Then the deck jumped under my feet and I realized that a shell had burst. There followed the report and out of our ventilators drifted some fumes with a sharp, acrid stench.

I could hear the crew shouting and coughing as they tumbled up from below and made for the boats. Officers checked the rush and I noticed that several had revolver butts showing out of their hip pockets, but there was no panic. Some of the firemen were ordered below to get extra clothes, and as our boats had been swung out, tested and provisioned when we entered the danger zone, nothing remained but to lower away.

Meanwhile the submarine kept on firing. A shell burst on the fidley, breaking it in two places, denting it out of shape and sending the rivet heads flying. The funnel uptake was riddled and the whistle pipe cut, as a result of which the decks reeked with a mixture of smoke, gas and hot steam. The men were swearing and choking and one stoker was cut in the thigh by a three-inch strip of jagged shell case.

The captain had gone overside in a small boat and was pulling out to meet the submarine, which forged slowly toward us. We could make out the Austrian ensign at her stern and saw that she was about 250 feet long. To me she looked like a big gray shark with one fin standing up out of the sea. I got the glasses again and watched our captain's boat as it pulled alongside. The captain stood up in the stern and the commander of the submarine leaned over the wire bridge rail of the conning tower. Presently one of our crew got out on the deck of the submarine, the captain sat down and the boat pulled back.

He was very red in the face when he reached the Petrolite and went into the wheel house with the first officer. We gathered from the boat's crew that the commander of the submarine was holding one of our men as hostage for a supply of provisions. He said that we had been attacked because our vessel appeared to be a big cruiser.

As there was no alternative except to yield to the Austrian's demand, our captain sent a quantity of canned goods and condensed milk to the underwater craft. Five minutes later the U-boat had sunk below the surface of the water and happily, according to my viewpoint, we saw her no more.

QUARANTINED FAMILY BUYS BY WIRELESS

A wireless telegraph apparatus kept the family of Charles Morton, of Edwardsville, Mo., in communication with the world during a period of quarantine.

The illness of Morton's son, with smallpox, caused the family to be isolated by order of the board of health authorities. A wireless set was installed on the Morton premises, and another at the home of Andrew Vogel, on the other side of town. As the Mortons have no telephone, they have been signaling their orders for groceries and other necessaries to the obliging Vogel, who sees that the orders are transmitted to their destination.

BRITISH EMBARGO BARS APPARATUS

The American Consul General, at London, has notified the State Department of a change in the British export embargo by which wireless telegraph apparatus is prohibited to all countries in Europe, excepting the British possessions.

With the Amateurs

Roland Cosgrove and Bruce Clark operating a wireless set at the Boston Boy Scout rally

As the New Year dawned the ether above the United States was a-tremor with wireless activity incidental to the relaying of a wireless message of good cheer and wishes for happiness in 1916 through the length and breadth of the land. The message originated at midnight in Davenport, Iowa, where it was sent forth from Station 9XE by W. H. Kirwan. Its destination was Washington, D. C., and the principal cities throughout the country. It was designed for delivery to President Wilson and the city officials of each city where it was received.

It was necessary, because of the restriction in the amount of power employed in private radio stations, to relay the message many times.

John B. Berger, president of the Rotary Club of Baltimore, received New Year's greetings from Oswald Becker, president of the Rotary Club in Davenport. The message was sent by Mr. Kirwan and received by C. R. Lamdin, who immediately communicated the dispatch to Mr. Berger. It read as follows: "A happy New Year to you and the members of your club. May the new year be full of love, laughter and song."

The same greetings were extended to the presidents of all the Rotary Clubs in the larger cities of the United States. At Washington, George W. Harris, president of the club there, delivered a copy of the message to Joseph P. Tumulty, secretary to President Wilson, who sent it to the head of the nation.

In order that the message might not be lost, all owners of stations, except those who were to receive it, had been requested, via wireless, by Captain W. H. G. Bullard, superintendent of the United States Naval Radio Service, not to use their apparatus after 9.30 P. M., Central time, or 10.30 P. M., Eastern time.

A practical test of the reliability of amateur wireless stations in time of war was made, when New Year's greetings were relayed from coast to coast by amateurs under the supervision of the Naval Radio Service.

For the period between the close of the sending of the regular night reports from Arlington and midnight, a space of about two hours, the United States was supposed to be in a state of war, with the high-powered government stations put out of business by the enemy, land telegraph lines cut or in the hands of the invaders, and the amateur stations the only means of communication left. Important messages had to be transmitted to commanders of various army and navy forces at widely separated parts of the country and these messages were handled by the amateurs.

Certain amateurs, the chain extending from coast to coast, were designated by the Naval Radio Service to handle the messages and the outcome of the test was closely watched by the naval officers in order to ascertain the real abilities of amateurs to serve the country in time of national peril.

The amateur operator who attempts to make use of the air for his own purposes soon discovers that the passage way for his messages are much more occupied than he suspected, because the recognized government official and the amateur himself and their thousands of associates are all using the air to such an extent that at times chaos reigns supreme. In the belief that the amateur might find relief in study, a radio club has been formed at the Boston Young Men's Christian Union.

The seventeen wireless enthusiasts, who have banded together for mutual purposes, have interested Professor A. E. Kennelly of Harvard, who is a practical wireless operator. At the head of the club is Edward A. Gisbourne. He was a signalman and wireless operator in the United States Navy until wounded at Vera Cruz, spending four years in the service. Under the guidance of these two men, the members of the club expect to learn more about the wireless than has yet come to their knowledge.

Books will not form a great part of the work of the club, except in so far as the members use them individually. One feature will be competent instruction in bench work, which will be carried out at the weekly sessions. All in all, the members are taking their new club as a co-operative affair in which they hope to give as well as receive.

The Radio Club is also enlarging its apparatus by the installation of an aerial having a wide receiving radius, a sending apparatus limited to the legal requirements of 500 miles, and the construction of a new receiving station. Arrangements have been made so that the apparatus needed by the club will be made in that institution.

Miss Aline Mengelkoch of Minneapolis, after a four months' course at the American Telegraph College, took the examination for the government radio service and was one of five out of a class of thirty to pass. All of the other candidates were men. Miss Mengelkoch is now eligible for any position in the service of the Navy Department's wireless division except that which will give her charge of a ship station.

The Radio Club of America has announced the election of the following officers for the year 1916: President, Edwin H. Armstrong; vice-president, T. Johnson, Jr.; treasurer, Ernest V. Amy; corresponding secretary, David S. Brown; recording secretary, Thomas J. Styles; directors, Paul F. Godley, Alfred P. Morgan, Harry Sadenwater, Joseph A. Fried and Walter S. Lemon.

The Atlanta Radio Club, organized a little more than a year ago for the purpose of advancing the amateur interests in Atlanta and vicinity, has received many congratulations on the booth and exhibit which was their share of the large electrical Show held in Atlanta during the National Electrical Prosperity Week.

One of the interesting features of the exhibit was a replica of the first Marconi set, complete with induction coil and coherer. Near this was a complete sending and receiving set of modern type, owned by members of the club, with which messages were received and transmitted. Visitors listened to popular lectures by members of the club on the theory and practice of wireless telegraphy.

The show was held on the ground floor of a large office building, upon the roof of which was erected an aerial, the height of which was almost 200 feet. Its length was 400 feet. Another point of interest was a table covered with sending and receiving sets constructed by members of the club.

Recently adopted rules save considerable interference and loss of time and make interchange of conversation much more pleasant. The club has a special operator who sends out official notices to all members on a certain day and hour and also has an inspector of stations whose duty it is to adjust each station so that it will cause a minimum of interference. The latter also sees that each station conforms to the government radio regulations regarding wave-length, power, etc.

The majority of the members possess amateur licenses and will try for higher licenses at the first opportunity.

The Atlanta Radio Club Exhibit at the Electrical Prosperity Week Show

The Atlanta Radio Club will be glad to hear from similar organizations or from anyone interested in wireless. Letters should be addressed to the secretary, M. A. Herzog, No. 16 Faith Avenue, Atlanta, Ga. Officers of the club are: President, Francis Merriam; vice-president, R. A. De Vore; secretary, M. A. Herzog; treasurer, B. Magee.

The New Britain Radio Club of New Britain, Conn., held a meeting on December 28 at which President Mulvihill presided. To eliminate local interference it was voted that members should devote the time from 7 to 7.15 P. M. to their personal calls, and that M O should be the general call.

With a membership of twenty the Wildwood Radio Association of Wildwood, N. J., was organized on January 7. Ten at least of the members have installed private wireless stations of considerable power, and one big central spar is expected to carry over a radius of 300 miles. The association will become affiliated with the Wildwood Rifle Club and be ready for service in the proposed Continental army.

The Eastern Radio Relay has announced the election of the following officers: Executive secretary, J. F. Diehl, New York City; division secretaries, M. V. Bryant, Nyack, N. Y.; C. Benjamin, Clyde, N. Y.; J. D. Platt, Weehawken, N. J.; district secretaries, George Meder, New York City; E. French, Peekskill, N. Y.; E. Heermance, Hudson, N. Y.; A. Dodds, Albany, N. Y.; and A. E. Newton, Jamestown, N. Y.

Students interested in wireless telegraphy at Phillips Academy, Andover, Mass., have organized a wireless club, under the direction of Harold S. Wilkins. The purpose of the club is to promote interest in wireless telegraphy and to provide the members an opportunity to perform interesting experiments. The trustees have promised to install an aerial very shortly, and Donald Kitchin, P. A., '15, has already donated a ½-kw. transformer. A room in the basement of Graves Hall has been reserved for the club.

The Austin Radio Club of Austin, Texas, has been organized with the following officers: President, D. Harrell, Jr.; secretary and treasurer, A. E. Hancock. Meetings are held once a month.

The Topeka (Kas.) Radio Club announces the election of the following officers: President, R. K. Trump; vice-president, I. H. Waugh; secretary and treasurer, R. L. Morehouse; sergeant-at-arms, V. Van Hook. All correspondence should be addressed to Raymond L. Morehouse, Highland Park, Topeka, Kas.

Wireless telegraphy gained so much popularity in Waterloo, Ia., during the past year that not only several groups of amateurs constructed stations, but a radio club was organized by the students at the West High School, for the purpose of taking up the subject of long distance communication by wireless. The officers of the new club are: President, Harry N. Royce; vice-president, Harold La Rue; secretary and treasurer, Karl von Lackum. An aerial was erected on the high school grounds.

Twenty-five members of the East Side Branch of the New York Y. M. C. A. have enrolled in the Wireless Reserve Corps of the United States Army. One hundred members of this branch have organized a company for military training.

The Central Branch of the Brooklyn Y. M. C. A. has installed one of the most complete wireless stations in New York City. At the recent opening of their million dollar building, visitors were able to receive and dispatch messages, which were picked up at other branches and delivered by Boy Scouts.

Regular scout bulletins are being sent out on Tuesday and Saturday evenings at 7 o'clock by the Hoosier Radio Club of Indianapolis. Scout Byron Elliott, a member of troop 18, is the official sender of the messages.

Wireless amateurs "listening in" on the tests conducted by A. F. Van Dyke at the Carnegie Institute of Technology at Pittsburgh on the night of December 21, heard talking, whistling and singing. Amateurs within a ten-mile radius were notified when these telephone tests were to take place.

Vessels Recently Equipped With Marconi Apparatus

Names	Owners	Call Letters
Amazonia	R. Lawrence Smith, Inc.	Koo
Santa Barbara	W. R. Grace & Co.	WBJ
Canastota	U. S. & Australasia SS. Co.	YSO
Catania	Haustica Petroleum Co.	WTI
Ardmore	Standard Oil Co. of New Jersey.	KIA
Healdton	Standard Oil Co. of New Jersey.	KOF
Henry Williams	Vacuum Oil Co.	KRL
Gargoyle	Vacuum Oil Co.	KRK
Diana, (S. Y.)	C. Ledyard Blair.	KZM
Souchan	Russian Volunteer Fleet.	RVS
Dade	Miami Steamship Co.	KXU

THE SHARE MARKET

New York, January 20.

All Marconi shares have shown gains during the past month. English, common, and English preferred, although closely held, have made remarkable advances. After two months of lethargy, the American Marconi stock has shown considerable activity with good net gains.

Bid and asked prices today:

American, 4⅛-4⅜; Canadian, 1⅜-1¾; English, preferred, 8¾-13½; English, common, 9¼-14.

ENGLISH MARCONI DIVIDENDS

Announcement has been made by the directors of the English Marconi Company that they have not yet been able to obtain from British Government departments a basis of settlement in regard to either remuneration or compensation for services rendered, for the use of their stations since the commencement of the European war, nor in respect to other matters in which the government is indebted to the company. However, without taking into account the considerable sums which are estimated to be due to the company in respect of these matters, the business which has been actually completed for the current year has been satisfactory, and the directors, without departing from the policy, which was approved at the last general meeting, of husbanding their resources, feel justified in declaring the seven per cent preferential dividend upon the cumulative participating preference shares, and an interim dividend of five per cent on the ordinary shares.

At a meeting of the directors it was therefore resolved that a dividend of seven per cent, less income tax, upon the 250,000 seven per cent cumulative participating preference shares, numbered 5,001 to 750,000, be declared on account of the current year; that an interim dividend of five per cent, less income tax, upon the 1,222,688 ordinary shares, numbered 1 to 500,000 and 750,001 to 1,472,688, be declared on account of the current year.

MARCONI SUES ANOTHER INFRINGER

Suit charging the Detroit & Cleveland Navigation Co. with infringement of a patent on its wireless apparatus has been filed by the Marconi Wireless Telegraph Co., in the United States Court, at Buffalo. A permanent injunction restraining the steamboat company from using the apparatus is asked. An accounting of the profits and damages are also asked.

Five steamers of the fleet are equipped with wireless apparatus furnished by the Kilbourne & Clark Co., of Seattle, Wash. The other vessels carry Marconi wireless. Restraining orders have been issued against the Atlantic Communication Co., the DeForest Radio Telegraph & Telephone Co., the American Hawaiian Steamship Co., and the Standard Oil Co. in similar suits.

NEW PLANT AT CAPE MAY

The contract has been awarded for the new building for the Marconi Wireless Telegraph Company, at Cape May, N. J.

Erection of a tower 140 feet high will be started immediately.

Conference on Sealing and Inspecting Apparatus

Methods Determined for Carrying Out Secretary of the Navy's Instructions Enforcing the Provisions of the Neutrality Proclamation Issued by the President

A CONFERENCE was held in New York on January 12 at the Custom House between Collector Dudley Field Malone, Lieutenants Bradford Barnette, U. S. N., and T. H. Taylor, U. S. N., representing Rear Admiral Nathaniel R. Usher, U. S. N., Commandant of the New York Navy Yard and Supervisor of the Third Naval District, and the chief radio inspector at this port, with regard to the enforcement of the President's neutrality proclamation so far as it concerns radio sealing and inspection.

The conference was arranged for the purpose of determining upon methods for carrying out the instructions recently issued by Secretary of the Navy Daniels, which provide for the necessary co-operation between the officers of the different forces upon whom devolve the duty of the enforcement of the provisions of the neutrality proclamation.

The instructions of Secretary Daniels follow:

All merchant vessels flying the flag of a belligerent country shall, upon entering United States ports, comply with the following rules:

1. Lower antenna of radio installation to deck and disconnect it from the radio station of the ship.

2. The receiving and transmitting apparatus shall be sealed by an officer of the United States.

3. The antenna shall remain lowered and disconnected and the apparatus remain sealed during the time the vessel remains within the limits of the port, unless repairs to such apparatus are necessary, the necessity and extent of such repairs being made known to the naval official immediately charged with the inspection, so far as relates to neutrality requirements, of the vessel's radio apparatus.

4. Permission to hoist and connect the antenna and to break the seals necessary to have the radio installation in operating condition on clearing the limits of the port must be obtained from the Collector of the Port.

William G. McAdoo, Secretary of the Treasury, has issued instructions to collectors of customs that a copy of the radio regulations be delivered to the master of each incoming belligerent merchant vessel. Collectors have been requested to notify the local naval commandant or designated naval officer of the arrival of each such vessel.

The supervisor of the naval district in which the port is located will inform the collector of the name and address of the naval officer to whom the notification of arrival of a belligerent merchant vessel shall be sent. Immediately before clearing, collectors will authorize the masters of such vessels to hoist the antenna and place the radio apparatus in condition for operation, so that on getting clear of the limits of the port the radio set may be available for its designed purpose.

Following are the naval districts, their limits and the headquarters of each:

1—Eastport, Me., to include Chatham, Mass.; Boston.

2—Chatham, to include New London, Conn.; Naval Station, Narragansett Bay.

3—New London, to include Barnegat, N. J.; New York.

4—Barnegat, to include Assateague, Va.; Philadelphia.

5—Assateague, to include New River Inlet, N. C.; Norfolk.

6—New River Inlet, to include St. Johns River, Fla.; Charleston.

7—St. Johns River, to include Tampa, Fla.; Key West.

8—Tampa, to include Rio Grande; New Orleans.

12—Southern boundary to latitude 42 deg. north; San Francisco.

13—Latitude 42 deg. north to northern boundary; Port Townsend.

AEROPLANE EQUIPMENT FOR NATIONAL DEFENSE

"A continuous picket line of seaplanes, fifty miles or more off shore and 2,000 feet or more in the air, around our entire coasts from Eastport, Me., to Brownsville, Tex., and from San Diego, Cal., to Cape Flattery, Wash., each machine traveling back and forth—back and forth—over its section or 'beat!'"

Thus Rear Admiral Robert E. Peary, retired, discoverer of the North Pole, spoke of the plan for an aeroplane coast patrol at the tenth annual banquet of the Aero Club of America.

After describing the advantages of the aeroplane as a natural and valuable adjunct of the coast guard and life-saving service, Admiral Peary proceeded to the subject of war.

"In war times the patrol could weave such a continuous off-shore curtain of observance around our entire coasts as would make a surprise attack in force an impossibility.

Admiral Peary recounted how at night, or in a fog, the sentinels would send in by wireless the signal that would bring out a flock of battleplanes with a cargo of bombs. It might be possible to send out a fleet, according to experts, of such power that it could completely destroy or cripple hostile battleships.

AERO-WIRELESS TORPEDO CONTROL

Wireless control from an aeroplane of a coast defence torpedo has been developed, the patents for which are included in the Hammond radio-controlled torpedo rights, for the purchase of which the Navy Department has asked Congress to appropriate nearly a million dollars.

Aeroplane control makes it possible for the operator to direct the radio torpedo from any height, air bubbles from the compressed air motor of the torpedo giving him a certain guide by which to steer it against a ship's hull. By use of powerful glasses it has been possible heretofore to control the torpedo from shore to a distance of nearly 10,000 yards, but the aeroplane device now will make the missile effective to the full range of its motor capacity, or even far at sea if the torpedo is launched from a swift motor boat within sight of a hostile ship.

The Hammond plans are now before the House Fortifications Committee, which is giving detailed consideration to the proposal to spend more than $80,000,000 on improving the coast defences within the next four years.

BOWLERS IN WIRELESS TOURNAMENT

The wireless bowling tournament between Pacific Coast and Hawaiian Y. M. C. A. organizations was set in motion on January 6, at San Francisco, when the Naval Training Station "Y," from Goat Island, bowled a total of 2,609. This score was immediately wirelessed to Honolulu, Sacramento, Fort McDowell, Oakland, San Jose, Los Angeles and Vallejo, all these sections having teams in the tournament. In the first contest the high score rolled was 569.

The tournament was continued for two weeks, the scores of all games being exchanged by wireless.

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.

W. S. E., Wichita, Kans., inquires:

Ques.—(1) How can one best determine if the antenna is radiating properly?

Ans.—(1) Normal radiation takes place from any aerial with normal current flow. The actual effectiveness can best be determined by experiment. If there is no leakage at the aerial insulators and the aerial hot wire ammeter indicates normal current flow then the maximum degree of efficiency has been attained.

Ques.—(2) Does the hot wire ammeter indicate the degree of coupling between the open and closed oscillation circuits, or the character of the emitted wave?

Ans.—(2) Positively no. It is merely employed for indicating conditions of resonance between these circuits.

Ques.—(3) Does the hot wire ammeter indicate anything more than the fact that current is actually flowing in the antenna system

Ans.—(3) No.

Ques.—(4) Is the matter of radiation as understood in wireless telegraph work determined by the degree of coupling between the two circuits, the quality of the spark, the efficiency of the condenser or by the deflection shown on the hot wire ammeter?

Ans.—(4) The actual radiation of energy from an antenna system is denoted in the terms of an equivalent resistance. That is to say, the energy lost by radiation from a wireless telegraph aerial is expressed as the equivalent of the number of ohms of resistance required in an identical non-radiative oscillatory circuit to reduce the current value to a similar value as obtained in a radiative circuit, such as an aerial system.

For a flat top aerial of vertical height, h, the radiation resistance is computed as follows:

$$R' = 160\pi^2 \frac{h^2}{\lambda^2}$$

where R' = the radiation resistance in ohms;
h = the height of the aerial in meters;
λ = wave-length of the aerial in meters.

The power radiated from a flat top or T aerial of a given vertical height is expressed by the following formula:

$$W = 1578.2 \frac{h^2}{\lambda^2} I^2$$

where h = the height of the flat top in meters;
λ = the wave-length of the flat top in meters;
I = the current measured at the base of the antenna system by a hot wire ammeter.

For a single wire, i. e., plain aerial, this formula becomes:

$$W = 640 \frac{h^2}{\lambda^2} I^2$$

We thus see that the radiation from an aerial depends upon its height, wave-length and the current supplied to the antenna system.

The power radiated from any aerial computed in watts is as follows:

$$W = R' I^2$$

where R' = the radiation resistance only in ohms; and
I = the current measured by hot wire ammeter at the base of the antenna system.

You will readily see that if the degree of coupling between the primary and secondary circuits of an ordinary radio transmitter is reduced, the current at the base of the antenna system will decrease (as per the formula) and the energy radiated will also decrease. For effectiveness as regards radiation the transmitting aerial should possess a high radiation decrement, but if of too great value the emitted wave is not sharp. We must therefore strike a happy medium in order that the advantages of one may not offset the advantages of the other.

It is considered preferable in commercial practice to confine the energy of the emitted wave to a single frequency or as near that condition as possible. With tight coupling between the primary and seconary circuits the antenna system generally radiates at two frequencies and it is usually possible only to tune the receiving apparatus to one; therefore the energy in the other frequency or wave-length may be considered as lost.

* * *

C. F. O., Schenectady, N. Y.:

Your single wire aerial, 450 feet in length with an average height of 35 feet, has a natural period in the vicinity of 710 meters.

There is no harm in having the two ends of the antenna at different heights nor will there be any loss of signals on this account.

A suitable primary winding for the receiving tuner (secondary winding described in the article of the series, "How to Conduct a Radio Club," published in the February, 1915, issue of The Wireless Age, can be made on a form 7 inches in diameter by 10 inches in length, wound closely with No. 24 wire. In addition, a loading coil about 10 inches in length by, say, 5 inches in diameter, wound closely with No. 20 S. S. C. wire, should be connected in series with the antenna system. Since you desire to use this coil to receive signals from Sayville we take the opportunity to say that this station operates with undamped oscillations at a wave-length of about 8,400 meters, and in consequence you will require receiving apparatus suitable for the reception of undamped oscillations in order that you may hear Sayville's signals.

We do not know whether the United States authorities will allow a special license for a wireless telephone experimental set in your vicinity. You should communicate with the Department of Commerce at Washington, D. C.

We are unable to advise you specifically concerning the operation of a polarized relay in connection with the multi-audi-fone. We do not know the principles upon which this device works, but if the signals in the telephones are as loud as you report, it would seem that sufficient energy flows to operate a sensitive polarized relay. However, you should take into consideration the fact that in order to receive the dots and dashes in the Morse code, it would be necessary for the armature of the relay to be adjusted for a sluggish movement in order that the individual sparks composing the dash might record properly.

We do not advise the use of freakish aerials as described in your fourth query. Your single wire, 450 feet in length, should be sufficient for long distance work.

* * *

H. R., Yonkers, N. Y.:

The fact that an applicant for admission to the Marconi service wears eye-glasses will not bar him from being accepted provided he possesses the necessary qualifications for admittance. We know nothing of the wireless school to which you refer.

* * *

S. O., Dallas, Texas, inquires:

Ques.—(1) What is the wave-length of a single wire aerial 600 feet in length, 85 feet in height at one end and 15 feet at the other?

Ans.—(1) The wave-length of this antenna is approximately 930 meters.

Ques.—(2) What size condenser would you advise in series with this aerial?

Ans.—(2) This aerial is by far too large for operation at a wave-length of 200 meters. The flat top portion for one of the inverted L type should not be more than 60 or 70 feet to be operated at the restricted wave-length.

P. R. C., Bradentown, Fla., inquires:

Ques.—(1) Please give data concerning NAT (New Orleans station) in regard to the power, wave-length, and whether damped or undamped oscillations are employed.

Ans.—(1) The naval station is fitted with a 30 k. w. arc set which operates at a wave-length of about 6,000 meters and can be heard at intervals throughout the day. Special apparatus is required for these signals. We have no data concerning the spark equipment used at this station.

Ques.—(2) In adjusting a transmitting set how do you determine the wave-length and the logarithmic decrement?

Ans.—(2) The wave-length is best determined by means of a wave-meter set in inductive relation to the antenna system. For measurement of the logarithmic decrement a hot wire wattmeter or hot wire milliammeter is connected in series with the wave-meter and certain determinations are made. The complete measurement is described in the book, "How to Conduct a Radio Club," published by the Marconi Publishing Corporation.

Ques.—(3) Please advise me regarding the proper dimensions of a sending condenser for a ½-inch spark coil.

Ans.—(3) A condenser is not recommended for a coil of this size. It is preferable to connect the spark gap of the coil directly in series with the antenna system. A single plate of glass, 8 by 8 inches, covered with tin-foil, 6 by 6 inches, should give sufficient capacity for the secondary potential of this coil.

* * *

A. G. F., Allentown, Pa.:

To decrease the wave-length of a receiving aerial the variable condenser should be connected in series with the earth lead of the antenna system. To increase the wave-length the condenser must be removed from this circuit and connected in shunt to the primary winding. A variable condenser is not necessary across the telephones on the average receiving set. A fixed condenser having a capacity of from .005 to .04 of a microfarad will fulfil the requirements.

The wave-length of an antenna system is not increased much by the addition of another wire. In fact, it will increase the wave-length very slightly unless there is considerable spacing.

* * *

T. O. B., Freeport, N. Y.:

Ans.—(1) We believe there has been an error. Receiving condensers having a capacity of 2 microfarads are not generally employed in wireless work. In any event, we advise purchasing a condenser of this type (having a dielectric of wax paper) rather than constructing one. We believe it will be the cheaper method. Generally these condensers consist of two very long sheets of foil, about 90 feet in length by 6 inches in width, separated by a very thin sheet of paraffine paper. The entire unit is then rolled up in circular form and sealed in a container.

If you desire to wind single layer coils to have a certain value of inductance we refer you to the article appearing on page 843 of the August, 1915, issue of THE WIRELESS AGE. The method for this calculation is fully explained and the explanation is made in such a manner that it can be understood by the amateur.

The inductance in centimeters of a single layer coil can also be calculated from the following approximate formula:

$$L = \frac{(5 \times D \times T)^2}{M + \frac{1}{3}D}$$

Where D = the diameter of the coil in inches.
T = the total number of turns of wire.
M = the length of the coil in inches.
L = the inductance of the coil in centimeters.

To convert centimeters to microhenries, divide by 1,000.

The complete method for measuring the capacity of an antenna system is described in the book, "How to Conduct a Radio Club." The construction of the auto-transformer is also described. An auto-transformer is generally considered as one where the primary and secondary circuits make use of the same turns, or at least have turns in common.

The variometer is also described in the book, "How to Conduct a Radio Club." Full instructions are given for the construction of two variometers, one to be used in an antenna system, and the second as a variable element of a wave-meter.

* * *

F. C. M., New Orleans, La., inquires:

Ques.—(1) Please give the formula for calculating the approximate wave-length to which a coil without a condenser will respond. The coil is to be used as the secondary winding of a receiving tuner.

Ans.—(1) The natural wave-length of a single layer coil can be computed from the following formula:

$$\lambda = 18.85 \; (10^8) \; \sqrt{LC_d}$$

where λ = the wave-length in meters;
L = the inductance of the coil in henries;
C = the distributed capacity of the coil in farads.

The value of C_d can be obtained from the formula and table given on page 269 of the January, 1914, issue of THE WIRELESS AGE. The value of L is computed as per the article appearing on page 843 of the August, 1915, issue of THE WIRELESS AGE.

The foregoing values merely give the natural wave-length of the coil and do not take into consideration the effect of shunting a crystalline detector and fixed condenser about it. The actual change in wave-length due to the shunt circuit depends upon the resistance of the crystalline detector. If the resistance of the crystal is excessive it will have little effect upon the natural period of the coil.

The natural wave-length of the coil can best be obtained in the following manner:

A crystalline detector shunted by a head telephone is attached to one end of the coil. A wave-meter set into excitation by a battery and buzzer is very loosely coupled to this coil and the variable element of the wave-meter altered until a loud response is secured in the head telephone. The setting of the variable element of the wave-meter (usually the condenser) is observed, which is, of course, the natural wave-length of the coil under measurement. The more accurate method is to excite the coil by impulse excitation. A quenched spark circuit can be inductively coupled to the coil. A wave-meter shunted by a crystalline detector and head telephone is then placed in inductive relation to the coil and the position of resonance noted by the loudest sound in the head telephone.

Ques.—(2) By what formula can the natural wave-length of an aerial be calculated?

Ans.—(2) An article by Cohen, published by the Bureau of Standards, Washington, D. C., contains the correct formula for calculating the distributed capacity and the effective inductance of an aerial system. A similar article appeared in The Electrician for February, 1913. The natural wave-length of a four-wire aerial, the wires being spaced from two to three feet apart is approximately 4.8 times the linear dimensions.

Ques.—(3) In Mr. Apgar's article in the September, 1915, issue of THE WIRELESS AGE, what is the function of the loading coil in the wing circuit marked "L"

Ans.—(3) This coil is intended to place the wing circuit in resonance with the grid circuit, thereby increasing the amplifications.

Ques.—(4) In the construction of a tuner for wave-lengths up to 10,000 meters should the loading coils in the primary and secondary circuits be coupled together?

Ans.—(4) Not if there is sufficient coupling between the primary and secondary windings proper. The coupler should be constructed so that a degree of at least ten per cent. between the primary and secondary circuits can be obtained.

Ques.—(5) If the secondary winding consists of No. 32 wire and the secondary loading coil is of similar dimensions, would the resistance of the wire be detrimental to the efficiency of the tuner? The secondary winding of the tuner in question is adjustable to 5,000 meters and the loading coil is a duplicate of the secondary winding. The tuner is fitted with dead-end switches.

Ans.—(5) The arrangement as described is satisfactory for use with the vacuum valve detector. In connection with crystalline detectors it may prove more efficient if the inductance in use is slightly reduced and the necessary wave-length value obtained by a shunt condenser. Keep in mind that doubling the inductance of an oscillatory circuit only increases the wave-length by the square root of 2, ($\sqrt{2}$). In consequence this tuner is adjustable to 7,000 meters. However, the addition of a slight value of capacity in shunt to the secondary winding will allow adjustments to wave-lengths including 10,000 meters.

R. G. P., Jamaica, N. Y., inquires:

Ques.—(1) What is the fundamental wave-length of my aerial which consists of four wires spaced 3½ feet apart, 75 feet in length by 50 feet in height at both ends?

Ans.—(1) The fundamental wave-length of this antenna is approximately 228 meters.

Ques.—(2) What is the receiving range of a Marconi type D tuner fitted with a carborundum detector and a pair of Brandes 1,000-ohm head telephones? This apparatus is to be used with the aerial referred to in my first query.

Ans.—(2) The night range of this equipment is from 600 to 1,000 miles; the daylight range is from 150 to 300 miles. Increased range from high power stations may be expected by the use of a larger aerial.

Ques.—(3) Would it be any advantage to use a variable condenser with the apparatus referred to? If so, in what part of the circuit should it be connected?

Ans.—(3) A variable condenser will be of little advantage except for the shorter wave-lengths. For the reception of amateur signals this condenser might be connected in series with the earth system, thereby reducing the fundamental wave-length of the antenna by a certain amount

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B. M. B., Belfast, Me.:

The solution of the majority of your problems in connection with long distance receiving can be found in the book, "How to Conduct a Radio Club," published by the Marconi Publishing Corporation. Extremely sensitive receiving apparatus is required for taking down the signals from the Marconi station at Glace Bay, N. S. This station has strong directional tendencies, the greater part of the energy being radiated in the direction of the British Isles. The wave-length employed is 7,925 meters and the power is from 70 k.w. up. Hand transmission as well as automatic transmission is employed. The automatic transmitter operates at a speed of about fifty words a minute.

The wireless telephone tests at Arlington have been discontinued. The wave-length employed was in the neighborhood of 7,000 meters.

* * *

G. S. H., Lakewood, N. J.:

Your aerial, 100 feet in length by 50 feet in height, has a natural wave-length of approximately 252 meters. The dimensions of a receving tuner suitable for the reception of Arlington time signals are fully described on page 214 of the December, 1915, issue of THE WIRELESS AGE. Duplicate these dimensions and learn by experience how to adjust a crystalline detector to a sensitive condition. You will then have no difficulty in receiving Arlington time signals, day or night, at your station.

* * *

P. W. H., Fredericktown, Ohio:

For a 3-inch spark coil a range of twelve miles is fairly good, particularly if it is operated at the restricted wave-length of 200 meters. The only means by which the range of this station can be increased is to fit the receiving apparatus with a vacuum valve amplifier set. It may be that local conditions are not conducive to long distance transmission but even under the best operating conditions your apparatus has a good range.

* * *

L. G. B., Keene, N. H.:

With the apparatus described in your communication you should experience no difficulty in transmitting and receiving at a distance of three miles. The necessary diagram of connections is contained in the book, "How to Conduct a Radio Club," published by the Marconi Publishing Corporation. Diagrams of connections for both transmitting and receiving apparatus are published.

It is difficult to eliminate the induction from nearby power wires. The effect may be reduced by the use of a balancing out aerial, but it is a difficult problem to eliminate it entirely.

* * *

A. H., Brooklyn, N. Y.:

Any of the supply houses advertising in this magazine can furnish you with apparatus for the reception of time signals from Arlington. You require for this work a receiving tuner, adjustable to wave-lengths up to 2,800 meters, and a two or four wire aerial at least 100 feet in length. The additional apparatus required consists of a sensitive crystaline or vacuum valve detector and a pair of sensitive head telephones. The cost of this equipment is not prohibitive.

We advise the use of the type E tuner, described in the Used Apparatus Catalog issued by the Marconi Wireless Telegraph Company of America.

* * *

J. T. S., Pittsburg, Pa., inquires:

Ques.—(1) Where can I obtain a copy of all the abbreviated numerals and phrases, including the comma, period, colon, semicolon, etc., used by the Marconi operators?

Ans.—(1) Communicate with the Department of Commerce and Labor or the radio inspector in your district and secure a copy of Forms Nos. 772 and 773.

Readers who submit questions to this department will greatly facilitate the work of its editor by not requesting immediate answers. Many questions received do not appear in these columns because they are not of general interest. Every effort is made to give prompt service, but as we usually have on hand for each issue more than 5,000 queries, it is obvious that all cannot receive immediate attention.

The construction of the 1 to 1 transformer for use in connection with a vacuum valve amplifier is fully described in the book, "How to Conduct a Radio Club." It has also been fully described in the Queries Answered Department of THE WIRELESS AGE. It consists of an iron core wound with several layers of S. S. C. wire. The same turns are used for the secondary and primary windings.

* * *

E. G. R., Trenton, N. J.:

We have had no experience with the silicon antimony combination as a receiving detector and therefore cannot campare it with some of the well-known combinations in commercial use.

We have not exact information concerning the power employed during the wireless telephone tests at Arlington, but it has been said that at least 80 k.w. of energy flowed in the antenna circuit.

Your 250-foot aerial has a natural wave-length of about 430 meters. It is likely that the amateur stations which you hear on this aerial have wave-lengths in excess of 200 meters, or perhaps an excessive value of coupling is used at their transmitters and consequently one of the emitted waves is above the United States restrictions.

The Arlington station uses a wave-length of approximately 7,000 meters when working with Lake Bluff, Ill. The wave-length of the Lake Bluff station is about 6,000 meters and the power employed 30 k.w. The arc type of transmitter is used at both stations.

* * *

W. L. M., New Braunfels, Tex., inquires:

Ques.—(1) Assuming that my apparatus is to be operated at a wave-length of 425 meters and furthermore, that all other conditions are equal, which of the two forms of aerial do you consider the more efficient for sending: the inverted L type or the umbrella type? In either case the areial is to be seventy feet in height with no obstructions in the near neighborhood, as the station is located on a hill.

Ans.—(1) For a wave-length of 425 meters, we prefer an aerial of the inverted L type by all means. If the means were available for erecting an aerial of greater height, we might consider the use of an umbrella aerial.

With the 1 k.w. apparatus described you should be able to cover from 40 to 100 miles at night, possibly more.

* * *

J. W. L., Jr., Philadelphia, Pa., inquires:

Ques.—(1) Please advise me concerning the size of a transformer necessary to transmit 100 miles at night over land with an aerial having a wave-length of 200 meters, which I understand is necessary to comply with the government law?

Ans.—(1) For the restricted wave we advise the use of a ½ k.w. transformer, having a secondary voltage of 20,000 volts. The apparatus should be fitted with a non-synchronous rotary gap for the production of semi-musical tones. To insure continuous communication the receiving station should be fitted with a vacuum valve detector or amplifier.

Ques.—(2) My station is very close to the Pennsylvania Railroad Main Line Division which has recently installed high voltage circuits and without doubt I shall experience trouble from electrostatic induction. Is there any danger that sufficient potentials will be induced in the aerial to burn out my apparatus? Would it be preferable to place my aerial at right angles to the power line, rather than parallel to it?

Ans.—(2) The aerial system must by all means be placed at right angles to the power line and, even with this precaution, you will probably be troubled in your receiving work. You need not fear that your apparatus will be burned out.

Ques.—(3) What should be the size of dimensions of an aerial to get the maximum range at the restricted wave? I am somewhat limited by local conditions as regards height and length. There is sufficient space to erect a flat top aerial about 75 feet in length by 50 feet in height.

Ans.—(3) We advise you to erect an aerial with a flat top portion, 75 feet in length, and bring the lead in from the center. The aerial will then have a fundamental wave-length of less than 200 meters, which can be brought to normal value by the insertion of the secondary winding of the oscillation transformer.

* * *

A. L., Winsted, Conn.:

Ans.—(1) Duplicate the diagram of connections (Fig. 4) shown on page 52 of the October, 1915, issue of THE WIRELESS AGE. This circuit will afford the maximum degree of efficiency with a vacuum valve detector and should clear up your problem. The secondary winding of the average amateur tuner is not properly designed for use in connection with a vacuum valve. It should be so constructed that for a given wave-length an exceedingly small condenser is used in shunt to the secondary winding. This affords a maximum value of potential which is necessary to receive loud signals. Look carefully and see that the positive plate of the high potential battery in the wing circuit is connected to the plate of the vacuum valve. Also make sure that the filament of the valve has not curled up and touched the grid.

Ans.—(2) The Sayville station is still in operation, but employs undamped oscillations at a wave-length of about 9,000 meters.

Ques.—(3) To secure employment in the Marconi Service, must the operator possess a first grade commercial operator's license and is he required to take a course in the Marconi School of Instruction?

Ans.—(3) Those in the Marconi Service must possess first grade license certificates. All applicants for admission to the service are required to attend the Marconi School for a short period, in order to familiarize themselves with the latest type of commercial apparatus.

Ques.—(4) How long, approximately, is it necessary for a student to attend the Marconi School of Instruction?

Ans.—(4) The actual length of time depends upon the previous training of the student. A student is qualified for the commercial service when he is able to make a clean, legible copy of a radio message in the Continental Code, at the rate of twenty-five words a minute. He must also be familiar with the International, United States and United States Naval regulations pertaining to wireless telegraphy. He must be able to make proper abstracts of commercial radio traffic and have knowledge of the Marconi method of accounting. He is also required to possess a detailed knowledge of commercial radio sets, in order that he may make repairs in case of emergency.

* * *

W. C. K., Melrose Highlands, Mass., inquires:

Ques.—(1) Please give a list of the additional stations (other than Arlington) on the Atlantic coast that employ wave-lengths of 1,500 meters or over and also make use of damped oscillations.

Ans.—(1) The Marconi station at Cape Cod, Mass., operates at a wave-length of 2,160 meters. The call letters are WCC. The Marconi station at Philadelphia (call letters WHE) operates at a wave-length of 1,650 meters. The Marconi station at Wanamaker's, in New York City (call letters WHI) operates daily on a wave-length of 1,850 meters.

Ques.—(2) What is the wave-length of my indoor aerial, 50 feet in height and 50 feet in length, consisting of four wires spaced 2 feet apart? The lead-in is about 25 feet in length.

Ans.—(2) The natural wave-length of this aerial is approximately 177 meters.

Ques.—(3) With this aerial, using an inductively-coupled receiving tuner, loading coil, galena detector, fixed condenser and a 1,000-ohm receiver, I am able to receive signals from Arlington. By also using a variable condenser, would it be possible to receive signals from Key West?

Ans.—(3) The spark station at Key West, Fla., operates on a wave-length of 1,600 meters. A variable condenser would be of no value for the amplification of signals. The Key West station also operates with an undamped oscillation set at certain hours of the day at increased wave-lengths.

Ques.—(4) In what part of the apparatus would you suggest that a variable condenser be connected?

Ans.—(4) If the secondary winding of the receiving tuner is already fitted with a variable condenser we see no use for another. It might be employed advantageously in the reception of the shorter wave-lengths, but for wave-lengths in excess of 600 meters it is unnecessary.

* * *

J. E., Philadelphia, Pa., inquires:

Ques.—(1) What size wire is proper for an earth connection when using a 1-inch spark coil as a transmitter? Is it desirable that this wire be well insulated? My present earth connection seems to allow the spark to jump into the side of the house.

Ans.—(1) The earth connection should be of, say, No. 4 solid or stranded copper wire. The sparking taking place in your present earth wire indicates that you have a poor earth connection and consequently a difference of potential is set up between it and the building.

Ques.—(2) How often should the high potential batteries in my vacuum valve detector be renewed?

Ans.—(2) This query cannot be answered definitely, for the actual life of these batteries depends, to some extent, upon the length and conditions of service. Ordinarily speaking, they will last from eight months to one year.

Ques.—(3) Do you know of any method for fastening the guy wires of a mast to a tin roof without doing damage?

Ans.—(3) Not knowing the construction of the building, it is difficult to give advice. We cannot see how this can possibly be done without putting eye bolts in the roof. This work, if placed in the hands of a good tinsmith, should do no particular damage.

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F. V. E., Portsmouth, Va., asks:

Ques.—(1) Where can the following be purchased: Tellurium, galena, cerusite, arsenic and pyron?

Ans.—(1) Messrs. Eimer & Amend, 205 Third Ave., New York City.

Ques.—(2) Which are the best for general purposes, the 3,000 ohm or the 2,000 ohm telephones? I have heard that on account of their higher resistance, the 3,000 ohm telephones will not respond to weak signals.

Ans.—(2) The actual value of resistance is not so important as the construction of the telephone itself. Generally speaking, telephones of high resistance if properly constructed, give better signals with the crystal detectors than those of a lower value, although we have experimented with telephones of low as 1,000 ohms resistance which gave better signals than very high-priced telephones having 5,000 ohms resistance. It is not the actual resistance which determines the sensitiveness, but the magnetic effect produced on the diaphragm with a given amount of current which counts.

Ques.—(3) What should be the distance between the secondary and primary windings of the receiving transformer? I have one in which the secondary is 3½ inches in diameter and the primary 5½ inches in diameter. Would I secure better results if the coils were nearer the same size?

Ans.—(3) This is entirely a matter of coupling and if you desire a very tight coupling it would be better to have the coils of like proportions, so that one just slides into the other. If, however, you desire in the majority of cases to work with a small value of coupling, you may allow the measurements to remain as they are.

Ques.—(4) In the article, "How to Conduct a Radio Club," in the January issue, the secondary of the receiving transformer is larger than the primary. Is the primary meant to go inside of the secondary?

Ans.—(4) Yes.