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April

THE WIRELESS AGE

APRIL

1916

WIRELESS IN WARFARE

Another Graphic Article by a British Army Officer in the trenches "Somewhere in Flanders"

IN THIS ISSUE

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THE WIRELESS AGE

An Illustrated Monthly Magazine of
RADIO COMMUNICATION

Incorporating the Marconigraph

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

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CONTENTS

RENEWALS When your subscription expires you will find a renewal blank enclosed. You should fill out and return same with remittance at once to avoid missing a number. Positively no copies will be mailed on any subscription after same expires unless renewed, and we cannot agree to begin subscriptions with back numbers.

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The National Association—What They Think About It

I have read all the matter and announcements concerning the whole idea very carefully and wish to say I think this propositior. is a splendid one both for the amateurs individually and the Government (if the occasion should ever arise therefor) and you can figure on my most hearty approval and co-operation and help in any and all ways possible at any and all times. RALPH SHORT.

The address of Mr. White, printed in the November issue of THE WIRELESS AGE, was a message of hope and encouragement that should meet with a hearty response. It opened a vista to me, I know, and I look to the National Association as a means of fitting myself for future advancement. C. V. SMITH.

I received all of the Charter Members' Equipment and am much pleased with it, but the best of all is THE WIRELESS AGE. I would rather miss a meal than miss a single issue. J. C. HOLLMANN.

I am heartily in favor of your association and think it by far the best one. I have been interested in wireless for five years, and have often wondered why some such organization was not formed before.
E. FORD.

I am more than pleased with the equipment, to be frank. It greatly exceeded my expectations, and I was unaware that there were two books on the market that covered the subject of wireless so completely.
N. B. SCHOTT.

"How to Conduct a Radio Club," is a real pippin, and the rest of the charter members' equipment is fine. I was going to ask how long the charter memberships would be held open and I found it in "How to Conduct a Radio Club." Believe me, it certainly sounded good to my ears to hear that the charter memberships would be held open until May 1st. Wishing you the best of success, I remain, CHAS. H. BELL.

NATIONAL AMATEUR WIRELESS ASSOCIATION, 450 Fourth Ave., New York

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.

APRIL, 1916

The American Marconi Company's Annual Report

THE annual report of the directors of the Marconi Wireless Telegraph Company of America and the statement of accounts for the year ended December 31, 1915, were made public on March 27. The report says that the directors feel that substantial improvement has been made in the operation of the company's affairs notwithstanding the fact that progress has been hampered by the restriction of ocean travel and the postponement of the Marconi trans-Atlantic service owing to the European war, and that the year reflects the beneficial results of careful organization of executive and administrative forces. Several pages of the report are devoted to proposals for government ownership and operation of wireless stations and it is declared that "From every possible point of view there is not a valid reason for placing the government in the commercial radio business. There are controlling reasons of every character why this should not be done."

The operations for the past fiscal year show, before allowing the reserves, a net income of $288,994.66, as compared with $271,888.71 for the year 1914. The management of the company has affected a substantial reduction in expenses, totaling $111,054.55 compared with the previous year.

The income derived from investment of surplus funds amounted to $87,010.01 and adding $17,922.96 interest on stock subscription, the total income from these sources for the year was $104,932.97, as against $150,274.21 for the previous year. The reduction is explained by the liquidation of investments necessitated by capital expenditures. The reserves set aside out of the 1915 profits for the depreciation account have been determined on practically the same basis as in 1914. After setting aside all reserves, the net profits for the year amounted to $177,316.51, or an increase of 18.30 per cent. over the profits for the previous year. This amount has been added to the surplus, increasing that account to $541,887.52 at December 31, 1915, and the reserve set aside at that date against depreciation amounts to $373,415.34.

"The new policies of standardizing wireless equipment and contracting for its use on a basis which provides a fair return for the service rendered," says the report to stockholders, "are now well established with ship owners, and have found favor with newcomers into the mercantile marine field. Important economies in operation have been effected and have resulted in a substantial saving. . . . Although the efforts of your officers during the past year have been largely directed to conservation and perfection of organization on account of the indefinite suspension of trans-Atlantic activities, your company has extended its service materially and greatly raised the standard of its mechanical and electrical equipment, thereby laying the foundation for further extension of operations with the return of normal conditions.

"In view of the great interest in national preparedness, active co-operation with the Government has already been given by distributing among your company's operators blanks furnished by the Navy Department, by which these skilled Marconi men have been enabled to signify their willingness to serve the country in times of emergency. Many have already been enrolled on the official lists as available for war time service if needed.

"With wireless communication featured prominently in the official measures taken for the safeguarding of the country, it is reassuring to know that

your company, representing practically the entire American field of commercial wireless telegraphy, is managed by Americans and conducts its operations under the direct supervision of the United States Government. Any suggestion that its control is in the hands of foreign interests through capital investment is directly refuted by a very recent analysis of its list of stockholders, numbering 23,027, of whom 21,664 are residents of the United States."

The traffic department reported that notwithstanding that practically all passenger traffic to and from European countries has been suspended, and American shipping has been withdrawn from the Pacific, "it is gratifying to report that due to excellent coastwise service, the receipts from message traffic during 1915 were only about 8 per cent. less than for 1914."

The service which the Marconi system rendered in marine disasters and its usefulness in the tornado which swept southwest Texas in August, 1915, are interestingly reviewed.

It is pointed out that there has been no change in the commercial status of the trans-Atlantic stations, the high power equipments remaining closed to business on account of the war.

"Reliable and rapid service has been maintained between your company's stations in California and Hawaii, and the volume of traffic shows steady improvement," it is declared. "The Hawaiian stations are known as two-way stations, being constructed so as to work with California and Japan simultaneously. The Japanese Government recently notified your company that its new wireless stations at Funabashi and Otchisi near Tokio, are complete and tests are now being made daily with a view to early inauguration of a public service, spanning 5,000 miles of the Pacific. Negotiations on traffic regulations are now in progress with the Japanese Government Department of Communications, and it is expected that by means of the Japanese Government cables the service will be extended, to China, Manchuria and other Far Eastern countries.

"The new circuit connecting the United States with Alaska was opened in August, 1915. . . . Although operated in competition with the submarine cable, the wireless traffic has shown steady increase each month, and has given practically continuous service, whereas the cable is operated but six hours daily. Many times since the opening the cable service has been interrupted, and your company's system has furnished the only means of communication with the territory. A reduction of some 20-25 per cent. in rates, and the establishment of three classes of dependable service, has been the means of making the Marconi service exceedingly popular. . . ."

In that section of the report devoted to the engineering department attention is called to the fact that "the year brought about several interesting developments in the art of wireless telephone communication, and pending the decision of your research engineers as to the relative merits of these developments your Directors have thought it advisable to delay the commercial introduction of wireless telephone."

The use of the Marconi wireless system on railroads has been advanced materially. Many important railroads are considering the advisability of adopting the system.

It is stated that the engineers "have given special attention to the design of suitable wireless equipment for aeroplanes and are confident that highly efficient apparatus for communication from aircraft will soon be developed. The United States Government, and also foreign Governments have expressed the keenest interest in such apparatus."

In a brief review of the work of the legal department it is stated that the injunction issued in the suit by the company against the Atlantic Communication Company (the Telefunken system of Germany) has been modified to permit an increase of power in the Sayville station, and a bond filed to protect the interest of your company.

(Continued on page 500)

With the Signal Corps Service at the Front

By A British Army Officer

Editor's Note.—Like a peep behind the scenes of the European theatre of war is this story of wireless at the front, written by an eminent British army officer. With terse simplicity he has told what he saw of wireless on the firing line—told it so vividly that the reader, even as the author has done, will without difficulty be able to visualize a day spent with one of the wireless details of the Allies. ". . . the long Belgian road, the balloon high in the air, the crackle and sparks from the improvised table in the car and the tense faces and attitudes of the men who received the messages from those far above us who were seeing what we all hoped to view later—the trenches of the enemy"—in this way does the writer, who has been twenty months in the thick of the fighting, picture his visit to the radio corps. His remarks on preparedness are significant. "I got to know something of the service rendered by the wireless men," he says, "and the need for proper training ahead of the time when those services will be of the utmost value." The writer of this article is the author of "How Wireless Is Being Used in the War," which was published in the March issue of The Wireless Age. Circumstances born of the war require that his identity be kept secret.

WHEN I first saw Private Tommy Evans he was crawling along a very muddy ditch at the side of the highroad which leads from Ypres to Poperinghe. Just as my car came alongside him he yelled an inquiry as to whether there was anybody in the machine who could fix up his hand. He evidently saw the big red cross on the side of the automobile.

Tommy had torn his hand pretty badly with a piece of barbed wire and his first-aid package had already been used. After dressing his hand I asked him what he was doing. From the blue and white brassard on his left arm I knew he was attached to the signal division of the Engineers.

"Just tryin' to couple up these wires, sir," he answered, pointing to a number of telephone lines running along the ditch. "The shells have knocked out the line along here and the forward posts need communications."

A couple of days later I met Tommy again, when he came into one of the dressing stations to "borrow" a cigarette. I was sufficiently interested to question him regarding his former life and why he had taken up the branch of the service he was now in, and as his case is somewhat of a lesson and a very good example of the need for training young men along proper lines it may be of interest to the readers of THE WIRELESS AGE.

Evans was the typical product of the English Board School. He had received a smattering of the "Three R's and with them a mass of partly digested ideas of various sciences. As he had to leave his school at the age of fourteen in order to assist in keeping together the souls and bodies of his mother and eight brothers and sisters, he went no further than the law demanded as regards education. One special course—imparted by a very bored teacher for the space of one hour a week—had impressed Tommy greatly. It was designated "Elementary Electricity" and to that sixty minutes a week Tommy Evans looked forward with intense fervor.

If, as it happened in the story books, a kindhearted millionaire had met Tommy just then, the latter would have been taken from his surroundings and would, in a very few years, have attained high rank as an electrical expert. How-

ever, as this was in real life nothing of the kind happened. I am aware of the fact that there are educational institutions which would have granted Tommy much technical instruction but—in the first place he knew little or nothing of them or how to enter such places and, which was of some importance, working from six o'clock in the morning until six at night in a wholesale shop checking parcels is rather tiring work and leaves small margin for study.

On the other hand, if by education in school and proper suggestion through his daily paper, he had been made to realize that he could master the study he had learned in such a short time to like, Tommy Evans, when his country needed his services, would have been a trained man and not merely an enthusiastic amateur.

This is about the way he described his ambitions and disappointments to me:

"You see, sir, when this 'ere wireless business began to be somethin', I wanted to take it up. I was always balmy about electricity anyhow. But I had to work and I thought the night schools were only for the toffs. It's only since I joined on that I heard that I could have joined the Territorials and got what I wanted. Seems to me that I lost a lot by not knowing just what a chance I had. I got some books from the library and they helped, but I wish I'd known I could have learned this work long ago."

I am glad to say that Tommy's ambitions are now realized; that by the use of a little influence he was enabled to join the wireless branch. He is now a first-class man and many times I have seen him proudly displaying his sergeant's stripes and dashing along the Belgium roads in one of the automobiles detailed to the wireless service.

It was by keeping track of Evans and watching him at work that I got to know something of the service rendered by the wireless men and—*the need for proper training ahead of the time when those services will be of the utmost value.*

Thus it happened that I spent a day with one of the wireless details. It was shortly after the first big gas attack of last April (1915). In a clump of trees on the narrow muddy road from Poperinghe to Woesten I found the detail in charge of the wireless work and received a cordial invitation to accompany the men and watch them at work.

First of all, there was the balloon to send up, from which, five miles away the observers would be enabled to see the dim outlines of the German trenches and—possibly—catch the flash of the guns bombarding our lines. The balloon, looking like nothing so much as a greatly magnified banana, was dragged out into the field and the observer and wireless operator climbed into the basket hanging beneath it. Up and up it went until it reached the desired height—about 1,500

Somewhere in Flanders,
Feb. 14, 1916.

My Dear Mr. White:

Replying to your request for a few words on the wireless situation at the front I beg to send you herewith a short article descriptive of what I have observed. You are at liberty to use whatever portion of it you may find of value.

As you will see, I am not able to write technically on the subject, but I have done my best to make it interesting. The little I know of what is being done in the line of improvements I cannot, of course, mention, but I am sure you will be greatly astonished and pleased to learn, in time, how much has been accomplished.

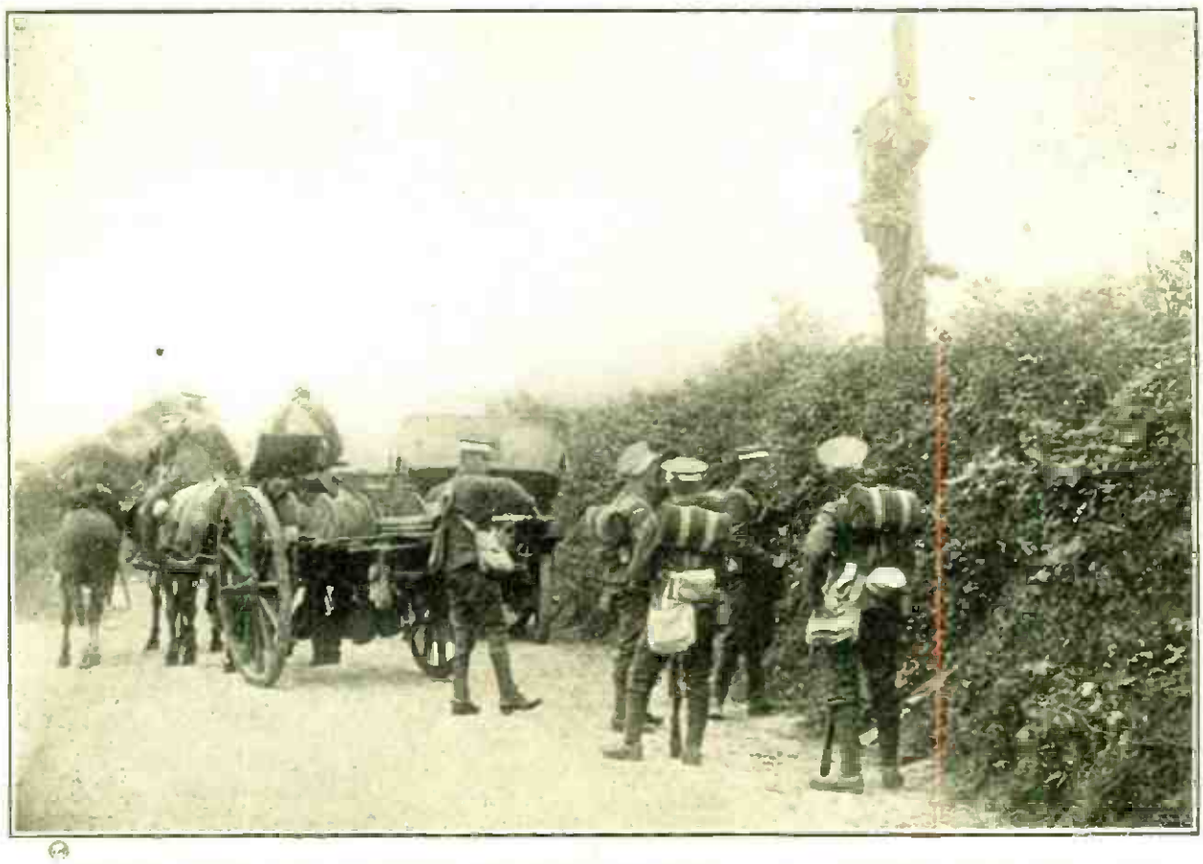
If anything I have written helps to make the young men of the United States realize the imperative necessity for proper training in advance of actual work in the field I shall feel that my labor has been well repaid.

Very sincerely,

.....

Major, H. B. M., Ex. F.

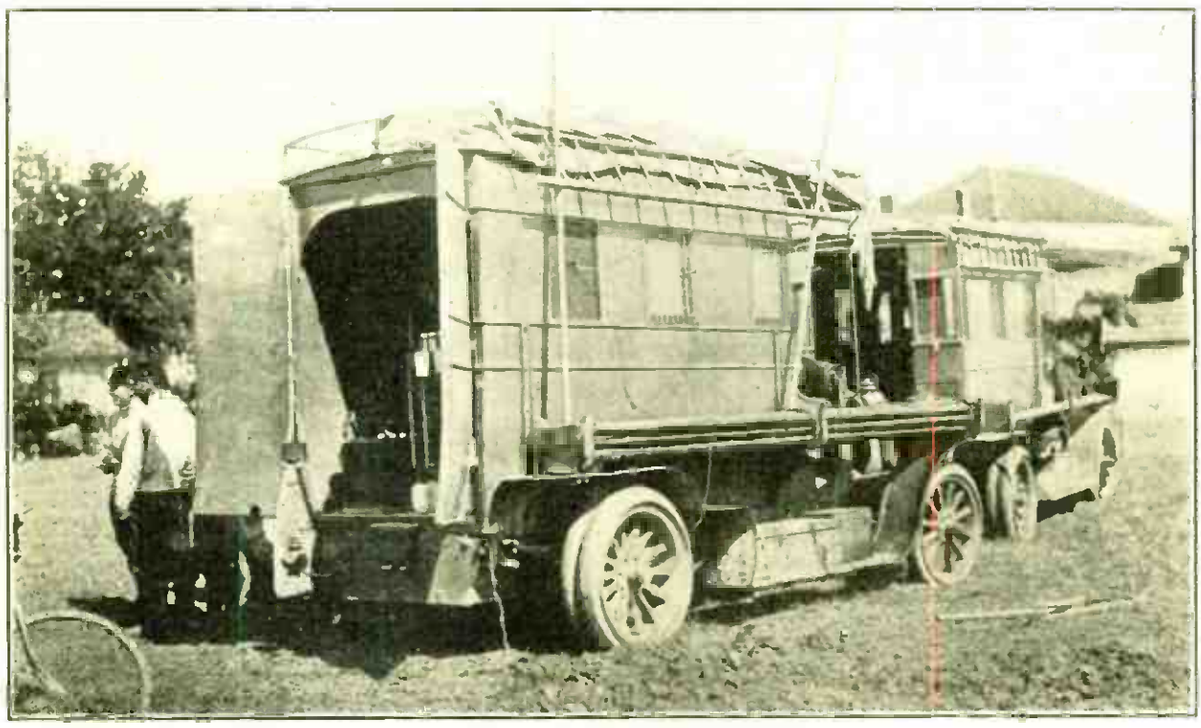
The letter to the editor which accompanied this article, written from the first line of trenches



British signal corps troops in the field establishing communication lines from the military base to the trenches

yards—and then it slowly drifted towards the enemy's lines, tugging at the cable which held it to the motor lorry beneath.

In the wireless car (once a fine high-class limousine but now changed over to such an extent that its former owner would never recognize it), were a radio



French field wireless tractors used effectively as "mother stations" to communicate with the light portable sets

operator and an officer. The operator received the messages as they were flashed from the sky, wrote them out and handed them to the officer.

On our thoughts of what was occurring a few miles ahead in the trenches, broke in the breathless voice of a motor-cycle orderly.

"Beg pardon, sir," he said, addressing the wireless officer. I've got to get a message to Colonel So-and-so, the Blankshires. My bally machine's broke. Can I get over your telephone to him?"

Unfortunately, there was no way of reaching the Colonel by telephone—but wireless came to the rescue. The message was sent through the air to the balloon operator who soon picked out the Blankshires' headquarters. By heliograph the message was sent in code and acknowledged—and another triumph was scored for wireless.

Later in the day we had another example of the value of the art. Again a motor-cycle orderly arrived, uttering curses loud and full of feeling regarding the Belgian mud which had caused his machine to skid with the result that it was thrown into a ditch and wrecked. The bearer of orders for more ammunition for Number Ten battery, he was on even more important service than the first orderly. The wires connecting the battery and the ammunition base were down all along the roads, but at headquarters, near the base, was a wireless station, and in a few minutes the needs of Number Ten were made known and attended to quicker than they would have been had the orderly's machine not gone out of commission.

A British supply train running under orders transmitted by wireless from portable stations established along the route

Notwithstanding all the wonders of wireless which have come to my notice I have never lost the sense of awe due to the realization that from the air, messages are being picked up and sent and that information of priceless value, which could not be transmitted by any other medium, is being received. And hereafter when I step into a wireless room on a

British motor supply train en route to the base of operations, accompanied by a motor-cycle messenger to deliver orders from communication points to the officer in charge

ship or into a receiving station on land, there will be instinctively added to this feeling the visualization of the long Belgian road, the balloon high in the air, the crackle and sparks from the instrument on the improvised table in the car and the tense faces and attitudes of the men who received the messages from those far above us who were seeing what we all hoped to view later—the trenches of the enemy.

Later that evening, after the balloon had descended and the night men had erected their masts and stood ready to receive and send messages to and from headquarters and observation posts in the trenches, I sat for a time with Tommy Evans, (now Sergeant Evans) discussing the day's work. I discovered then, to my great surprise, that most of the men had begun wireless work since they enlisted, and that, while all had been more or less interested in it, they had not taken it seriously until the necessity arose.

Among all those who have performed such excellent services for their country during this war none has excelled the men of the Signal Divisions. And this is particularly true of the members of the wireless branch. Of all nations England has paid least attention to the training of her young men in the radio art and it was only when the war broke out that the Government recognized the value of the enthusiastic amateurs who had "disfigured" the landscape by placing an-

Mounted orderlies whose duties and experiences in signal corps work are vividly described in this article

tennae on their houses and disturbed the nights with the crackle and spark of their instruments.

Every one interested in the radio art realizes that the European war has demonstrated the value of wireless telegraphy to no inconsiderable degree. After the history of this conflict has been written I am sure that due praise and honor will be given to the men of the service who have done so much in the face of big obstacles to make competent the wireless corps of the entente nations; for to train young men along serviceable military lines when their only asset was unbounded enthusiasm, has been far from an easy task. Nevertheless, this was done and to-day there is no more efficient force of wireless men than that of the Allies.. It must not be forgotten, however, that to obtain this result required a good deal of training after the war began and that much valuable time was lost, because of the fact that enthusiasm and loyalty, no matter how great, will never offset lack of knowledge.

On my last visit to England from the front I was so impressed by the usefulness of wireless that I induced two of my relatives who had declared their intention of enlisting to enter that branch of the service. One is now at the front and the other is taking instruction in wireless and aviation, for the purpose of using the two in combination.

The British Government, which controls the entire telegraph and telephone service of the United Kingdom, has ordered that every telegraph operator be given a course in wireless work. For this purpose thousands of text-books have been ordered and promotion will depend greatly upon a man's progress in this art. This, at least, serves to demonstrate that the British Government has learned to value wireless and sees the necessity for training men to be skilled in the art.

The British field wire telephone in operation under the direction of the signal corps

As fast as the radio education of these men is completed and they can be spared from the duties awaiting them in England, they will be detailed to army service at the front. The employment of mobile wireless stations with the supply columns is now being developed, but full information regarding what is being accomplished along this line cannot be made public now. However, at a future

date I may be able to give interesting details concerning this work and an explanation of how it is done.

I wish I could be in this country when Marconi returns to the United States and relates what he has accomplished at the front. He will give you the technical details of which I, unfortunately, am ignorant, and I am sure he also will be able to impress strongly upon you the necessity for a competent and thoroughly trained body of men, which will be ready and available at any time to handle the wireless work of the army.

How the art is used on the firing lines cannot, of course, be told of in detail as yet. When the war is over, however, if not before, the facts will be made public.

Just as it takes a crisis to develop a man, so it has taken this war to develop wireless telegraphy to a point which two years ago was undreamed of. And not the least of the many lessons learned in the war is that which has taught us that a well trained and competent body of wireless operators and signal men is one of the greatest assets an army can possess.

CHANGES IN CENSORSHIP REGULATIONS

Changes in the naval wireless censorship regulations have been announced by Secretary Daniels. A strict interpretation of the regulations as they were made when the Government placed naval censors at Sayville and Tuckerton prohibited the censors from passing for publication in the United States the German official statements if they made reference "to movements or locations of war or other vessels of belligerents." This operated to prevent Germanys statement of the result of naval operations being received direct from Germany, although they were received by cable via London after having passed through the British censorship.

The regulations as now modified by Secretary Daniels provide: "The restriction as to movements of war or other vessels of belligerents shall not apply to messages received from belligerent shore radio stations. It applies only to Germany, as Great Britain is using the cable."

PRAISES THE ANCONA'S OPERATORS

Pietro Buffa and Nicola de Crecchio, Marconi operators on the steamship Ancona, which was recently torpedoed in the Mediterranean Sea, have received favorable mention from the Italian Ministry of the Navy as a result of their bravery in time of stress. A letter from the under-secretary of state for the navy follows:

"The Committee who had charge of investigating the circumstances attending the sinking of the s. s. Ancona have felt it their duty to make special mention of the efficacious and commendable work done by the two Marconi operators, Mr. Pietro Buffa and Mr. Nicola de Crecchio, by making timely important communications to the captain of the ship, by the rapidity wherewith they sent wireless signals of danger and help so as to enable the French steamer Pluton to arrive at the scene of disaster only five hours after the sinking of the ship; and also because, not being in a position to continue their work on account of the wireless station being destroyed, they saved themselves only on the last lifeboat that left the ship.

"I am well pleased to bring to your notice the two operators, who in this disaster gave proof of serene energy and a high sense of duty.

"I therefore consider that they deserve special praise, which you will please give them in my name."

In order to observe strict neutrality during the European war the Columbian Government has suspended the operations of two wireless stations on the coast of that country.

How Wireless Has Served the Sea

Sixteen Years of Triumphant Achievements of an Unerring System and a Brave Devotion to Duty

PART ONE

A REMARKABLE record of achievement is presented by wireless telegraphy since the service was first utilized in controlling the forces of nature for the benefit of mankind. It shows what the aerial message has done to safeguard lives on board vessels disabled by storm or mishap; that come into collision in the ocean fog; that are wrecked on rocks or swept ashore. It shows how fire in midocean has been robbed of much of its historic dread and how rescue is brought to the helpless victims of warfare on merchant ships.

In no single instance on record has the Marconi system failed of its purpose, and even where sea or storm or fire or collision have temporarily disabled the apparatus, it has been quickly set aright and its intended work fulfilled.

All through this serial story of the sea's happenings runs the record of men living up to the traditions of the Marconi service. The list of such men who bravely gave up their lives to duty tells a story of courage amid difficulty and danger, of men who braved death to save the lives of others, men who were the last to leave the sinking ship.

The first recorded use of the wireless in rendering assistance to a ship endangered by collision, was on March 3, 1899, when the steamship R. F. Matthews ran into the East Goodwin Lightship. This accident was reported by wireless telegraphy to the South Foreland Lighthouse, and lifeboats were promptly sent to the relief of the lightship. It was an incident of small importance in itself, yet a harbinger of great deeds to come.

Years passed, and then suddenly occurred one of the greatest shipwrecks of modern times—one, indeed, in which the Marconi wireless service first impressed its overwhelming importance upon the public mind, through being the means of saving nearly 1,500 lives. With thirty feet of her bow cut away, the Italian steamship Florida, of the Lloyd Italiano Line, came slowly into the port of New York on January 25, 1909. Three days before, near Nantucket, she had run down and sunk the White Star liner Republic. The Baltic, also of the White Star Line, brought the survivors of both steamships into port. Thanks to the utility of the ether-waved call for aid, it was a story of lives saved rather than of lives lost.

The collision occurred in a dense fog shortly before six o'clock in the morning, while both vessels were out of their courses. While the passengers were huddled on the deck of the Republic, water pouring into a rent in her port side, one whose task was all-important was John W. (Jack) Binns, Marconi operator, to whom the survivors owed the swift summoning of distant ships, and the world owed what news it received within a few hours of the collision. A few moments after the Florida faded back into the mist whence she had come, the air above the ship was transmitting the code signal C Q D, which apprised the world of what had happened. The Re-

public's whistle kept going, and this brought the Florida back out of the fog to the aid of the vessel she had wounded. The passengers were then transferred to the Florida.

On board the Republic there remained only the Captain, the second officer, the boat's crew and the Marconi operator. Distant vessels, which had picked up the call for aid, were guided by Binns to the scene of the accident. And the cheering news had gone out to the world that the passengers were safe, the ships had not sunk and that there was no immediate danger. The wireless told its story all the livelong day and well into the night, until the electricity in the storage batteries gave out. The dynamos had gone when the engine room was flooded. But the great Baltic then hove in sight, and the Gresham from Wood's Hole.

The world was forced to marvel at the now historical story told by Captain Ransom, of the Baltic. "We got notice at six o'clock on Saturday morning," said the Captain, "that the Republic had been in collision and needed assistance, and we turned. We went back and commenced the search. It began at eleven o'clock and continued until eight at night. She was found finally by means of wireless. She heard our whistle and steered toward us, guided by wireless. As fast as our Marconi operator got a message, he rushed it to me. I have all the copies. One of them reads: 'You are now on our port bow. Can you see us? Republic.'

"Other messages read: 'You are now very close. Can you see our rockets? Republic. Steer east-southeast. Listen to our bell. Republic.'

Jack Binns, to whom the survivors of the Republic owe the swift summoning of rescue ships

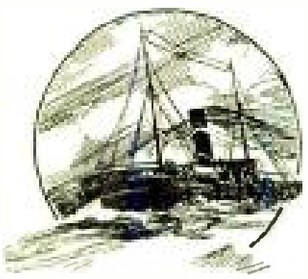
"It was a sort of blindman's buff, with the wireless messages coming, 'Now you are hot, and now you are cold.'"

The Republic rescue stands out in the lay mind as the first collision at sea to receive wireless aid.

Only two days previously, on January 20, the steamship Hamilton, of the Old Dominion Line, had been in collision with a car barge of the New York, Philadelphia & Norfolk Railroad, in Hampton Roads. The distress call was sent out by wireless, and soon after tugs were towing the badly battered steamer back to port. Then, on March 10, blanketed by a dense fog and proceeding at half speed, the coastwise steamship of the Maine Steamship Company, the Horatio Hall, Portland for New York, and the H. F. Dimock, of the Metropolitan Line, New York for Boston, met in the middle of the narrow channel known as Pollock Rip Slue, with a crash that sent the Hall to the bottom within half an hour and caused the Dimock to run ashore six hours later on Cape Cod Beach. The two steamships, looming out of the fog, had met in a crushing jar, the sharp, nose of the Dimock going through the side of the Portland boat. The wireless operator on the sinking Hall managed to transmit a brief message calling for aid, and then the passengers on the Hall were dragged to the deck of the Dimock, which began to list. Six hours of silence ensued, during which half a hundred wireless stations, commercial, government and amateur along the coast from Portland to New London, endeavored to obtain news of the accident. Revenue cutters, scouring the waters

up and down the coast, managed finally to reach the place of the disaster and rescue the men and women on the disabled Dimock.

The wireless next served its purpose in the rescue of endangered passengers on the steamship Ohio, which was rammed and sunk by a craft off the Alaskan coast on August 27. Vessels which responded to her calls for help saved 200 lives.



Lowering fogs, through which the helmsman guides the ship's uncertain way, are the most prolific causes of collisions, as can be seen in this summary of such events. The siren's voice is deadened and the location of the oncoming vessel is rendered uncertain by the ocean haze. It is the wireless only that can bring help to the stricken ships. Such was the case with the steamer Merida, of the Ward Line, which, on May 12, 1911, while off the Virginia Capes in a heavy fog-bank, bound for New York from Vera Cruz and Havana, was struck midships by the Admiral Farragut, on her way from Philadelphia to Jamaica. The wireless distress call was launched, and responded to by the steamship Hamilton, to which vessel all persons on board the two colliding ships were transferred before the Merida sank. The Admiral Farragut was helplessly disabled.

Next occurred the greatest marine disaster in world's history, when the Titanic, the largest passenger liner of her time, on April 15, 1912, came into collision with an iceberg and went to the bottom of the Atlantic, carrying with her nearly 1,400 lives. More than half that number of persons were saved, however, through the steadfast courage and self-sacrifice of the Marconi wireless operators, Phillips, the senior, and Harold Bride, his assistant.

Bride described the scene in the wireless room of the Titanic as follows: "Phillips and I were in the room. 'Send a call for assistance,' ordered the Captain, barely putting his head in the door.

"'What shall I send?' asked Phillips.

"'The regulation international call for help. Just that,' was the reply.

"Phillips began to read C Q D. 'Send S O S,' I said. 'It's the new call, and it may be your last chance to send it.'

"We picked up first the steamship Frankfurt. The Carpathia answered then, and we told her our position and said we were sinking by the head. Phillips told me the wireless was growing weaker. The Captain came and told us our engine rooms were taking water and that the dynamos might not last much longer. We sent that word to the Carpathia.

"How poor Phillips worked through it I don't know. He was a brave man. We picked up the Olympic and told her we were sinking by the head. As Phillips was sending the message I strapped his life belt to his back. Then came the Captain's voice: 'Men, you have done your full duty. You can do no more. Abandon your cabin. Now it's every man for himself.' Phillips clung on, sending and sending. He clung on for about ten minutes or maybe fifteen minutes after the Captain had released him. Water was then coming into our cabin. Phillips ran aft, and that's the last I ever saw of him alive."

Bride was washed off the foundering vessel, swam to the surface and was pulled aboard a boat and saved. His senior went with the other souls to the bottom.

Another scene of this ocean drama is related by Howard Thomas Cottam, wireless operator aboard the Carpathia, the ship of rescue:

"I got the Titanic C Q D call at 11:20 o'clock on Sunday night. It was this: 'Come at once. We've struck a berg. It's a C Q D call, old man."

Then the Titanic operator followed with his position, which was latitude 41:46 north and longitude 50:14 west. I think I received the C Q D seven to ten minutes after the Titanic struck. It was only by a streak of luck that I got the message. After hearing the Frankfurt, then I heard the Olympic calling the Titanic with a service message.

"All this time we were hearing the Titanic sending her wireless out over the sea in a last call for help. 'We are sinking fast,' was one which I picked up being sent to the Olympic. Just before we reached the Titanic I got this message, and it was the last one I received: 'Come quick, our engine room is flooded up to the boilers.' I answered that our boats were ready, and for them to get theirs ready also, and that we were doing our utmost to get there in time. Until we reached the spot where the Titanic foundered, I was listening for a spark from his emergency set, and when I didn't hear it, I was sure he had gone down."

Walter Seddon, first operator on the Volturno

Owing to its speed and the vast distances it travels, wireless aid is distinguished from all other forms of safeguard at sea by the promptness with which it communicates the story of disaster, and brings rescuers to the stricken ship. It was this feature of prompt service that saved all the lives aboard the steamship Madison, on February 22, 1912, when she was rammed by the Hippolyte Dumois; and resulted in the preservation of the El Sud in April, of that year, when she came into collision with the steamship Denver off Galveston Bar. The El Sud was not equipped with wireless, but, fortunately for her, the Denver was, and in response to calls sent out by the latter, assistance came and the injured steamship was towed into Galveston.

Christopher Pennington, second operator on the Volturno

Similar promptitude on the part of Arthur Ridley, of Ridge Hill, Mass., the Marconi operator on the Millinocket, in summoning a tug and a lighter, when that vessel was struck by the steamship Persian on July 24, 1913, resulted in the successful docking of the injured ship. A wireless appeal for assistance brought an equally prompt response to the steamship Pleiades, in October of the same year, when she was struck by an unknown steamship off the Pacific coast. A tugboat appeared in answer to the call and towed the Pleiades to port in safety. There would undoubtedly have been great loss of life in an accident which occurred ninety-five miles south of Hatteras on November 1, had there not been a speedy response to the radio call. The steamship Norwega came into collision with the schooner Glenlui, tearing a hole in her side of such enormous size that she rapidly filled with water. A passenger vessel, two revenue cutters and a battleship were soon at hand and saved all on board.

The fine spirit of devotion that typifies the Marconi service was next exemplified by the heroic conduct of a wireless operator, who sacrificed his life in humanity's cause. It was in a heavy fog off Hog Island, sixty miles from Cape Charles, on the morning of January 30, 1914, that the Old Dominion Line steamship Monroe came into collision with the smaller ship, the Nantucket, of the Merchants' and Miners' Transportation Company. Ferdinand J. Kuehn, chief wireless operator on the Monroe, who was in the operating room when the accident occurred, notified his assistant, R. S. Etheridge, and sent the S O S call. Etheridge fetched two life preservers, and while one was being put on by Kuehn, Etheridge continued sending out the S O S, giving the position of the Monroe which was sinking rapidly.

Etheridge then dashed for a lifeboat and was picked up by the Nantucket. Kuehn was standing on deck when a woman ran toward him. "Where is your life preserver?" he asked. "I have none. Oh, I am lost," she cried. Kuehn took off the one he wore and fastened it upon her. Then he led her to the rail and helped her over. Attempting to enter

the boat, Kuehn missed his footing and fell into the water. He managed to keep afloat for a while, during which time efforts were made to rescue him, but the water was too cold and he finally sank, after having given up his life to save another. The Monroe sank ten minutes after the collision. Forty-three lives were lost and ninety-eight persons rescued as a result of the help that arrived in answer to the distress call.

Again this lesson of courage and strict attention to duty was heralded to the world, several months later, when two wireless telegraphers on a sinking liner, at the risk of their lives, sped the message of disaster to the nearest shore. The Empress of Ireland, bound for Liverpool, had left Montreal on May 27 in a thick fog. When in the St. Lawrence River, 150 miles from Quebec and ten miles from Rimouski, she came into collision with the Danish collier Storstad, with fifty men aboard, feeling her way through the fog, inward bound. The collier crashed into the liner and tore her side open to the stern. The two Marconi operators on board the Empress were Ronald Ferguson, senior, and Edward Bamford, his assistant. While the vessel began to list, the operators quickly sent out the S O S, reaching the land operator at Father Point. Then the lights went out aboard the Empress, she careened and sank.

Meantime, the operator at Father Point sent word to the Canadian government boats Eureka and Lady Evelyn, which steamed to the scene of the disaster. They found 452 survivors in the lifeboats of the Empress, among whom were the two operators. The death list of the disaster was placed at 1,024, and the prompt work of the Marconi operators undoubtedly served to save those who were rescued from the foundered vessel.

On the morning of August 25, of the same year, the steamship Admiral Sampson, owned by the Pacific Alaska Navigation Company, was feeling her way carefully along her course, off Point-no-Point, near Seattle, Wash. The greater number of the passengers were asleep in their berths, but some of them, aroused by the siren, had come on deck. The Princess Victoria, of the Canadian Pacific Line, was also making her way through the fog in much the same cautious manner as the Sampson. Fog whistles on both vessels sounded continuously, but the thick mist blanketed the warnings. The Victoria rammed the Sampson, a steel vessel, directly on a line with the after hatch, cut three-fourths of the way through her, and opened a twelve-foot gash in her own steel plates, in which the cover of the Sampson's hatch was still jammed when the Canadian Pacific liner arrived in Seattle with the survivors.

The vessels were so close together that the majority of the Sampson's passengers were able to climb on board the Victoria. The bow of the Victoria entered the side of the Sampson at a point where a considerable quantity of fuel oil was stored and crushed several large containers. They were set ablaze, and in an instant both vessels were enveloped in flames. When the Victoria backed away, the Sampson's side was left uncovered and she began to settle and went to the bottom four minutes after she was struck.

W. E. Reker was the senior wireless operator on the Sampson, and while the vessel was foundering, he made his way to the Captain on the bridge, preferring to share whatever fate overtook his commander rather than seek safety by leaving the doomed craft. The two men faced death fearlessly in the line of their respective duties, and were drowned. Not less praiseworthy was the conduct of H. F. Wiehr, the junior Marconi operator. He stayed on the Sampson until the last, finally being compelled to jump over the side, and was picked up by one of the lifeboats.

Meantime the wireless operator on

the Victoria had sent out the S O S call, which was picked up at the Marconi station at Seattle, and established communication with the steamship Admiral Watson, which came to the aid of the injured vessel.

The steamship Metapan, of the United Fruit Company's Line, on October 15, was rammed in the fog by the freighter Iowan, of the Hawaiian-American Line, at the entrance of Ambrose Channel, New York Harbor, and sank. When the collision occurred the wireless operator on the Metapan sent out a call for assistance, which was responded to by vessels in various parts of the harbor, and all on board were rescued.

Ferdinand J. Kuehn, wireless operator on the Monroe

On January 24 of the following year, the Washingtonian, of the Hawaiian-American Line, came into collision with the five-masted schooner Elizabeth Palmer, off Delaware Breakwater. The Washingtonian sank, and the schooner was abandoned with her decks awash, only one life having been lost. Captain E. D. Brodhead, of the Washingtonian, ordered the lifeboats to be made ready, and into them the crew of forty-odd men tumbled. There were also thirteen men and one woman on the schooner. All made their way safely to a lightship, and wireless messages sent from the station there summoned the steamship Hamilton, of the Old Dominion Line, which stopped and took aboard the victims of the wrecks, and conveyed them to New York.

But it is not only in the solitude of midocean or in the perilous channel that the wireless teaches the lesson of its superb value. Its service is as efficient on the lake or the inland water course. This was shown on March 25, 1915, when the steamship Parisian grounded in the Mississippi River. While in this position she was struck two days later by the Heredia, of the United Fruit Company, which had 164 passengers aboard. Wireless brought prompt aid to the two distressed vessels.

On May 26, 1915, the S O S aided in the rescue of 230 passengers who were aboard the Holland-American liner Ryndam, which was in collision with the fruit steamer Joseph J. Cuneo, south of the Nantucket Shoals. Water poured in torrents into the hole which the Cuneo tore in the side of the Ryndam, and the bows of the fruit steamer were stove in, she also taking water rapidly. On board the Ryndam were two Marconi operators, B. Moore, senior, and A. T. A. Le Clercq, his assistant. They sent out the distress signal while the passengers were being transferred to the Cuneo, which was the least damaged of the two vessels. The battleships South Carolina, Texas, Louisiana and Michigan responded to the call, and the South Carolina took aboard the passengers who had sought safety on the fruit steamer. No lives were lost.

Even in casualties at sea, where the wireless is not the direct means of saving life, or ship or cargo, the mere fact that the service is at hand, ready for immediate use, brings solace and hope to those endangered. This is made evident in the following list of accidents: On June 13 of the same year there was a collision between the Metropolitan Line steamship Bunker Hill, bound from New York to Boston, with 250 passengers, and the steam yacht of C. K. G. Billings, the Vanadis, in a fog off Eaton's Neck, L. I. Two persons were killed and several injured as a result of the accident. Ingalls and Pitts, Marconi operators on the Bunker Hill, sent Marconigrams to New York, giving news of the accident. The Bunker Hill returned under her own steam, and several vessels which had received the wireless message volunteered their aid, which, however, was not needed.

Raphael Emanuel, the Templemore's operator

The pilot boat New Jersey was rammed and sunk by the United Fruit steamer Marchioneal at the eastern entrance to Ambrose Channel on July 10, 1915. The crew was saved by the Marchioneal, and S O S calls brought assistance, which, again, was not needed.

The presence of wireless apparatus lent courage and steadiness to those aboard the steamship Dorchester, when, on May 28, she was rammed by the schooner J. A. Palmer, off Annapolis, Md., and the aerial message was utilized to apprise the world that no lives had been lost. And when, on June 16, the steamship Alabama was struck by the Delaware, fifty-three miles south of Scotland Lightship in a dense fog, and neither vessel suffered serious damage, wireless was used to relieve the anxiety of the owners. Also on February 1, 1916, when the Takata Maru came into collision with the Silver Shell, the fact that the last-named vessel had rescued the former's crew was sent by wireless to the Marconi stations at Boston and Cape Race.

There is probably no danger that is dreaded more by the seaman or the sea traveler, than the ship afire. Storms may be outlived, and the ship with broken propeller blades may drift, but flight, as a rule, is the only salvation from the burning ship. But the aerial message brings aid so swiftly to those marooned on flaming vessels of late years that the dread of this form of calamity has been materially lessened.

Plying between Panama and Peruvian ports, the steamer Huallaga, of the Peruvian Dock & Steamship Company, took fire at sea on July 20, 1910, off the north coast of Peru. In fighting the flames, three of her seamen perished. Wireless operators flashed the S O S which was received by the steamship Ucayali. Making all haste, the rescuing vessel arrived in time to take off all the passengers and the remainder of the crew. Three days later, July 23, the Momus, of the Southern Pacific Company, bound from New York to New Orleans, took fire south of Cape Hatteras. Under the directions of Captain Boyd, the crew fought the flames for hours, but the fight becoming hopeless, the Captain summoned aid by means of the wireless. The steamship Comus responded to the call, not only taking off the passengers safely, but assisting in subduing the flames. The cargo and vessel, valued at $3,000,000, were saved. Again, on January 25, 1911, the Queen, of the Pacific Coast Steamship Company, while off Point Reyes, Cal., developed fire in her forward hold. The distress call brought four steamers to her assistance and the crew and eighty-seven passengers were saved.

The year 1913 was one in which there occurred an unusual number of fires at sea. Never before did the Marconi wireless service have a better opportunity to prove its utility. On June 10 of that year, the Olinda, of the Munson Line, with five passengers aboard, caught fire at sea. In response to the S O S call, the U. S. S. Nashville went to her assistance and took off the passengers in safety. Fire started on the British steamship Templemore on September 29 while she was on a voyage from Baltimore to Liverpool. Raphael Emanuel, the Marconi operator on board, sent out the distress signal, which was picked up by the steamship Arcadia, fifty miles away. While the Arcadia was hurrying to the burning ship's relief, the Templemore was consumed by the flames, 800 miles east of the Virginia Capes. Passengers and crew were in the lifeboats when the rescuer arrived and took them aboard. During October the steamship Berkshire was burned off Lookout Cove, N. C. The S O S call was heard at Wilmington, 164 miles away, by the revenue cutter Seminole, which reached the scene of disaster in time to take off all the passengers. After the flames were extinguished the following day the vessel was towed to a safe anchorage.

Of all the marine disasters of that fateful year, the most sensational was the burning of the immigrant ship Volturno, which was ablaze from stem to stern in a terrific storm in the Atlantic, 450 miles east of Newfoundland, on Thursday, October 9. Wireless calls fleeting over the ocean, brought ten vessels to the rescue, but for more than twenty-four hours they were compelled to cruise about the flaming vessel, incapable of rendering help because of the fierce wind and turbulent sea. It was not until the next morn-

ing that it was found possible to transfer passengers. Of the persons aboard, 521 were rescued. The others, numbering 136 souls, lost their lives in the raging seas, which smashed the lifeboats against the sides of the Volturno and spilled their human freight into the water.

The Marconi wireless operators on the Volturno were Walter Seddon and Christopher Pennington. Pennington performed his duties courageously while menaced by peril and escaped from the vessel by leaping into the sea. Seddon was an occupant of the last boat that left the doomed craft.

With seas running so high that it was seemingly impossible for small craft to live in the waves, 103 passengers of the Spanish steamer Balmes, which was threatened with destruction by flames, were taken from the burning vessel by the Pannonia, of the Cunard Line, on November 14, after aid had been summoned by the Marconi wireless. The rescue occurred 600 miles east of Bermuda. While Captain Ruiz, of the Balmes, and his men battled with the flames, Inocencio V. Michavila, senior Marconi operator, began sending the S O S. The Pannonia was 287 miles distant from the burning ship when the call of distress was received by the senior Marconi operator, Stanley G. Rattee. His assistant, Edward Murphy, who was in the ship's hospital, crawled from his berth to the wireless room to aid his comrade in gaining the location of the distressed vessel. The Pannonia rescued 125 persons from the burning ship. At the time of the rescue the crew of the Balmes was reduced to the last degree of exhaustion, and the firemen lay about the deck so overcome, as a result of asphyxiation, that they had to be relieved every fifteen minutes.

The freighter Columbian, bound from Antwerp to New York, caught fire on May 3, 1914, while 300 miles south of Cape Race. The members of the crew were driven to take refuge in the lifeboats, and fifteen of them perished. Thirteen of the survivors were picked up by the steamship Franconia, of the Cunard Line, fifty hours after the men aboard the ship had been driven to the boats by a serious explosion of unknown origin. Among those taken on board the Franconia was James Drohan, the Marconi operator on the Columbian. This rescue was made possible by the receipt by wireless of news of the disaster by the Franconia's Captain from other ships that had passed the burning Columbian after she had been deserted by her men. The Cunarder searched for the boats of the survivors and picked up the one containing the thirteen men. The Cunarder, by wireless, then cautioned other vessels to be on the lookout for the missing boats of the Columbian, which resulted in the rescue of the remaining survivors by the Manhattan and the Seneca. In all thirty-one lives were saved.

On September 1, while the City of Chicago, twelve miles out from Chicago, was learned to be on fire, apprehensions regarding the safety of those aboard were quieted by the comforting assurance, transmitted by wireless, that the vessel was in no danger, and in time she returned safely to port.

Another spectacular marine disaster, which caused much anxiety to the friends and relatives of those aboard the vessel, was the fire of mysterious origin on the French liner La Touraine, bound from New York to Havre, with a cargo of ammunition. An S O S call sent out by the liner on March 6, 1915, apprised the world that a serious fire had developed on board and that the flames were spreading at an alarming rate. The call was promptly answered by the steamships Arabic, Cornishman, Swanmore and Rotterdam. The Rotterdam was the first to arrive, and announced her readiness to take off the passengers, but by that time the crew had made headway against the flames. The Rotterdam, however, remained nearby, ready to lend aid, and escorted La Touraine as far as Prawle Point, where two French cruisers came in sight and convoyed the injured vessel to Cherbourg.

This year also was one prolific of fires. In the month of May two ves-

sels were saved from destruction by the prompt summoning of aid by wireless. The steamship Standard was at sea in latitude 22:50 north, longitude 88:18 west, on May 18, when fire was discovered in her oil-fuel bunkers. The distress calls brought the steamships Bradford, Winifred and Alfonso to the scene. They fought and extinguished the flames and the Bradford towed the disabled vessel into Key West. On May 28 the steamer Mackinaw was on fire off San Francisco, and wireless calls brought tugs to the assistance of the burning vessel.

Alarm occasioned by a fire on board the steamship Sucha, on July 22, while in the Gulf of St. Lawrence, was emphasized by signals for help sent out from the ship and received by the Royal George. The latter proceeded to the rescue, but received word later that the fire had been controlled and help was no longer needed, which cheering information was promptly sent to shore by wireless.

Nearly 500 persons, abandoning a burning vessel in midocean, were rescued from their distress through the beneficent aid of the Marconi wireless service on September 11, when the Greek liner Athenai, bound from New York to Piraeus, caught fire. The vessel was entirely destroyed. The passengers and crew, numbering 470 souls, crowded in lifeboats, were rescued by the Tuscania and the Roumanian Prince. Two days later the lives of more than 1,700 persons were saved through the summoning of assistance by aerial messages. The Fabre Line steamship Sant' Anna, from New York to Naples, was thronged with 1,700 Italian reservists when she caught fire in midocean. The S O S call brought the Ancona to the scene. She took off 600 persons and convoyed the distressed vessel to port.

On November 1 the steamship Rochambeau sent out wireless calls, stating that she was on fire, which were immediately answered by nearby vessels. The ship, however, sent messages subsequently, stating that the fire was under control and that assistance was not required. In this instance, as in others, failing in the wireless service, the world would have undergone anxious days of waiting before this cheering news could have reached land.

Another instance occurred, where, without the prompt assistance obtained by wireless, a vessel and her cargo would have been a total loss, when, on November 9, the steamship Lievatta, loaded with cased kerosene and gasoline, caught fire sixty-five miles east of Sabine Bar, Texas. The danger was reported by aerial message to the steamship Gulfstream, which arrived and stood by the burning ship until other assistance, summoned by wireless, arrived from Port Arthur and Galveston.

Such is the record to date of the value of the Marconi service in lessening that dreaded danger of navigation, "the ship afire at sea."

The aerial message serves unexpected ends. Many an injured seaman owes his well being, if not his life, to the fact that aid was summoned on his behalf from some doctor or surgeon hundreds of miles distant, when no other help was available.

While the oil steamer Asuncion was off the port of Eureka, Cal., on March 11, 1909, the Humboldt wireless station received from her a message saying that one of the sailors had fallen from the rigging to the deck, sustaining injuries resulting in severe internal hemorrhages. Medical advice was solicited for the injured man. The wireless station at once communicated with the marine physician, Dr. Charles Falk, who prescribed treatment. The vessel remained hove to until the directions of the physician had been received by wireless, when she proceeded on her way, while the remedies presumably were applied.

Captain McGray, of the steamship Herman Frasch, was stricken with ptomaine poisoning and at the point of death, January 2, 1911. A wireless message was promptly sent to physicians of the United States naval station at Dry Tortugas, Florida, about 100 miles away. The operator of the Merida, which was leaving the harbor

of Progreso, Yucatan, about 800 miles away, caught Captain McGray's message asking for a prescription and method of treatment. The reply, written by the surgeon on the Merida was received on board the Herman Frasch before the naval station at Dry Tortugas could respond. Captain McGray, following directions, prepared a remedy from his medicine chest and soon recovered.

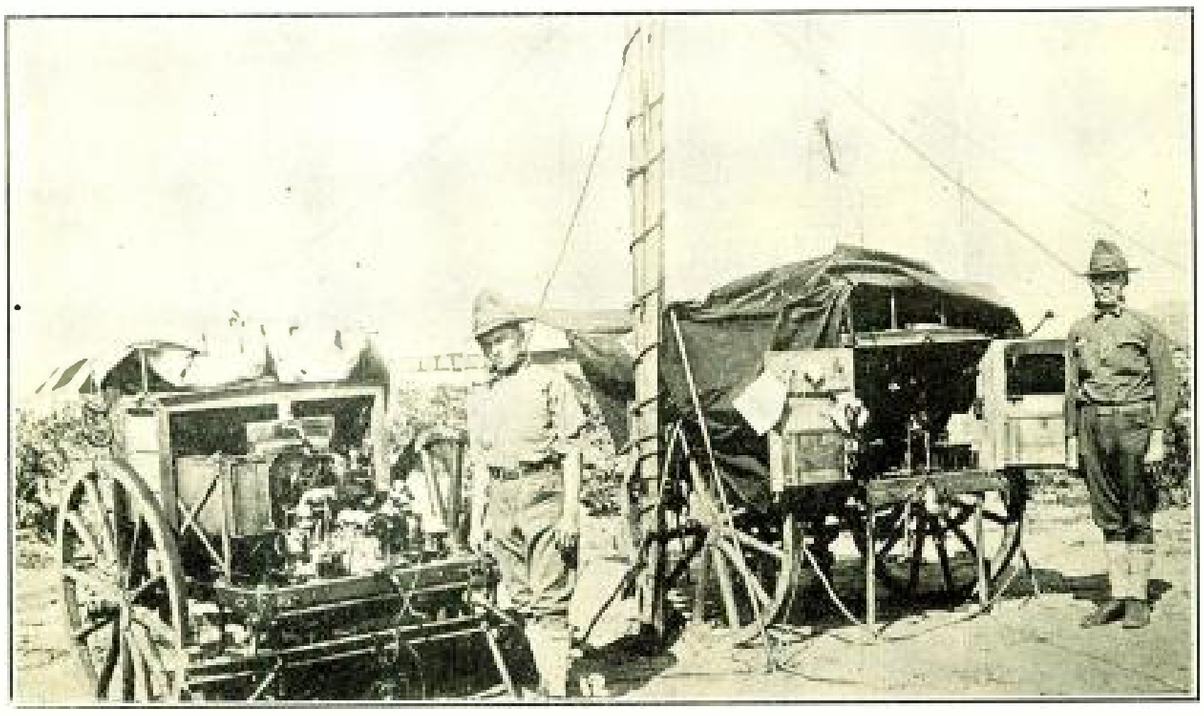
Dr. Ernestus O. Kuhr, of Brooklyn, New York, was aboard the Ward liner Esperanza, in March, 1913, when, on nearing Havana, the vessel's wireless caught a call for medical aid. The call came from the Altastad, a Norwegian freighter. It was explained that William Murray, a Marconi tester aboard, had his arm badly infected. The doctor told him that the case was one for immediate operation, and advised the opening of the arm with a sharp, properly sterilized penknife. He instructed the patient to use carbolic acid freely, and sent detailed instructions for dressing the wound.

A wireless call for a surgeon was sent out by the Marconi operator on the steamship John A. Hooper, in September, 1915. The appeal brought aid to Miss Annie Christiansen, a passenger who, during a severe storm, fell to the floor of her stateroom, sustaining a fractured leg. Aid was rendered by a surgeon on the steamship Allianca, which, although thirty-five miles away, responded to the call. The sufferer received directions by which she could alleviate her distress temporarily. The doctor, however, advised that the patient be sent to the nearest hospital, which was at Kingston, Jamaica, where the young woman was taken.

A wireless call was sent out from the steamship "Radiant," on October 11, 1915, asking for the proper treatment to be extended to the ship's engineer, who, for three days, had remained unresponsive to medicines administered by the captain. The Marconi operator, William C. Thompson, communicated with the station at Tampa, Florida, and then with the Southern Pacific steamship Comus, from which the doctor's advice was obtained, and the sick man was greatly relieved.

These are only a small part of the achievements of the wireless message, which insures comfort and safety to those who go down to the sea in ships.

USING FIELD SETS IN PURSUIT OF VILLA



A close view of the wireless equipments employed by United States troops when in the field. The apparatus is of light construction and can be erected and dismantled in a short time. It has great value as means of communication for the United States forces sent on the punitive expedition into Mexico against Villa because of the ease with which the wire telegraph lines can be cut

A Dream That Materialized

(From the Cedar Rapids, Iowa, Gazette)

ABOUT eight years ago two men visited Cedar Rapids as representatives of a company that was financing a wireless telegraphy project. They explained that a man named Marconi had perfected an invention that was going to revolutionize the telegraphic world and they were traveling in the West for the purpose of selling stock, the proceeds from which were to be used in developing and marketing the Marconi wireless.

Most people were skeptical. The representatives had wireless apparatus with them and they gave demonstrations in the auditorium. Some persons, somewhat less skeptical than the majority, invested a little money in the stock. That was the last they heard of the men who delivered the certificates and took their money. They never received any dividends, and they grinned at one another and decided that they had been victims of a flim-flam.

Recently a Cedar Rapids woman decided to find out whether her stock was valuable or worthless. Marconi has become famous, as has his wireless system of telegraphy. The local woman wrote to the American Marconi representatives in New York. They replied that her name was not on their stock books and that, so far as they could discover, she owned none of their stock. They requested that she send her coupons to them, so that they might learn how the fraud was perpetrated. She complied with their request.

A reply came from New York to the effect that the stock was good, but that it had been issued by the Marconi Company of London, not by the American company. They advised the woman to get in touch with that concern, and she did so. Then she received dividends for the last eight years. There are a few other owners of Marconi stock in this vicinity. They can obtain money in the same way.

Just a few years ago people were calling Marconi a dreamer. They laughed at his plan to transmit messages across miles and miles of sea without the use of wires. But Marconi had courage and convictions—without which, by the way, no man achieves greatly—and he refused to be laughed down. Now he is hailed as a genius, one of the inventors who pave the world's path of progress.

Without its dreamers this old planet would be a poor place in which to live. Contrary to the common belief, it is the dreamers who do. Edison dreamed, and now we can hear Caruso and Melba as they sing from a small, round stage of black glue in the top of a mahogany box. Bell dreamed and we speak across the continent over the telephone. Dreams built the first skyscraper, the first steamship, the first locomotive, the first submarine, the first air ship, the first subway. Dreams have been responsible for most of the world's great achievements.

That is why Cedar Rapids people who once had a small amount of faith in what then was widely thought to be a dream, now can collect dividends on their Marconi wireless stock.

THE SILVER SHELL AND TAKATA MARU IN COLLISION

The Shell oil tanker Silver Shell and the new Kippon Line steamship Takata Maru came into collision on the night of February 2, about 200 miles southeast of Cape Race. The crew of the Japanese vessel was transferred to the Silver Shell before the former vessel sank, while the British tramp Armonia and the steamship California, both of which were summoned by wireless, stood by to render aid if necessary.

The steamship Alamo, 130 miles off Cape Hatteras, sent out a wireless call for aid on March 23, and the coast guard cutter Onondaga went to her assistance.

The President's Letter

What the Communication from Woodrow Wilson to the National Amateur Wireless Association Means to Amateurs and How Their Obligations as Patriotic Americans Can be Fulfilled

By J. Andrew White
Acting President, National Amateur Wireless Association

ADDED to the strong endorsements of the National Amateur Wireless Association given by the Secretary of the Navy, the Superintendent of the Naval Radio Service and the Chief Signal Officer of the radio service of the United States Army, the letter from President Wilson, reproduced in this issue, establishes very definitely the standing of the organization with the official nation.

President Wilson's letter is one that must mean a great deal to every member who holds the emblem and certificate of the National Association. "It is only through the agency of such organized bodies that maximum efficiency can be obtained," he says. That means in effect that the development of the amateur to the point of recognition as a factor in the affairs of the country, is due solely and simply to the carefully devised plans for standardized instruction and supervision of activities; it means that the individual amateur who has not availed himself of the co-operation of the Association is still unrecognized as a progressive worker and has no more standing than in the days before the organization came into existence.

The President has paid a sterling tribute to the executive personnel of the Association in stating: "The organization of the amateur radio operators of this country under the direction and control of representative American civil, military and naval officials, would undoubtedly be a valuable asset to the nation." This statement reflects his confidence in the men who direct the Association's affairs, states in so many words that the development of its members and the co-ordinated efforts of its chartered clubs will "undoubtedly be a valuable asset to the nation."

These are very encouraging phrases from a man noted for his conservatism in approving the activities of newly established organizations. Nothing of the kind has ever been given out over the President's signature to movements of similar nature, and this endorsement followed careful investigation into the operations of the body destined to exert a nation-wide influence in the highly specialized field which it represents.

President Wilson has recognized that the auxiliary services which the National Amateur Wireless Association offers to all Americans cannot be duplicated under any existing plan; he has appreciated —to use his own words—that "the value of such an organization in co-ordinating the activities of a large number of specially qualified young men along carefully planned lines will be of great benefit, not only in an educational way to the young men themselves, but also to the country at large when the necessity for their employment, individually or as an organization, may develop."

It is significant that he recognizes N. A. W. A. members as "specially qualified young men." Amateur wireless opera-

tors developed under the Association's tutelage are thereby set ahead of those conducting their experiments individually under hit-and-miss methods.

The President's letter should be highly prized by every member and, at the next meeting of the administrative board, as Acting President, I shall propose that a copy of it be placed in the hands of each of the 1300 members.

While on the subject of messages to N. A. W. A. members, I should like to call attention to the letter published in the March issue in which Col. Reber, our vice-president, and the army's chief radio signal officer, mentioned that our operators "will be of great service to the War Department in case of emergency."

There are at present a dozen or more signal corps companies being organized by Association members. The Eastern States are particularly active, but with the single exception of a military signaling organization being created in Texas, the balance of the country is not so well represented in this movement as I should like to see it. It may be, of course, that members and clubs have done organization work of this kind and have failed to advise the Association of their progress. A military committee has been formed at the New York headquarters, and it is suggested that full particulars of all activity of this kind be forwarded for registration. The summer season will soon be upon us, and full data should be in hand early, so arrangements can be made for quarters in the military camps.

Never before in the history of the nation has it been more evident that with efficient communication in time of war, rests the success or failure of campaigns. Since the March issue of THE WIRELESS AGE reached your hands, the American army has entered Mexico in pursuit of the bandit Villa. As I write this short message to members, it is rumored that communication by wire between the border and General Pershing's punitive expedition in Northern Chihuahua has been cut off. It is reported also, that the army's field wireless station at Casas Grandes, is temporarily out of commission. Major Sample, by latest advices, has announced that the field telegraph line, running from Columbus, N. M., to a point thirty miles south of the border, has been cut in twenty-eight places.

What the chase will come to, cannot even be surmised at this time. When this magazine reaches readers the expedition may have finished its work successfully, or any number of complications may have arisen. But aside from predictions which cannot be made, the movement of the troops into Mexico has emphasized what I have said before on the subject of *trained* men.

Col. Samuel Reber, the U. S. Army's chief radio signal officer and a vice-president of the National Amateur Wireless Association, who has declared that the trained members "will be of great service to the War Department in case of emergency"

It required one week to get the flying column off, and this is considered unusually rapid work. If, with the men already on the border—men trained for warfare, fully equipped and under experienced commanders—a week was required, how long would it take to send a large army of untrained men into the field if the country is invaded by some first-class power?

This is written on March 22. Excepting four and one-third regiments of

The President and his secretary, photographed in the White House. The President's letter, endorsing the National Amateur Wireless Association as an organization of great benefit both to its members and the nation, appears on the opposite page

THE WHITE HOUSE
WASHINGTON

The organization of the amateur radio operators of this country under the direction and control of representative American civil, military, and naval officials, would undoubtedly be a valuable asset to the nation, as it is only through the agency of such organized bodies that maximum efficiency can be obtained. The value of such an organization in co-ordinating the activities of a large number of specially qualified young men along carefully planned lines will be of great benefit not only in an educational way to the young men themselves, but also to the country at large when the necessity for their employment, individually or as an organization, may develop.

Woodrow Wilson

The letter reproduced above was received on March 1 by J. Andrew White, Acting President, National Amateur Wireless Association, accompanied by a note from Joseph P. Tumulty, Secretary to the President, which read: "My dear Mr. White:—I have much pleasure in sending you the enclosed letter which the President has prepared for you." This remarkable testimonial from the nation's Chief Executive emphasizes to members the meaning of the official recognition and approval of the National Amateur Wireless Association given by American Army and Navy officials, firmly establishing the organization as one of national importance

infantry, two regiments of cavalry, and what amounts to about a regiment and a half of field artillery, practically all mobile troops of the regular United States Army, either are already on the border territory and in Mexico, or on foreign service. This gives some idea of the defense problem the country faces.

Few Americans realize the extent of the Mexican border line. By railroad, it takes nearly three days from the Gulf to California. And along that line we have something like 20,000 regulars and the number available to reinforce them is about 9,000 more; with the whole force distributed in skirmish formation, about 17 miles could be patrolled. The border line is something like 1,800 miles long.

Consider the Atlantic and Pacific coasts and the Canadian line and you begin to realize how great would be the need of citizen-soldiers if invasion by a first-class power was threatened.

There should be no delay on the part of amateurs. Signal corps troops, sponsored and organized by local clubs, will grow to full strength very quickly. Under command of a competent officer, preliminary drill can begin at once. If organization is made now, the companies and battalions will be aided and assisted

Letter to National Amateur Wireless Association Showing Preparation of Members for Possible War Mobilization

NAVY DEPARTMENT
U. S. NAVAL RADIO SERVICE
OFFICE OF THE SUPERINTENDENT
RADIO, VA.

March 15, 1916.

I have the pleasure of acknowledging receipt of your letter of March 13, 1916, and today under separate cover the names and addresses of persons who have enrolled in the National Amateur Wireless Association, also a tabulation of the membership by States.

The preparation of these data must have entailed considerable clerical work on the part of your office force, and I thank you very sincerely for the information. This will be the greatest help to us in the organization of amateurs along our coast line in times of public peril. For your information, I may state that one district, that of New England, has been thoroughly organized and all are acting in co-operation to produce best desired results. This has been made possible through the activities of our District Radio Superintendent for that locality, and by means of the names and addresses which you so kindly furnished, this office will be in a position to continue the organization further down along the coast, and we are confident that we will get most excellent results as the result of your hearty co-operation in this matter.

With renewed thanks and best wishes,
Very truly yours,
W. H. BULLARD,
Captain, U. S. Navy,
Superintendent of Radio Service.

by the Association's headquarters military committee under plans which are now being shaped up.

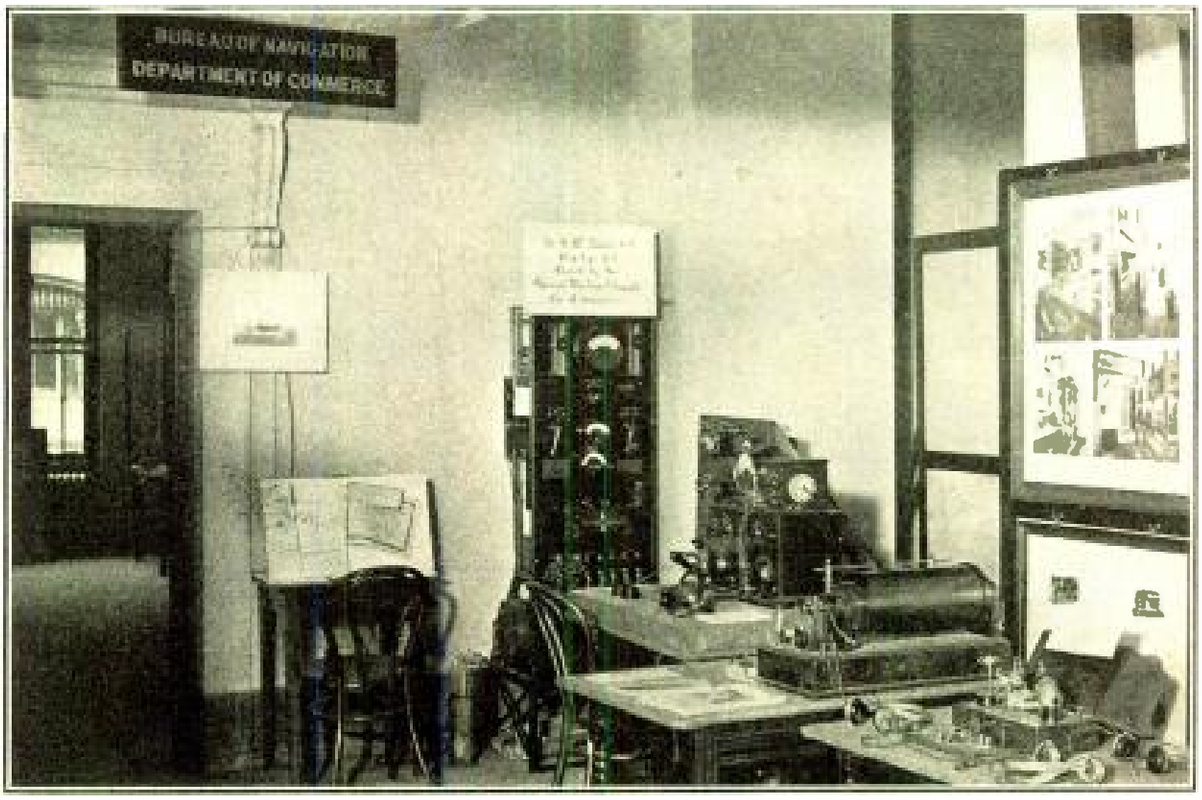
Aside from the obvious fact that it is every patriotic American's duty to prepare himself for emergency, the signal corps work will be found the most fascinating application of wireless knowledge yet devised by the Association's officers. The clubs which have started work along this line are already finding difficulty in taking care of the large number of applicants.

The United States has awakened, and with that awakening has come definite recognition from the nation's President, that the members of the National Amateur Wireless Association are "specially qualified young men" to prepare for the maintenance of communication in event of war.

New Standardized Ship Set at the Safety First Exhibition

Record of Life Protection by Wireless Shown by Chart in the National Museum in Washington

A ½-k.w. Marconi panel set loaned to the Department of Commerce by the Marconi Wireless Telegraph Company of America to demonstrate a complete marine wireless equipment was a feature of the Safety First Exhibition, which was opened in the National Museum, Washington, D. C., on February 21. The Bureau of Navigation detailed two men in charge of W. D. Terrell, who devoted their time to explaining the apparatus and demonstrating with a temporary antenna by means of which visitors were able to listen in to messages from the Arlington station. Thirty-five thousand persons attended the exhibition. The Department of Commerce showed by a chart, that of the vessels equipped with wireless, clearing from United States ports last year, twenty-five had met with disaster, but only two lives had been lost.



The complete Marconi ship equipment shown at the Government Safety First Exhibition

With the Amateurs

The Dallas Radio Club has received a charter from the National Amateur Wireless Association. A notice to this effect from the national organization was read at a meeting of the club held recently at the residence of Ben Emerson.

The matter of permanent quarters for the club was discussed at length. This matter is to be definitely settled at the next meeting.

Several new members have been admitted to membership. All members of the club are requested to get into communication with M. L. Hunt, the secretary, so their names may be properly placed on the rolls of the organization.

The latest is the wireless news service for farmers' clubs. John Baldwin a graduate of the University of North Dakota, where he made a study of wireless, has installed an apparatus at his home.

On club meeting nights, Baldwin retires to his wireless station, and getting in touch with the station at the University of North Dakota, he is informed of the day's new developments.

For instance, flood damage in Illinois, the Great Northern train wreck in the Cascades and several similar items were flashed to Baldwin, and a half hour later, at the farmers' club meeting, Baldwin was reading the world's news by wireless.

Brown University will offer a course in practical and experimental wireless telegraphy to students in the department of electrical engineering. The course is to be elective to any student in the University.

The equipment is of the latest type. The towers will support a 450-ft. aerial. Two wires stretched apart on bamboo spreaders twelve feet wide, make up the aerial, which is of the L type.

The Radio Club of New Britain, Conn., held a meeting recently at the Y. M. C. A. President Mulvihill presided.

The meeting marked a record night for the club as regards good attendance. President Mulvihill wishes to make known the fact that the club was not organized for amateur wireless operators alone, but for every person interested in wireless telegraphy. The club extends an invitation to all attracted by the art to attend its meetings, which are held in the Y. M. C. A. every Tuesday evening.

The Bridgeton (N. J.) Wireless Club, is desirous of interesting many more in radio communication and of increasing and advancing the study of wireless in all its forms. William S. Fithian is secretary of the club. There are now six licensed amateur wireless stations in Bridgeton, and one station is equipped with receiving apparatus only.

A Milwaukee boy, Carl F. Kottler, of No. 1035 Second street, now a sophomore in the school of engineering at the University of Wisconsin, received a message sent by wireless from Eilvese, Germany, which contained war orders. Experiments were being made with the wireless apparatus at the university when the message was caught. Kottler was one of the first Milwaukee youths to install his own equipment.

A new wireless club under the name of the San Francisco Radio Club has been formed in San Francisco. The club already has a membership of thirty operators. Among them are E. D. Stevens, Paul Fenner, E. R. Riddle and H. W. Dickow.

The Wireless Club has been reorganized among the students of the University of Pennsylvania, with a large membership. The original club was described as one of the first organizations of its kind in America.

The course in radio engineering to be given at Tufts College, began in February. It is an elective one for seniors and juniors in the engineering school. The theory will be taught by Professor William L. Hooper, head of the electrical engineering department, and H. S. Power will instruct in practical work in the laboratory.

The president of the Tufts Wireless Society is E. W. Bearse, '17, of Somerville. S. R. Wainwright, '18, of Andover is vice-president and Guy R. Entwistle of Malden is treasurer and secretary. There are about thirty members actively engaged in experimentation.

The Lake Shore Radio Association held its semi-monthly meeting at the home of its treasurer, Fred Bubb, of 221 Steele street, Jamestown, N. Y., on the evening of March 2. Two new members joined the association.

Case School has now a wireless station, which is described as the second largest installation in Ohio. Professor H. B. Dates purchased the apparatus from the Marconi Company and presented it to the school.

Captain Sidney V. D. Levine, in charge of the Barnert Memorial Boy Scouts, of Paterson, N. J., has announced that a wireless telegraph corps of eight members is being formed.

Receiving wireless messages atop the tall building of the Greenpoint Y. M. C. A. at Meserole avenue and Lorimer street, Brooklyn, N. Y., is a popular pastime among the younger members of the branch. Under the direction of H. N. Baker, assistant director of boys' work, a wireless club has been formed with Charles Clarke as president, Stanley Goodwin, vice-president, and Norman Keith, secretary.

Wireless telegraphy has attracted the attention of many ingenious and scientifically inclined young men and boys in Troy, New York, with the result that there are at present a large number of amateur stations. The young operators have made records for receiving and sending which are exceptionally good. Most of the local stations are the handiwork of the owners who have built their own sets of instruments and brought them up to their present workable condition. The common interests of these young experimenters brought them together in the formation of the Amateur Marconi Radio Association of Troy and vicinity, which last month celebrated its first anniversary. The club is affiliated with the National Amateur Wireless Association. The officers of the year are: President, Wendell King; vice-president, William Le May; secretary, Malcolm Williams, and treasurer, John Vaughn. When organized, the association had a membership of eight, but now has twenty-five members, five of the number having received United States government wireless licenses. The club meets bi-monthly at the Lansingburgh Y. M. C. A., where the problems of wireless communication and the study of electricity are taken up, with many interesting discussions.

The third meeting of the Rock Island Wireless Club was held in the older boys' room of the Rock Island Y. M. C. A. on the evening of February 29. Fourteen were present. Ben Sperbeck, president of the club, led a discussion on "The Connections of Receiving Instruments."

The club chose as its name, "The Rock Island Radio Club." A committee was appointed to formulate a constitution and another to set the dues.

Plans for the amalgamation of the four amateur wireless clubs of Trenton, N. J., were discussed at a dinner given by the Radio Association at Central Y. M. C. A. on the evening of March 2. E. T. Rossi, district superintendent of the Public Service Corporation talked interestingly of wireless telegraphy. Those present were : Edward G. Raser, Robert W. Lister, J. E. Pritchard, N. R. Steward, W. Perry, George N. Hill, T. Howard Atkinson, R. J. Brown, L. Lewis, Emery Parichy, William Goldstein, Frank H. Silvers, Martin K. Pillsbury, Ernest Johnson, Mr. Berry and Mr. Hughes.

Some "Don'ts"

1. Don't reduce the power of the new 2 k.w. 500 cycle quenched spark transmitting set without readjusting the generator voltage for a clear spark note. It is disagreeable to copy a message sent by an irregular or broken-up spark note.
2. Don't operate this set at full power when within fifty miles of a shore station—it causes unnecessary interference.
3. Don't use the 600 meter wave in communicating with a ship almost visible on the horizon—make a brief call on the standard wave of 600 meters and then cut down to 300 meters.
4. Don't call a shore station until you have first ascertained whether it is in the act of receiving—carefully adjust your receiving tuner to determine the general conditions of the ether about you.
5. Don't try to develop an original style of sending. Avoid a jerky, irregular method of formation—listen to the Marconi station at Cape Cod, which employs an automatic transmitter with perfect formation of the code characters. Imitate it.
6. Don't congest the ether with useless dots and dashes, queries, remarks, etc.—it is a violation of the International Regulations and appropriate abbreviations have been adopted for use.
7. Don't put your transmitting apparatus out of commission because the aerial ammeter fails to indicate—the meter may be burned out and the set still be in good condition. Shunt the meter with a piece of stout copper wire.
8. Don't notify the port inspector or the superintendent of the maintenance department that your head telephones are out of order and leave them on the ship—bring them to the shop and have them repaired.
9. Don't leave the ports of the wireless cabin open in damp climates while you are absent from the ship—it destroys the insulation of the set.
10. Don't allow the room steward to shine the brass of your apparatus without afterward making a personal inspection of the position of the helix clips—refer to the tuning card and replace the plugs in their proper positions:
11. Don't wait until the bearings of the motor generator "squeak" for lack of oil—make a daily inspection of the oil gauge. The room steward may have unintentionally opened the drain cock with his broom and drained the oil well.
12. Don't become alarmed if a hurricane destroys the greater portion of your aerial—stretch a single wire between the masts or between one mast and the smoke funnels. The set will transmit almost as far as with a standard aerial.
13. Don't forget, under such conditions, to retune the set to resonance by means of the aerial ammeter to one of the standard wave-lengths, 300, 450 or 600 meters.
14. Don't widen out the gap of the synchronous rotary disc discharger abnormally—it will puncture the condensers. The standard gap for the 2 k.w., 500 cycle set is .005 of an inch.
15. Don't tell the government inspector that your 2 k.w. set consumes 500 watts—it is designed to consume 2,000 watts at normal rating, but may be operated at lower powers if necessary.
16. Don't attempt to regulate the spark note by means of the motor field rheostat—use the generator field rheostat, which was intended for the purpose. If the source of current supply remains at a constant potential, the motor field rheostat need not be touched.
17. Don't allow carbon granules, copper dust., etc., to accumulate on the brushholders of the motor—you cannot expect the brushes to move freely under these conditions, and in consequence you will not have sparkless commutation.
18. Don't drop the receiving telephones on the table—the shock will destroy the magnetism of the permanent magnets.

The Construction of a Precision Detector

By Charles Horton

FROM time to time there have appeared in the various magazines devoted to wireless telegraphy and telephony, articles dealing with crystal detectors having very accurate adjusting means. Some of these accurate detectors have been so constructed that by the use of a set of micrometer screws it is possible to set the contact point on the surface of the crystal in thousands of different positions, thus allowing the thorough searching of the sensitive surface and the selection and recording of the points which show sensitivity of a higher order.

On account of the great accuracy necessary in the design of these detectors, the construction has been confined to experimenters possessing the tools and the high order of skill required, consequently there have been few of these instruments in use among amateurs. The writer has given considerable thought to the problem of constructing a practical precision detector which would permit of accurate adjustment and yet require in its construction no more than usual accuracy, and it is the purpose of this article to show how this can be done.

The principle embodied in the design will be made clear by an examination of the accompanying drawings in which Fig. 1 is a top view of the instrument, Fig. 2 a side elevation in which the cover is shown in section and certain of the parts are broken away to show details of construction, and Fig. 3 a side elevation of the instrument.

The crystal is mounted in the usual cup by means of Wood's metal, and the cup then mounted in a hard rubber block which is itself screwed upon a circular wood disk in such a position that the center of the cup is eccentric with the center of the disk, while the contact point is mounted independently of the disk in a position directly above the center of the cup. It is evident that when the disk is revolved about its center that all points on the crystal surface will travel in circles about that center and the contact point will describe on the crystal a circle or a part of a circle. The disk referred to is itself mounted upon

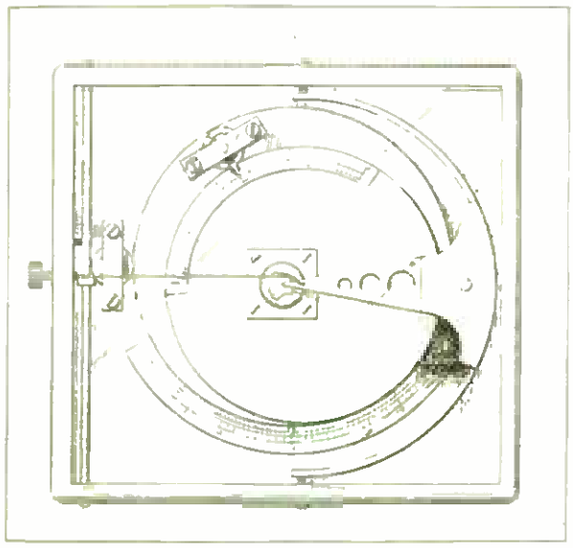


Fig. 1

a second and larger disk with its center eccentric to the center of the latter, so that when this second disk is rotated about its center, the points of the crystal surface describe circles about this new center and the contact point describes on the surface of the crystal a circle crossing the first.

Upon careful consideration of this arrangement it becomes evident that by the proper rotation of these two disks the contact point can be made to touch any part of the crystal surface. Furthermore, since the center of the crystal is mounted quite near to the center of the disks and the disks are quite large in proportion, it follows that a movement of a part of an inch on the periphery of either disk amounts to but a small fraction of an inch at the center of the crystal. This ratio is made greater and a

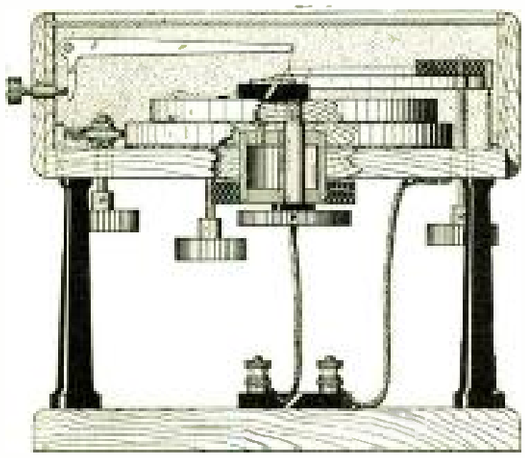


Fig. 2

means of adjustment is provided by the use of two rubber rollers which roll on the periphery of the disks which are covered with very fine emery cloth to insure frictional engagement. The disks are further provided with scales to allow a record to be made and kept.

The friction rollers are mounted on shafts which project through the bottom of the detector case and have knurled knobs at their ends. In order to allow the crystal to be moved relatively large distances the disks are provided with knurled knobs at their centers which permit of direct movement of them. The contact point is mounted at the end of a triangular flat spring which is itself so mounted that its center of rotation is a short distance from the point, thus permitting the use of a lever arrangement for reducing the movement of the adjustment screw when transmitted to the point.

It will also be noted that when the point is brought against the surface of the crystal and the adjusting screw revolved further that the flat spring is bent more and more, thus bring more and more pressure to bear on the crystal, but preventing injury to the point. For raising the spring when moving the crystal in large amounts there is provided a set screw and a co-operating lever. The arrangement used permits of a dust tight case with, however, perfect adjustment. The action of the parts is at all times apparent through the glass top.

The detailed construction of the detector will now be taken up. Detail No. 1 is the surbase of the instrument and should be made of oak or mahogany. When the instrument is finished a sheet of felt is glued on the bottom of this piece. The two large holes at the top of the drawing are for the binding post, nut and screw.

Detail No. 2 is the supporting posts for the detector proper. If the instrument is made of oak these posts show up nicely when made of hard rubber or blacked and polished wood. For mahogany, however, yellow finished brass posts present a fine appearance. Detail No. 3 is the hard rubber panel on which the binding posts are mounted and needs no explanation. Detail No. 4 is the base of the detector proper and is mounted on the posts, Detail No. 2. Detail No. 5 is the larger of the two rotating disks and is made exactly as shown.

Detail No. 6 is the smaller of the two disks and has holes drilled to receive the flat head wood screws with which the cup holder is screwed to it. These holes are drilled considerably smaller than the screws to insure good purchase. Details Nos. 7, 8 and 9 are parts of the pillar which supports the two disks. These should be very carefully made as they determine the accuracy of the instrument. Detail No. 10 is the upper and lower brackets of the rubber roller bearings. Detail No. 11 is the separating pieces for the same and are made according to the size of the rollers when completed.

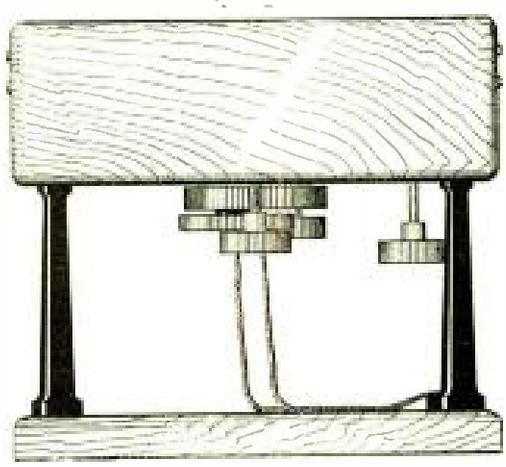
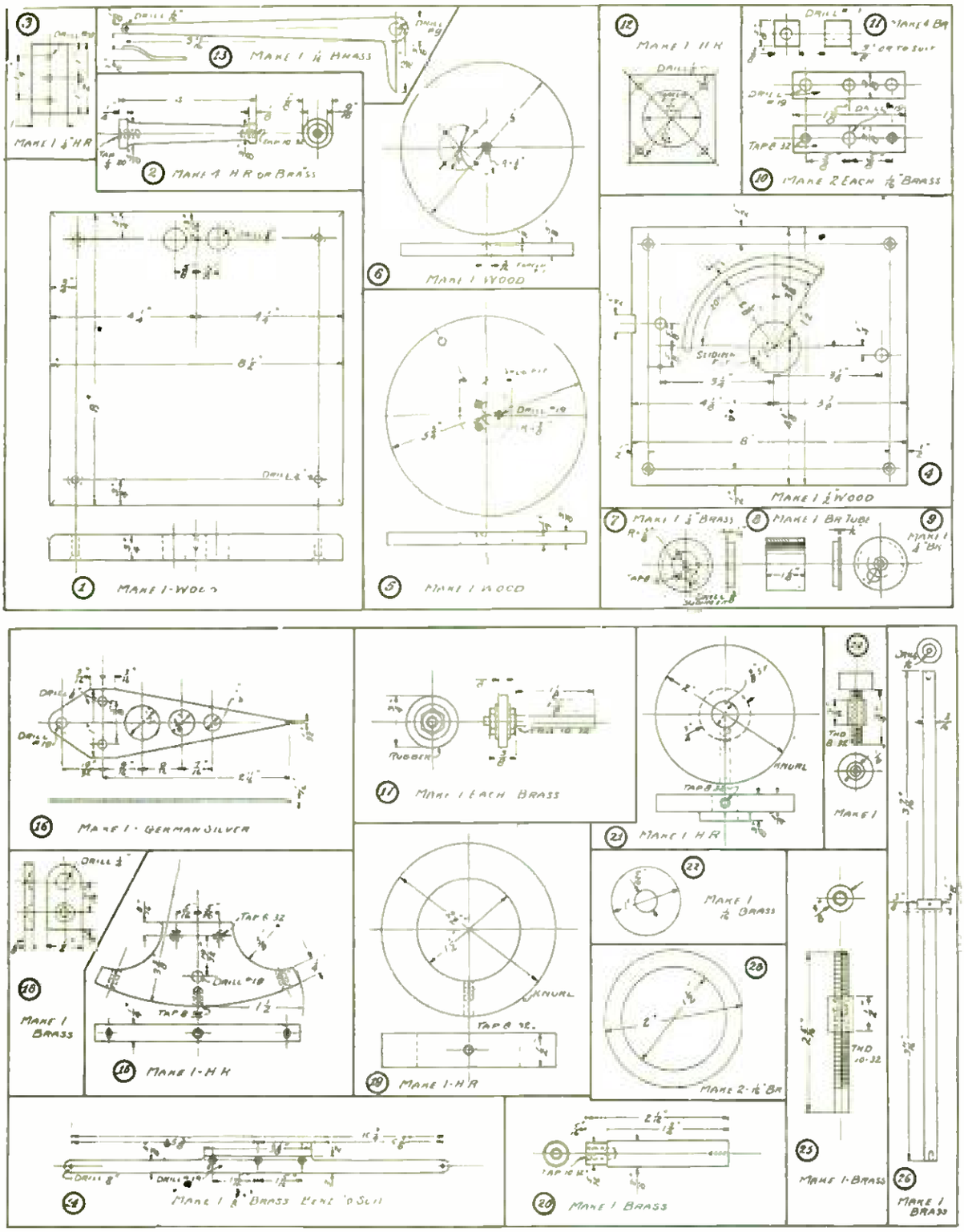


Fig. 3



Detail drawings

Detail No. 12 is the crystal cup supporting block. The cup containing the crystal is forced into the same by the use of the vise as a press. Only a little pressure should be required or else the block is apt to split.

Detail No. 13 is the contact spring lifting lever and is intended to be mounted on the shaft. Detail No. 20 is the position shown by the dotted lines and should be soldered in position. Detail No. 14 is the yoke on which the contact spring is mounted and is pivoted on two screws, one at each side of the cover of the detector, as seen in Fig. 1.

Detail No. 15 is the hard rubber mounting for the detector spring and is screwed to the yoke just described by

means of three flat head brass machine screws. The tap hole in this piece at the bottom in the drawing is drilled and tapped at the time the piece is made but the other two holes are drilled when the brass yoke has been bent into contact with the rubber piece. This is to insure perfect alignment.

Detail No. 16 is the contact spring itself. It can be made of German silver or phosphor bronze and should be about eight-thousandths of an inch in thickness. The point should be rounded.

Detail No. 17 is the rubber rollers for bearing on the disks. The rubber part is from a pair of circular typewriter rubbers and is made true round by mounting as in the drawing and spinning the whole in the lathe while a piece of sandpaper is brought against it. The rod used is No. 9 drill gauge size and is threaded for a distance of half an inch. The several parts are then mounted and the projecting piece of the rod turned down to No. 19 drill gauge size. To insure no slipping of the rubber a pin may be put through the rubber and the two brass washers.

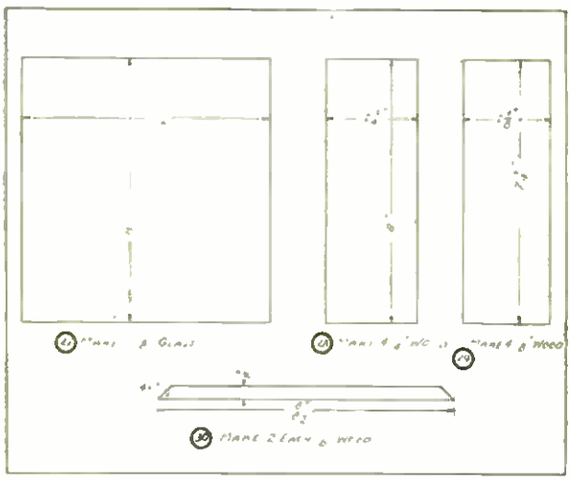
Detail No. 18 is the spring abutment for the bracket which bears on the large disk. This bracket is screwed to the base in only one place in order that the spring may act to cause perfect engagement.

Detail No. 19 is the adjusting ring for the large disk. Detail No. 20 is the shaft for the small disk. Detail No. 21 is the adjusting knob for the small disk. Detail No. 22 is the washer which separates the two disks. Detail No. 23 is the two washers which mount the large disk on the base of the detector.

Detail No. 24 is the adjusting screw and bushing for the spring lifting lever. Detail No. 25 is the threaded rod for the spring tension adjustment. For grips on this and the rods of No. 17 ordinary typewriter knobs are specified. Detail No. 26 is the raising lever shaft beforementioned. Detail No. 27 is the glass top for the cover. The dimensions given are the maximum, and it is best to cut somewhat under them in order to insure a fit in the cover.

Detail No. 28 is the four sides of the cover which are to be glued together, brads being used if necessary. Detail No. 30 are then glued on the top edges of the cover thus made, which forms a ridge for the glass to rest against. The parts (detail No. 29) are then glued or screwed inside the case to keep the glass from falling out. When all wood parts are glued together the corners are rounded off as shown in the figures, and the bottom planed off. Holes are drilled in the two long sides at the two following points: an 8/32 tapped hole in each long side 5/8 of an inch from the end, and 2¼ inches from the bottom edge, and an 8/32 tapped hole on each of the same sides 4½ inches from the same end, and 1¾ inches from the bottom edge. Also, on the end from which the measurements were taken, one ¼ inch hole 3 13/16 inches from the left hand side and 1½ inches from the bottom edge.

Care should be taken when assembling



Detail drawings.

the detector to see that the disks rotate freely, but have no play in their bearings. The bearings may be coated with graphite before assembling. The disks are to be covered on the edges with a strip of very fine emery cloth or sandpaper, and for their under edges with fine velvet to keep out dust.

The connection to the cup is made by running a wire from its under side (to which it should be soldered), to the top of the shaft. Detail No. 20, which shaft has a flexible lead soldered to the center in the hole provided connected to one binding post. The other connection is made by connecting the other lead to the bushing of the spring adjusting screw which contacts with the switch point on the hard rubber support for the spring.

The total movement of each disk is arranged to be 120 degrees and the scale is divided into fifty parts. It is evident that a movement of one division on a disk moves the center of the crystal about .015 of an inch. Thus it is evident that very accurate adjustment can be secured.

This detector is designed for the use of silicon, but any other mineral can be used, and if the contact is constructed to have mounted at its tip a piece of pyrites, the perikon combination may be secured.

This instrument, if carefuly made, will be found very serviceable and present a handsome appearance.

MEDICAL ADVICE BY WIRELESS

Master Frederick VIII: Pls have your Dr. state symptoms and treatment of appendicitis immediately.

Capt. Banvard.

This was the message from the Standard Oil tanker Brindilla, which was delivered to the captain of the Scandinavian-American liner Frederick VIII, by his wireless operator on the evening of February 12 while the vessels were at sea. The ship's surgeon immediately diagnosed the case and directed by wireless the treatment given the patient by the captain of the Standard Oil tanker. Under the doctor's instruction, Captain Banvard administered opium and applied ice bags, continuing this treatment until the ship reached port.

A NOVEL MARRIAGE PROPOSAL

A newspaper relates that a new feature of wireless telegraphy has recently had a demonstration in Connecticut. A young couple in the Nutmeg State had a misunderstanding. The young man started for the West Indies on a fruit steamer. Along came Saint Valentine's day, and the young woman changed her mind. Her sweetheart was well out to sea on his voyage. She bethought herself of the wireless and sent through the air the statement: "I have changed my mind. This is leap year. Will you have me?" This brought a quick response: "A great valentine. Will return by next boat."

Wireless telegraphy has been useful in a great many ways, bearing messages of war, of peace, of business, of sorrow, of joy and of love and perhaps hatred, but this is said to be the first time on record that a proposal of marriage was ever made by marconigram by a young woman, and acceptance returned by the same means.

MARCONI SETS DESCRIBED AT INSTITUTE MEETING

At a meeting of the Institute of Radio Engineers, held at the Engineering Societies Building, 33 West 39th street, New York City, on the evening of March 1, Harry Shoemaker, research engineer of the Marconi Wireless Telegraph Company of America, read a paper on "Recent Standard Radio Sets." He described in detail two types of standard wireless sets which the company has placed on several hundred ships. The paper was discussed by Professors A. N. Goldsmith and J. Zenneck, Dr. E. F. W. Alexanderson, R. H. Langley, L. R. Krumm, chief United States radio inspector, and David Sarnoff, assistant traffic manager of the Marconi Wireless Telegraph Company of America, who described the operation of the sets used in the Marconi service.

TOWING HALF WAY AROUND THE WORLD

The longest tow in the history of shipping oil began recently, when the California Standard Oil Company's steamship Richmond steamed away from Bayonne, N. J., on her way to Shanghai, China, with the Standard Oil barge No. 95 in tow. Both vessels are equipped with Marconi wireless sets. They are carrying a total of nearly 3,000,000 gallons of oil.

WIRELESS TELEPHONE PROGRESS IN THE NAVY

Wireless telephone communication between ships for the transmission of orders in movements at sea took place recently in the Atlantic fleet in the maneuvers off Guantanamo. The instruments were operated on the battleships Wyoming and Texas and Lieutenant William Furlong, fleet radio officer, was placed in charge of the work.

"Bucking" the Great Lakes Ice-Jams

Difficulties of Navigating the Inland Seas in the Winter

ALL along the shores of the Great Lakes, from Buffalo to Duluth, there is bustle and activity among wireless and shipping men; for the navigating season proper has just opened, the ice is beginning to disappear, and vessels which have been laid up for the winter are leaving their havens. From April until December an endless procession of ships passes through the Soo and fleets comprising many vessels discharge their cargoes at the various ports. But when the lakes are covered with ice and chill winds sweep across the frozen surface, the greater number of these craft seek refuge behind breakwaters or in rivers. Some of the ships continue to ply the waters, however, despite the difficulties of navigation.

An ice-encased car ferry in Lake Erie on January 30 last

Wireless operators who were detailed on vessels that were in service on Lake Michigan in February, 1915, well remember the sea of slush ice through which the ships were compelled to plough. Low temperature and snow storms brought about this condition. On February 4 seventeen vessels, among them being the steamship George, were imprisoned in ice-jams in various parts of the lake. The situation of those on the vessels was far from enviable but it was alleviated considerably by the Marconi operators on the craft who established communication with the shore stations and sent information concerning the marooned folk.

There is no lack of thrilling experiences for the wireless men who voyage the Great Lakes in the winter months. An illustration of this statement is contained in the story of the wreck of the steamer Iowa which was crushed in the ice in Lake Michigan off the mouth of the Chicago River on January 3, 1915. The Iowa, with George Keefe in the wireless cabin, was bound from Milwaukee to Chicago. Four miles off the Government lighthouse she became wedged in the ice. Gradually the frozen cakes closed in on the vessel and a hole was torn in her bottom. Through this the water poured in

such great volume that she began to sink.

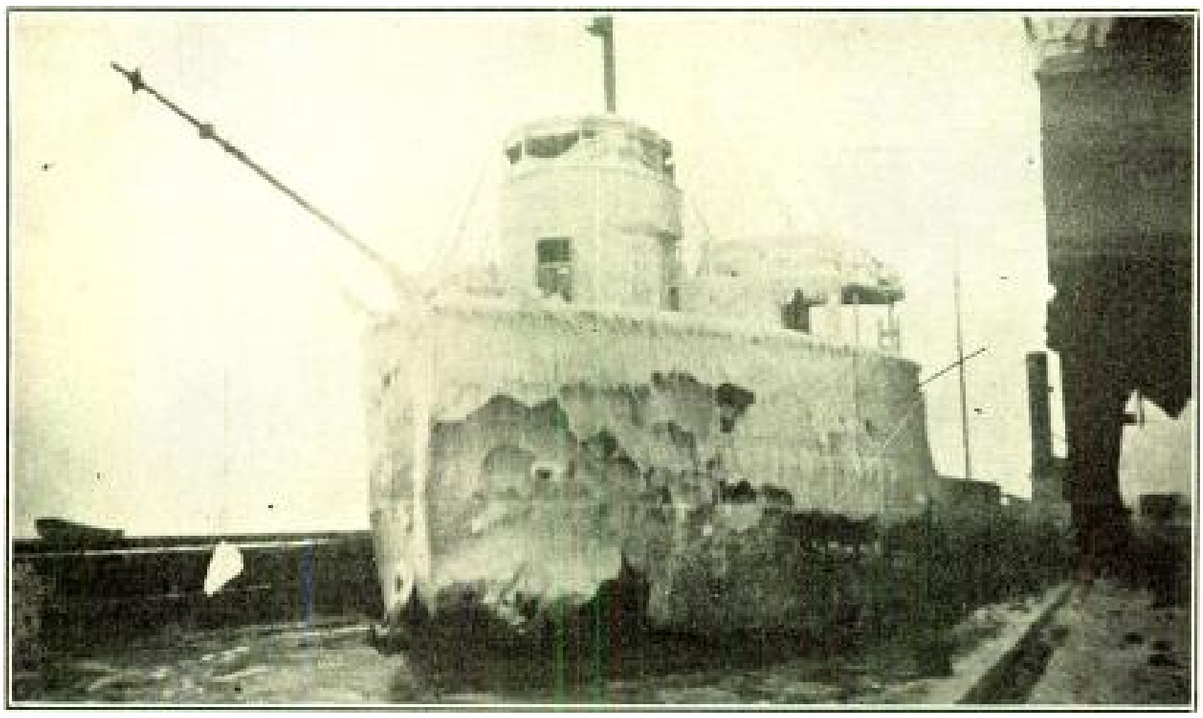
Keefe, in the meantime, had not been idle. He sent out the S O S, and tugs were started to the rescue. The vessel was settling in the water so rapidly, however, that the crew of seventy and one passenger clambered over the side of the vessel on to the ice. Keefe remainted at his post to flash the appeal for aid until five minutes before the Iowa sank, when he joined the others, and made his way to the shore by walking—a distance of a mile and a half.

There are, of course, other perils incidental to navigation in addition to those resulting from the formation of ice. Car ferry Pere Marquette No. 19, with Marconi Operator Millgard on board, ran aground in Lake Michigan, about four miles north of Ludington, Mich., early in the evening of January 17 last. Millgard used the wireless to obtain aid and Pere Marquette steamers Nos. 17 and 18 sent word that they were ready to go to the assistance of the stranded vessel. They were informed, however, that because of the heavy seas and the shallow water, it would not be safe to make the attempt.

Messages were exchanged between the 19 and the officers of the Pere Marquette company until three o'clock in the morning of the following day. At that time Millgard reported that the water had reached the boiler room, and that he would only have power for a few more minutes to operate the set.

The life-savers were not idle meanwhile, and the members of the vessel's crew were kept informed by wireless regarding the progress of the efforts being made to effect a rescue. Those on the 19 were taken ashore on the afternoon of January 18. The vessel, which was considerably damaged, was towed to dry dock.

The incidents related in this article are brief examples of the events which go to make up the life of an operator on Great Lakes craft. To be sure he does not have the opportunity given to his brother of the Atlantic or Pacific vessels for long distance communication, but he does have frequent occasion to display his courage and judgment when these qualities are essential. And, like the wireless man of the salt water craft, he has shown that he is not lacking in either.



The vessel pictured in this photograph shows plainly the effects of battling with ice and storm. The camera man snapped her at Rondeau, Lake Erie

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It is reported from Rome that the organization of an Italian aviation ministry, with Guglielmo Marconi as its head, is about to be effected.

From and For those who help themselves

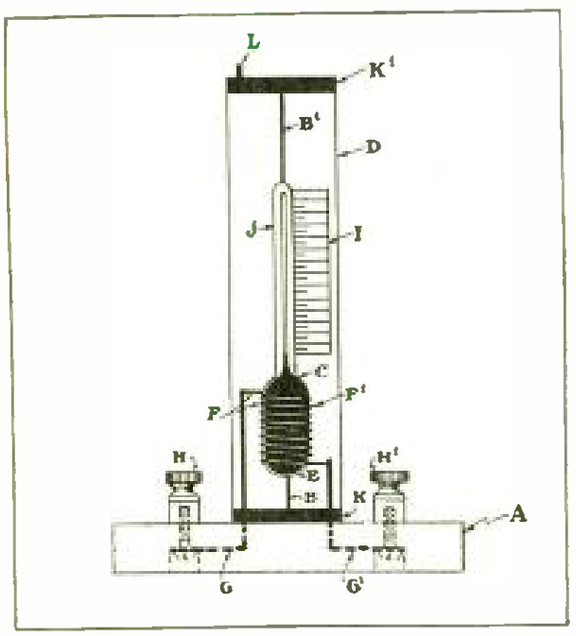
Experimenters' Experiences.

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 an Aerial Hot Wire Ammeter

When lacking the necessary funds for the purchase of a commercial aerial hot wire ammeter, the amateur is accustomed to resort to many make-shift devices for determining conditions of resonance in a



Drawing, First Prize Article

wireless telegraph transmitter. In fact, it is generally recognized that the construction of a good aerial ammeter presents a problem not easily solved. With this point in view, I intend to present the details of construction for an ammeter which I worked out, and which I believe to be of suitable range for the average amateur station.

Referring to Fig. 1, a glass tube, D, is fitted with a wooden or a fibre stopper at both ends, K and K¹. Two wires, B and B¹, are attached to either end of a small thermometer in such a manner as to hold it fairly rigid within the tube. The bulb of the thermometer, E is ground down until the walls are as thin as possible after which it is wound with six or seven inches of No. 30 bare copper wire or special resistance wire with the turns slightly spaced. The terminals of this winding are connected to two soft copper wires (about No. 12), G and G¹, which are in turn fastened to the base of the binding post as indicated.

It is desirable to fit the ends of the glass tube, D, with the heads, K and K¹, so that they will be air tight. Then a small valve may be fitted to the bottom head, so that the air within the tube can be exhausted. This can be effectually accomplished by cutting a small rim in the heads of the glass tube, so that the glass will fit it very snugly. It can then be made air tight by pouring a good sealing compound, such as wax, etc., around the rim.

When the binding posts, H and H¹, are connected in series with the aerial system at any station, the small wire, F and F¹, becomes very hot, causing the mercury of the thermometer to rise. This instrument can be calibrated direct in amperes by connecting it in series with a standard ammeter, applying several values of current to the circuit and noting the corresponding deflection upon the small cardboard scale, I, which is attached immediately alongside the ther-

nometer. The current for the calibration purposes may be supplied by a storage battery regulated by a small controlling rheostat. To insure greater protection against changes of temperature, the original tube, D, should be placed inside another tube, from which the air is exhausted.

It will be well for the experimenter to make several trial experiments with the wires, F, F¹, to determine the size most suited to the current flowing in the antenna circuit at his station; or if desired, a small shunt circuit consisting of a loop of copper wire may be connected across the terminals, H and H¹.

FRANK K. MORSE, *Colorado.*

is composed of a number of sheet steel strips 9 inches in length by 2 inches in width with an average thickness of 3/32 of an inch. Piled up, they appear as in Fig. 2. A sufficient number of strips are cut to make a core 2 inches square. Better results would be obtained by the use of silicon transformer steel, but good results are secured from ordinary soft sheet steel.

It will be noted from the drawings that the primary and secondary windings are wound on opposite legs of the core and held in place by cardboard forms 3 inches in diameter, which are slipped over and secured on the core. Fibre discs are inserted between the sections of the secondary windings and at other

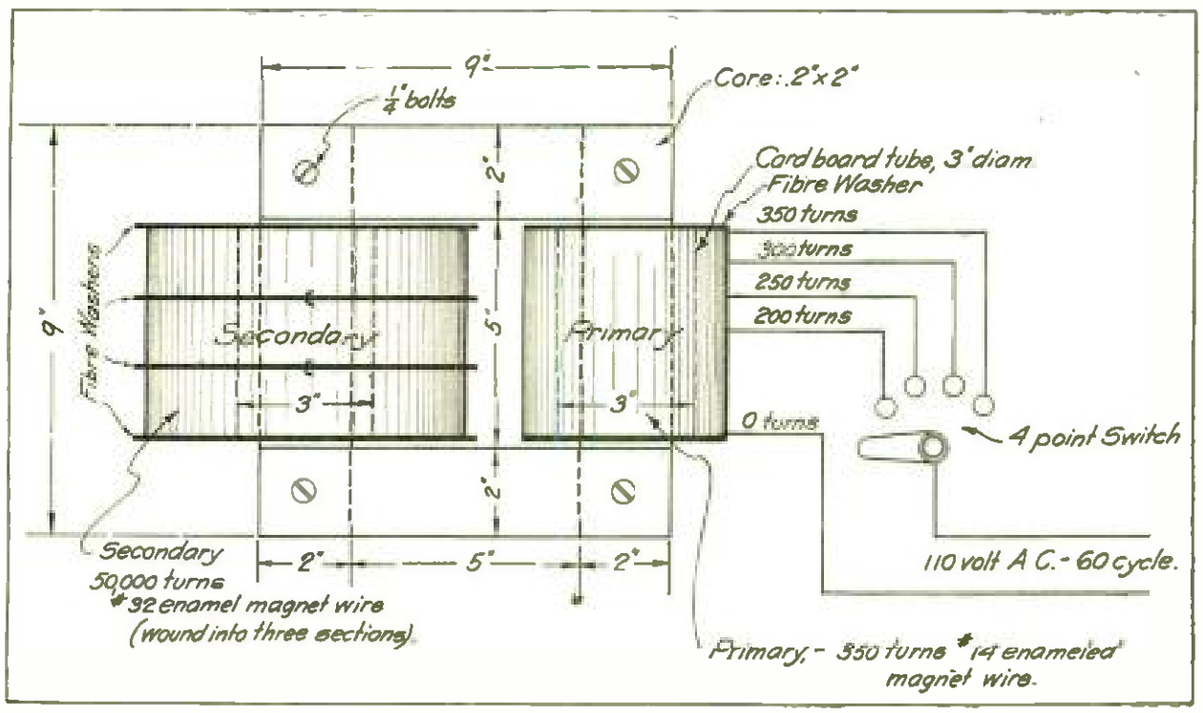


Fig. 1, Second Prize Article

SECOND PRIZE, FIVE DOLLARS

The Construction of a Closed Core High Potential Transformer

With the exception of the high potential transformer, the wireless experimenter with the average mechanical ability does not find it a difficult matter to construct the various parts of a complete wireless telegraph set. Amateurs who have arrived at this point in the design of their sets will profit by duplicating the closed core high potential transformer which I herewith describe.

As indicated by Figs. 1 and 2 the core

points, as shown in Fig. 1.

The primary winding consists of 350 turns of No. 14 enameled magnet wire wound on in even layers with sheets of empire cloth interposed between the layers. Taps are brought out from this winding to a multiple point switch from the following turns, namely 200, 250, 300, 350.

The secondary winding is composed of 50,000 turns of No. 34 enameled magnet wire, divided into three sections which are separated for purposes of insulation by means of a vulcanized fibre disc. The final secondary terminals are brought

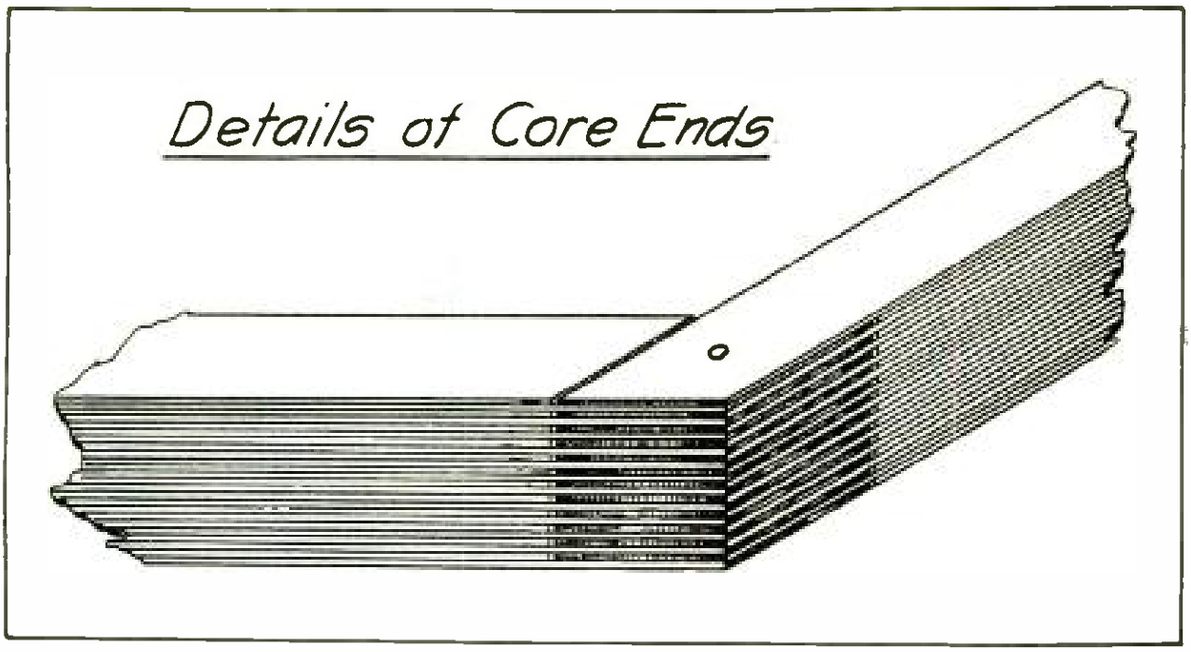


Fig. 2, Second Prize Article

through insulating tubes to high tension terminals mounted on the top of the containing case.

To give this transformer satisfactory operating characteristics and also to allow the power input to be varied over a considerable range, it is fitted with a magnetic leakage gap, which is controlled from the outside of the case by means of a suitable handle. The complete details for this gap are given in Figs. 3 and 4.

The design of the containing case for this transformer is left to the builder but it is preferably made of metal. The adjustment for the magnetic leakage gap is mounted on the outside of the case as well as the multiple point switch for the control of the number of turns in use at the primary winding.

In connecting together the secondary sections particular care should be taken to make sure that the current flows in the same direction around all of the coils.

After a suitable containing case is constructed, it should be filled with a good insulating compound or a good grade of transformer oil.

The cost of construction for this transformer will be found rather low, and owing to the value of secondary potentials it will be particularly applicable for amateur purposes; in fact, the potentials can be varied between 10,000 and 22,000 volts.

The power input to the primary winding may be varied from ¼ to ½ k. w.

The transformer was designed to operate on 110 volts alternating current at a frequency of 60 cycles, and has given completely satisfactory results in my station under all possible conditions of service.

MARK BISER, *Maryland.*

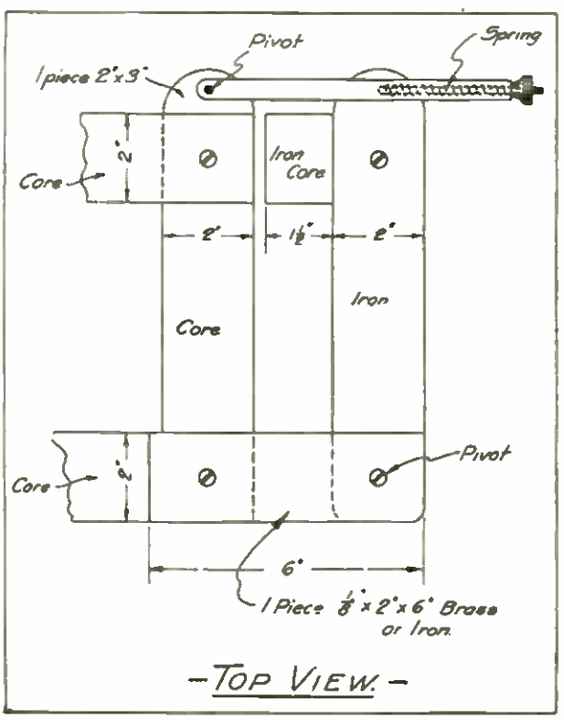


Fig. 3, Second Prize Article

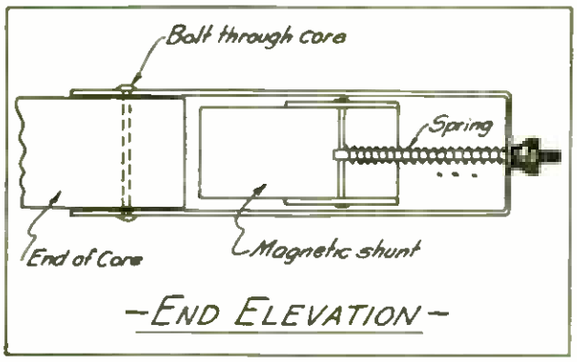


Fig. 4, Second Prize Article

THIRD PRIZE, THREE DOLLARS

A Suggested Design for a Compact Receiving Set

From the viewpoint of operating efficiency, a compactly mounted receiving equipment is a desirable fixture at any wireless station. It is a comparatively easy problem for the experimenter to design the detailed parts of a receiving set, but he is not always able to arrive at a quick decision regarding the construction of the cabinet for housing the various parts.

A front view of a complete tuner which I have designed and from which I have obtained extremely satisfactory results is shown in the front elevation in Fig. 1, with a corresponding end view in Fig. 2. The complete loose coupler is represented at A, the primary winding

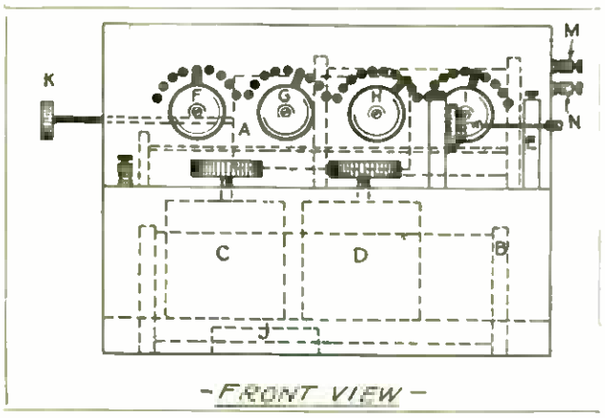


Fig. 1, Third Prize Article

of which is connected to the multi-point switches, H and I, while the turns of the secondary winding are connected to the multi-point switch, S. The primary winding is preferably made up of No. 24 S.S.C. wire, while the secondary winding is covered with No. 32 S.S.C. wire.

The coupling between the primary and secondary windings is regulated by the rod, K, which draws the secondary winding away from the primary over the two brass rods shown in Fig. 2.

A suitable loading coil for the tuner is mounted on the inside of the cabinet and the turns are connected to the points of the multi-point switch indicated at G. This coil can be conveniently made up of No. 20 or No. 22 S.S.C. wire. Two variable condensers, C and D, of standard make are mounted to the front of

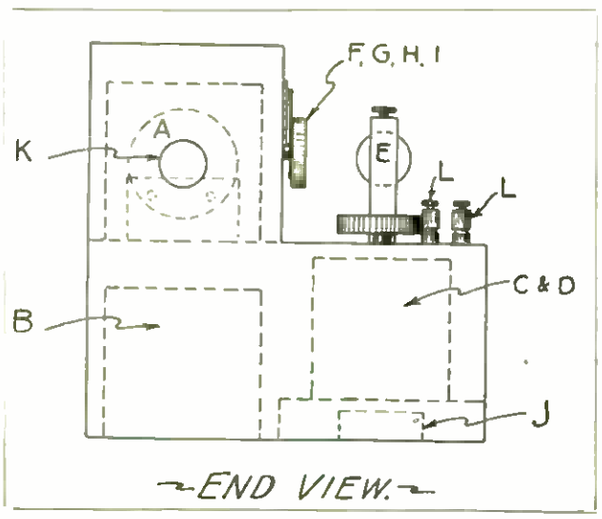
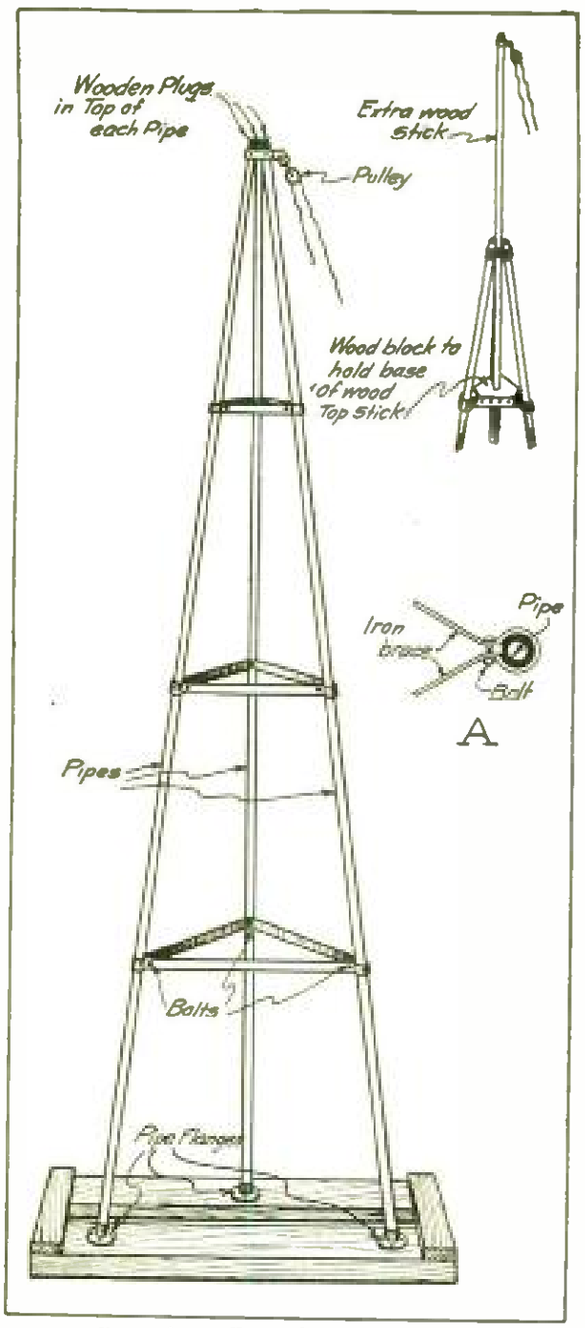


Fig. 2, Third Prize Article

the cabinet as indicated; one of these is connected in shunt to the primary winding, the other across the terminals of the secondary winding. Immediately underneath these condensers is placed the fixed condenser, J, and the binding posts for the telephones are indicated at L. The aerial and earth connections are attached to the binding posts M and N.

The foregoing description is not accompanied by dimensions, because the size of the cabinet will vary with the design of the tuning coil. The description given is merely intended to outline a convenient method for assembly of an amateur apparatus, and it will be evident that the operation of the equipment will be facilitated in every way.

William Griffith, *California*.



Drawing, Fourth Prize Article

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A Metallic Mast for a Wireless Telegraph Aerial

Users of iron piping for masts have found that they require excessive guying to hold them rigid, and to overcome this difficulty I designed the triangular tower, as shown in the accompanying drawing. I am sure that your readers will agree with me that it presents a neat, business-like appearance.

To simplify the description, a twenty-foot mast will be described. A glance at the drawing will convey to the reader's mind the essentials of my design. It consists of three lengths of pipe separated at their base by one-fifth of their length. At equidistant spaces they are bound together by an iron strap which is rigidly bolted to each pipe in the manner shown at the detail A. The strap passes part way around the pipe and a bolt is inserted as shown and screwed up tight.

A pulley for the aerial may be attached to the top of the frame, or if preferred, an extra length of wood may be used at the top to increase the height and improve the insulation. This can be accomplished by fastening a cross piece of wood at the first brace from the top, as shown, and by fastening the base of the top mast to this by means of a large lag screw. An iron band bolted around the top mast will hold everything firmly.

It is unnecessary to guy such a small mast, but in larger sizes, three guy wires should be attached to the top.

ROBERT KENNEDY, *New Jersey.*

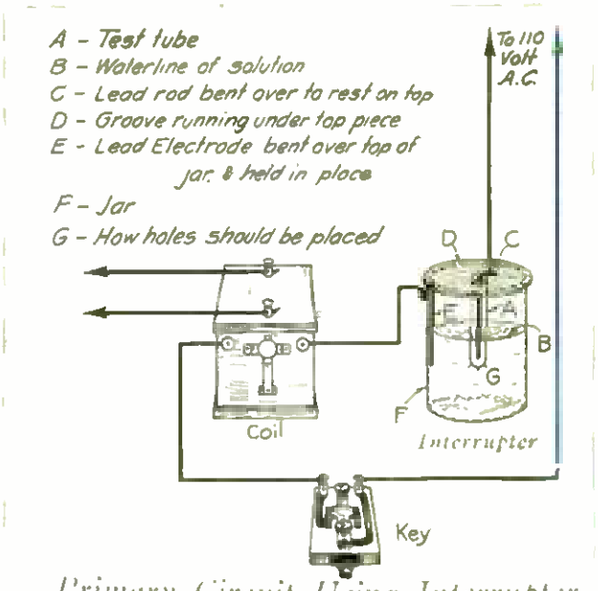
HONORARY MENTION

An Electrolytic Interrupter Constructed by an Amateur

Since the rise in the price of batteries, I decided to construct an interrupter that could be used on 110 volts alternating current in series with an ordinary spark coil. I worked out the design in the following manner, and instructions to be given can easily be duplicated by the amateur experimenter.

Procure an old blue cell battery jar, or if there is none to be found an ordinary quart fruit jar will do. Now, place a thin piece of wood over the top of this jar and draw a line on the wood around the top of the jar. Then cut a circular groove in the wood to keep it from sliding off the top.

Next procure an ordinary six-inch test tube, hold the end in a Bunsen flame and blow into the mouth of it. If the hole is blown too large, hold the tube in the flame and it will fuse together. It is generally found that a hole about the size of a lead pencil point will give the most satisfactory result. Sometimes two or three holes in the bottom of the tube are better than one, but the best results are found by experiment. Now, drill a



Primary Circuit Using Interrupter

Drawing, Honorary Mention Article, E. Lawrence Chalmers

hole through the center of the wood top according to the size of the tube. Place the tube in the hole and lower it so the flange around the top of the tube just rests upon the wood top. The top of the test tube and jar being ready, the only remaining materials required are the electrodes and a solution of sulphuric acid and water.

The best material for the electrodes is lead; two thin strips are needed, one to go into the tube and the other to hang down the side of the jar into the acid. A binding post or battery nut can be easily attached to the top of the strips.

The solution is mixed in the following manner: Always place the water in the jar first, filling it about half full. Now pour a few drops of the acid into the water and test the spark. If the jar buzzes quite loudly and the spark is "fat," the interrupter is complete. If otherwise, put a few drops more into the water and so on. Here again the best results are obtained by experiment.

Do not forget that the vibrator on the spark coil must be screwed up tight, so that there can be no possible vibration.

E. Lawrence Chalmers, *New Jersey.*

HONORARY MENTION

Design for Spark Plug Transmitting Set.

It is not always easy for the amateur experimenter to formulate the design for a compact transmitting set. It is the general custom to spread the parts of a transmitting apparatus over the instrument table which in some cases is not conductive to efficiency. The set to be described has the advantage over the ordinary one because it is compact, has a much neater appearanc, is more easily operated and allows the use of short wires between the component parts of the apparatus. It will be noticed from the accompanying diagrams that the induction coil is mounted to the right hand side of the cabinet, the spark gap directly above, the oscillation transformer on the top to the left and the aerial switch inside, as shown in the details (Fig. 2.)

The cabinet should have sufficient dimensions so that when the coil is laid in crosswise there is enough room at the right for the aerial switch and in the rear for the sending condenser. A space is now cut out of the left side of the cabinet so that when the top and bottom of the coil are taken off the vibrator end of the coil just fits. The oscillation transformer is made of edgewise wound copper strips mounted on hard rubber or bakelite standard. A fixed or quenched gap is mounted on the right hand front of the cabinet with a hard rubber face countersunk into it. Care should be taken not to let the connecting leads touch any wood. The aerial switch is mounted on the right hand front of the cabinet and thoroughly insulated with hard rubber.

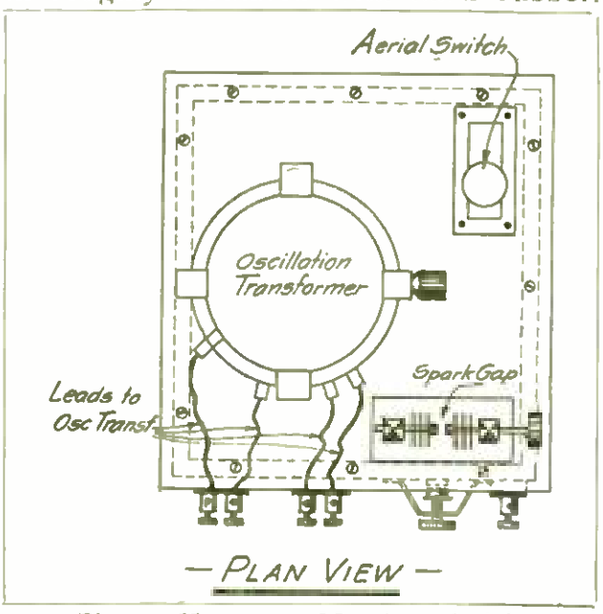


Fig. 1, Honorary Mention Article, Francis R. Pray

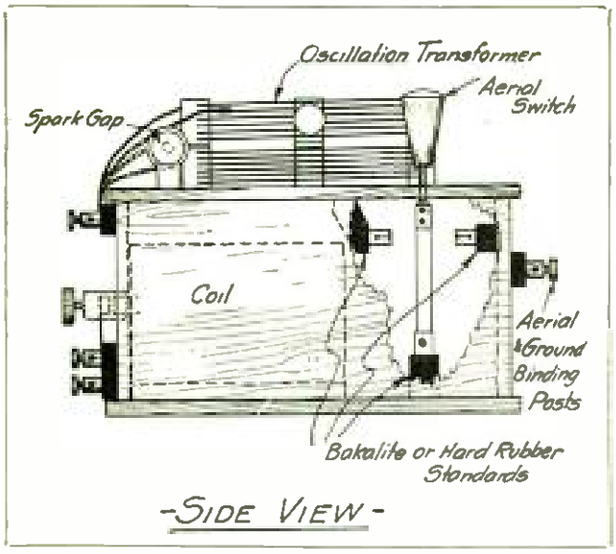


Fig. 2, Honorary Mention Article, Francis R. Pray

The binding posts should be mounted on a small hard rubber panel countersunk into the cabinet. The binding post for connecting the oscillation transformer and key are on the left side, and the ones for the battery, aerial and ground on the right side. The placing of the receiving binding posts is optional with the builder. Dimensions have not been given as they will differ according to the size of the apparatus.

FRANCIS R. PRAY, *Massachusetts.*

HONORARY MENTION

How to Make Cardboard Tubes for Tuning Coils

I find that many amateurs when making tuners or loose couplers are confused when they come to the cardboard tube problem. They either do not know where to buy the tubes or cannot make them successfully. I have had this trouble myself, but have succeeded at last in making them very cheaply with little time and trouble.

In making the tube the first thing to do is to secure a cylinder of the desired length and diameter. Next get some thin cardboard or thick paper. Wind the paper or cardboard around the cylinder. After the first layer has been applied, coat the inside of the paper with glue to make the layers stick together. When the paper has been wound, put elastic bands around the tube to prevent the paper from becoming loose. The tube thoroughly dry, take it off the cylinder and coat the inside with shellac. This strengthens the tube very much. It is now ready for use.

ALBERT KILLMEYER, *New York.*

HONORARY MENTION

Hearing Arlington and Other Stations by Means of a Simple Equipment

For the benefit of amateurs who believe that ideal conditions are necessary for the reception of signals from stations located at a considerable distance, I wish to tell something of the performance of a simple wireless telegraph outfit during the summer months.

About two years ago I visited the Maine coast and of course I took along my receiving outfit consisting of a loose coupler of generous dimensions, a galena detector and a pair of Murdock 2,000-ohm type "A" head telephones. For the aerial system I used 100 feet of annunciator wire, wound two or three times around an apple tree as high as I could reach. The only insulation of the aerial was the cotton covering of the wire. As an earth connection I used three brass curtain rods driven in the ground to a depth of about three feet.

To my great surprise I heard not only Arlington and Cape Cod, but all the naval stations along the coast down to and including the station at Norfolk, Va., which is not very powerful in comparison with Arlington. As far as I am aware, this is near to a record-breaking accomplishment, considering the earth connection and the aerial employed.

H. C. McINTYRE, *Maine.*

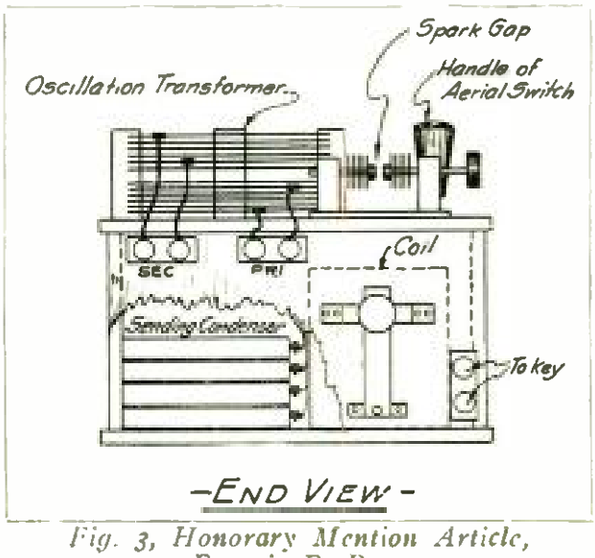


Fig. 3, Honorary Mention Article, Francis R. Pray

AN EXPLANATION

Regarding a Cabinet Receiving Set of the Panel Type

The accompanying drawing will aid in making clear the diagram of connections illustrating my First Prize Article in the October (1915) issue of THE WIRELESS AGE. It should be understood that both the condenser switch and the detector switch are used in oblique positions only. When the detector switch is in the position indicated, the crystaline detector is connected to the secondary terminals of the receiving transformer; but when this switch is shifted to the opposite oblique position the vacuum valve detector is connected instead. Tracing out the diagram of connections for the condenser switch it will be seen at once that it may be connected either in series with the secondary winding to the receiving transformer or in shunt, as desired.

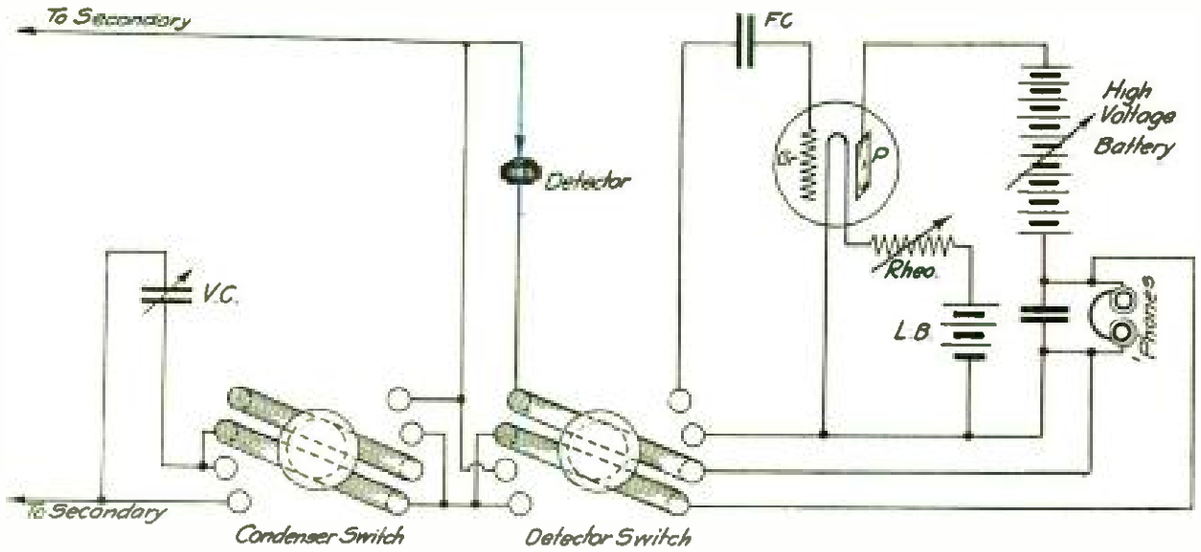
It is, of course, understood that when the crystalline detector is employed the switch to the filament of the valve is open. I trust that the details of construction for my apparatus are clear to your readers and I feel assured that with the corrected diagram they will experience no difficulty in obtaining results.

ARTHUR C. BURROWAY, *Ohio.*

HONORARY MENTION

A Testing Buzzer That Gives a High Pitched Note

The majority of amateurs have one or more of the old-fashioned type of bells or buzzers that are worthless for practicing the code or testing the crystal detector, because of the low, harsh note that they give, and the difficulty of adjustment. It is not advisable to use some of the small buzzers now procurable on the amateur market, because of the increased cost, and the fact that they do not retain their adjustment for an indefinite period. With a little patience, an old bell buzzer can be made over into an instrument that cannot be equalled by anything now on sale.



— DIAGRAM OF CONNECTIONS —
FOR FIRST PRIZE ARTICLE IN OCTOBER "WIRELESS AGE"

If it is an old bell that is to be used, the hammer arm should first be cut off near the contact point. Then solder the vibrator spring to the armature. Remove the lower magnet, the one nearest the binding post, and insert in its place a long screw, the end of which has been filed to a sharp point. The ordinary type of bell or buzzer already has a hole tapped which, through the medium of a small screw, holds the magnet in place. If the hole in the frame is not tapped, this may be done, or a nut may be soldered that will fit the screw to be used

through the hole. A lock nut on the screw is necessary to keep it from loosening up when the bell is in operation.

By varying the tension of the screw on the spring and regulating the contact screw, any note from the original low to a high shrill pitch that is almost inaudible about the room, can be obtained. When by adjustment the desired note has been obtained, tighten up the lock nut, and suspend the entire buzzer by rubber bands. Do not screw it to a solid support, because the wood will vibrate with the buzzer and destroy the shrill note. If the buzzer is to be used for learning the code, about six volts should be employed for its operation. It will then make enough noise to be heard in any part of a large room.

If it is to be used for testing crystals, a flexible lead should be soldered to the contact point of the vibrator and connected to the earth connection of the receiving apparatus. This will produce a sound in the telephones equal in pitch and volume to that of the loudest signals.

D. SAMUEL MEYER, *Illinois.*

More Light on Long Distance Work

Since I wrote my last article, which appeared in the February issue of THE WIRELESS AGE, I have collected additional data concerning amateur communication, which may be of interest to the readers of this magazine.

My station was heard and copied in Yonkers, N. Y., by 2-IB (a distance of 1,000 miles), on January 19, and at that time it was raining in Chicago. I used a transmitting power input of 1 k. w., and the station at 2-IB employed a single vacuum valve bulb.

Regarding daylight work: I communicate practically every afternoon with 9-KV and 9-MA, located in Salem, Wis., (70 miles away). Station 9-KV uses a 3-inch coil and Station 9-MA uses a 2-inch spark coil. These stations employ oil condensers, oscillation transformers and a series condenser to reduce their wave to 200 meters.

With respect to the character of my own wave, it is exactly 200 meters, with a decrement of .2 and I obtain an antenna current of six amperes. My friend, who operates the station 9-EV in Chicago, using a 1 k. w. transmitter, has also been heard by 2-IB. This apparatus sets up 4¼ amperes in the antenna circuit, and was tuned exactly to 200 meters by the United States radio inspector.

Station 9-EV, has communicated with 8-NH, of St. Mary's, Ohio, at four o'clock in the afternoon, and I have worked with an amateur at Lawrence, Kansas, at three o'clock in the afternoon. His station is approximately 500 miles distant from mine.

I note the statement that, on account of close coupling, a double wave may be emitted. I use a coupling of 3 inches between the primary and secondary windings, while station 9-EV uses one of 6 inches; therefore, I do not think the double wave theory feasible, especially in the latter case.

There are many amateurs in the country about us obtaining the same results. As a matter of fact, I have a list of nearly seventy-five amateurs, over 200 miles distant, with whom I could communicate, or whom I have heard. If this kind of work is "freak" work, it is a pretty successful "freak" and can almost be considered as normal.

R. H. E. MATHEWS, *Illinois.*

Experience in the Middle West

I read in your comments on the long distance work performed by R. H. E. Mathews, in the February issue of THE WIRELESS AGE, that you wish to hear from other amateurs regarding the results obtained on the 200-meter wave in the Middle West. I have obtained results equal to those secured by Mr. Mathews during the winter, using two vacuum valve detectors connected in cascade.

Within the past two years, I have employed more than a dozen different vacuum valve bulbs, and I find occasionally that a single bulb with an ordinary hook-

up is as good or often better than the usual cascade connection. This may account for Mr. Mathews' excellent results, but it would hardly explain those obtained by his friend using the galena detector. I might mention in this connection that I have a friend in Owatonna, who obtains results almost as good as I secured with the galena detector.

I have no difficulty in receiving signals from stations in the Twin City, sixty miles away, with 200-meter sets in the daytime. I have heard 200-meter stations at distances of 200 and 300 miles in the night time, but have had somewhat better results on slightly longer waves, some of them a little in excess of 200 meters. For example, I heard 5-BJ, which is now known as 5-ZC, at least one foot from the head telephone. I receive 9-LO fully as well, and have heard 7-BD, Lewiston, Mont., rather strongly.

To illustrate the conditions in this vicinity, Station 9-ZM, Minneapolis, Minn., using a wave-length of 420 meters, and a power input of ½ k. w., can reach Grand Forks, N. D., a distance of 300 miles, any fair evening in the winter time. Station 9-YG, the Agricultural College at Fargo, N. D., has been heard well at Station 8-ZW, Wheeling, W. Va. From the results obtained by other amateurs, I believe that conditions are much better in the West than in the East.

The fact that the before mentioned stations generally use sensitive receiving sets should be taken into consideration.

EBEN R. DENNIS, *Minnesota.*

From an Eastern Amateur

In view of R. H. E. Mathews' statement, and the editor's note appearing in the February issue of THE WIRELESS AGE, an Eastern amateur's experience with 200-meter waves may be of interest. Using a single X grade vacuum valve, with no amplifier attachment, a large loose coupler, and a single wire inverted "L" aerial, 330 feet in length and 40 feet in height, with a very small variable condenser in series with the aerial (an admittedly inefficient arrangement for short waves), I have copied signals from scores of amateur stations on a 200-meter wave in Michigan, Illinois, Indiana, Ohio, West Virginia, North Carolina, and nearer.

I have heard 200-meter stations 700 miles distant while holding the telephones over twelve inches from my ears, and I have read 8-NA and some others in Ohio with the aerial disconnected entirely from my set. Furthermore, I have copied amateur stations in Iowa, Florida and North Dakota. Station 9-GN's signals come in very good with an ordinary receiving hook-up. Time and again I have noted that 2-KK, and other amateurs about 300 miles distant come in much stronger than NAH (Brooklyn Navy Yard), and other long wave government and commercial stations in New York and nearer.

I have attributed the long distance record to the efficiency that this particular vacuum valve bulb has shown; but the facts mentioned in the foregoing paragraph cannot be explained thus.

ALLAN E. DUDLEY, *Massachusetts.*

Editor's Note.—We have no data regarding the design of Mr. Dudley's tuner, but we are inclined to believe that if it had the proper values of inductance for the reception of signals from the Brooklyn Navy Yard, louder signals would be obtained than from amateur stations using the 200-meter wave. In addition it should be taken into consideration that the Brooklyn station is badly located for long distance transmission and cannot be expected to cover the range of a similar set more favorably located. An error in many amateur receiving tuners used with a vacuum valve detector is that on the longer range of wave-lengths a condenser of considerable capacity is connected in shunt to the secondary winding. This condenser limits the voltage which may be applied to the grid of the vacuum valve and in consequence stations using the longer waves are not well heard. The dimensions of the secondary winding of the receiving tuner should be such that for all ranges of wave-lengths a very small condenser in shunt to the secondary winding is in use. Its maximum value in no case need exceed .0005 of a microfarad and better results will be obtained if it is kept as low as .0002 of a microfarad.

We should like to learn from Mr. Mathews and Mr. Dudley whether the results they report can be obtained at night during the hot summer months. We doubt very much if they could carry on such communication throughout the twelve months of the year continuously, although the fact that they are able to do so occasionally is of great interest to the amateur experimenter. It should stimulate interest in amateur communication to

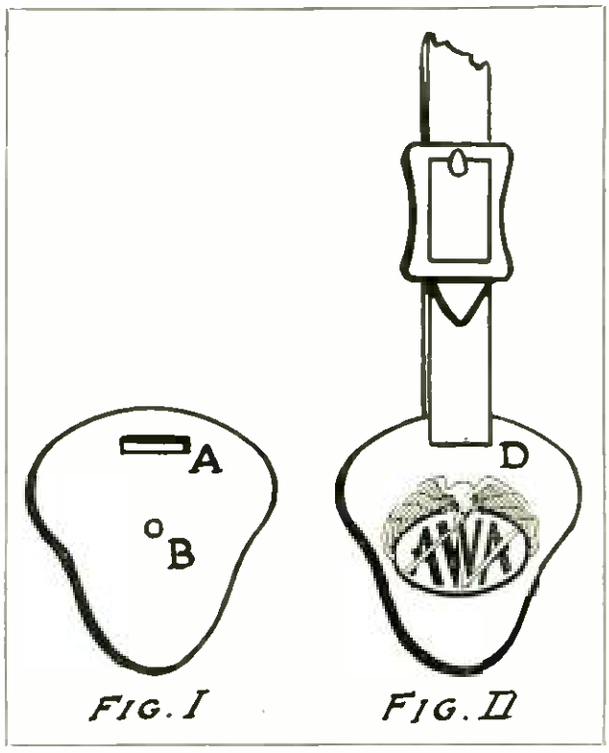
know that exceptional distances with small sets operating on the 200-meter wave can be obtained, and we rather fear that the Post Office Department of the United States will be the greatest sufferer, for if an individual can communicate by wireless for a distance of several hundred miles, there is no need of waiting twenty-four hours for a written message.

It has been known for years in commercial wireless telegraphy that an apparatus capable of transmitting 500 miles continuously in broad daylight will often cover from three to six times that distance during the night hours, throughout the favorable months of the year, which in the eastern part of the United States seem to occur between September and May. However, we advise our correspondents that in order to maintain continuous communication throughout the twenty-four hours of the day and throughout the twelve months of the year over a distance of seven hundred miles, they would require a good 50 k.w. transmitting set constructed to give a high percentage of efficiency. Reports, such as the foregoing, are of interest to all radio experimenters.—TECHNICAL EDITOR.

A WATCH FOB FOR N. A. W. A. MEMBERS

By Leighland Parker

Members of the National Amateur Wireless Association will be interested to learn that the Association buttons can be made into attractive watch fobs. A large number of the members carry the pins in the button holes on the lapels of their coats, but some have school or class insignia which they are at a loss to find suitable wearing places for. To the latter class the pin-watch-fob device will appeal particularly.



Directions for making the watch fob follow:

Take the back of an old leather fob, or, if none is at hand, cut one out with a knife. Having obtained a leather back in some form, such as is shown in Fig. 1, cut a hole, A, about ⅛ of an inch from the top, of sufficient size to allow the strap used in attaching the fob to the watch, to pass through. Then, at some point, B, preferably near the center of the figure, punch a hole large enough to accommodate the screw on the back of the button. The fob may be finished and polished by using either black or tan shoe polish. The strap should then be placed through the slot (see D, Fig. 2). The button is put on by placing the screw on its back through the hole already punched and screwing on the nut. When complete the fob appears as shown in Fig. 2.

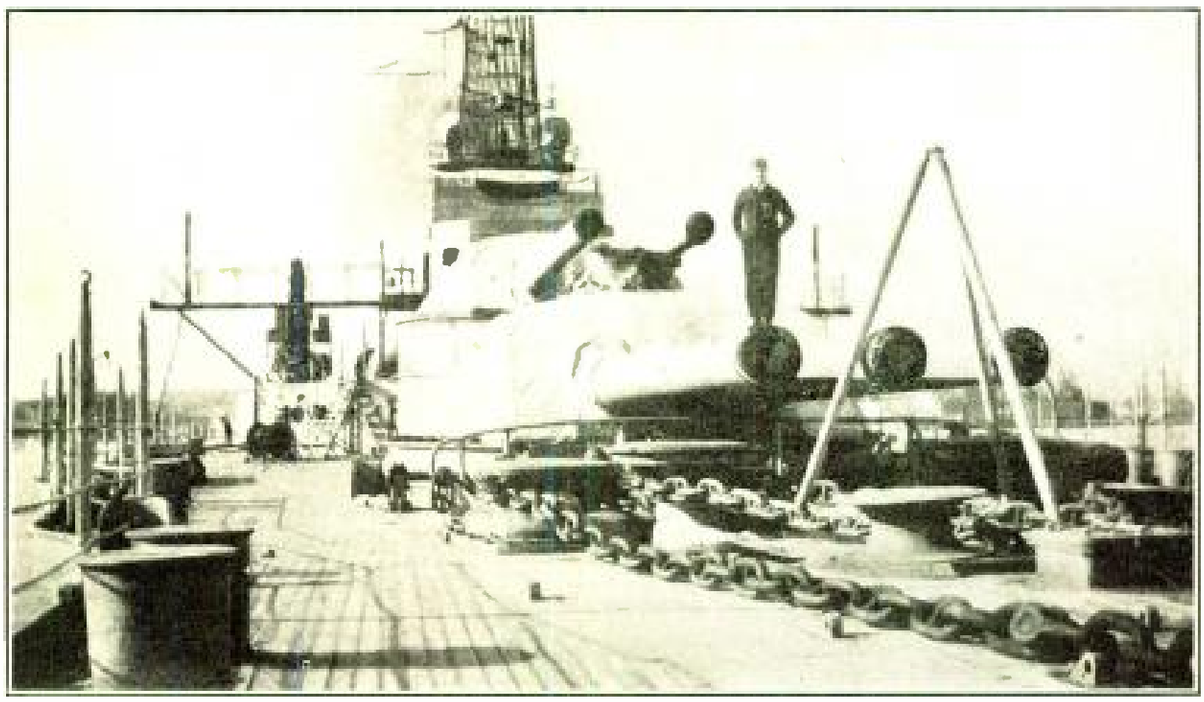
PLANNING TRENTON'S THIRD LINE OF DEFENCE

Members of the Washington Radio Club, of Trenton, N. J., which organization has received a charter from the National Amateur Wireless Association, are planning to form a local branch of the Junior American Guard. The Guard, as has been announced in THE WIRELESS AGE, has affiliated with the National Amateur Wireless Association. Boys ambitious to become members of the Guard should communicate with Martin K. Pillbury, Washington Market Building, Trenton.

Excellent progress in the study of wireless telegraphy among the members of the Boys' Club, of Malden, Mass., is reported. Addresses by members of the club on phases of wireless telegraphy and electricity in which they are most interested are features of the meetings of the organization. The officers of the club are as follows: President, Joseph Muldoon; vice-president, Joseph Robbins; secretary, Charles Robinson; treasurer, Myles Garrigan.

The Oklahoma's Trial Trip

By Willard S. Wilson



The forward battery of five fourteen-inch guns on the Oklahoma

ALTHOUGH a wireless operator on a battleship is not, strictly speaking, one of the men behind the guns, he is always in the center of the activities. My experience in the wireless cabin of the United States superdreadnought Oklahoma during her recent trial trip induced the foregoing opinion.

The battleship left Camden, New Jersey, on January 5 and steamed down the Delaware River to Deepwater Point where, as she was drawing almost twenty-nine feet of water, it was decided to wait a day for the high tide. Then we continued our trip, and on the morning of January 7, the Oklahoma pointed her nose up the East River. She steamed under the Manhattan Bridge to the accompaniment of clicks from the cameras of the motion picture operators on the structure, and made her way into the Brooklyn Navy Yard. There she remained for four days to be inspected and painted.

When the vessel steamed out of New York harbor at the end of that time she was bound for the official trial course of the Government, off Rockland, Me. This, I found, was one mile in length and was marked by buoys. It has the advantage of a considerable depth of water.

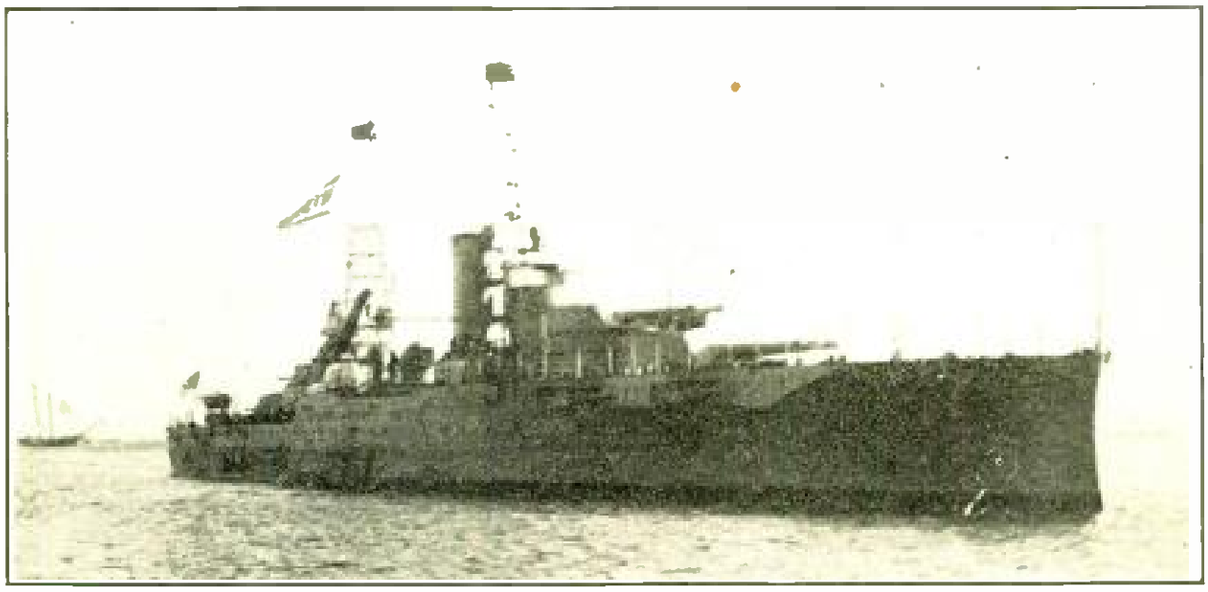
The Oklahoma steamed over the course several times, her highest speed being 21.47 knots an hour. This record excelled that of her sister ship, the Nevada.

After the full-speed tests were completed the ship was required to make a ten-knot, twelve-hour run, a fifteen-knot, twelve-hour run, and a twenty-and-one-half knot, twelve-hour run. These trials were made between Rockland and Boston for the purpose of ascertaining how much fuel oil was burned and how much water was used to produce the desired speed. Other information, such as the revolutions a

minute of the propellers during the different speeds, was also obtained in this manner. At full speed the propellers reached a speed of 130 revolutions a minute and little vibration resulted.

The final tests were made outside the Delaware Capes on the return trip. The first consisted of reversing the engines to full speed astern while the ship was going full speed ahead to determine just how long it took to bring her to a stop. The next and final tests was the making of the figure eight at full speed in order to show how quickly the ship could be turned about and navigated in an opposite direction from that in which she had been steaming. It was also a severe test for the steering gear.

The wireless apparatus was idle but little of the time during the trip. "Press" was sent out by Cape Cod, Miami, Cape Hatteras and other Marconi land stations and published daily in The Oklahoma News. All of the stations came in strong enough to be copied on a typewriter. The set on the Oklahoma consisted of a ½ k. w. Marconi panel transmitter and a receiver, type 103.



The Oklahoma anchored in Boston harbor after her trial trip

THE AMERICAN MARCONI COMPANY'S ANNUAL REPORT

(Continued from page 453)

Referring to government ownership, the report says in part:

"If the ships of the sea are to develop among themselves and to the shore, universal intelligible communication, which is undoubtedly within the possibilities of radio development, a government department, it will be admitted, can hardly be qualified to insist on the disciplining of an operator in a foreign ship who may be lax in duty or deficient in qualifications. There are daily possibilities here for the development of unpleasant and embarrassing international complications. Private enterprise is already rapidly working out this problem through the means of equipment contracts, binding ships to employ only operators possessing standardized qualifications as to langauge, etc., and amenable to a central discipline as to the observance of certain mechanical and operating regulations. The abandonment of the ideal of the universal intelligibility of wireless is to abandon its future development; but such abandonment is inherent in a government monopoly of the art, as can readily be seen from the limitations of the jurisdiction of a government, and the cumbersomeness of its international representation."

The report is signed by Hon. John W. Griggs, president of the company. Annexed to it is a seventeen years' record of the marine disasters in which wireless figured, extending over a period from 1899 to 1916.

How to Conduct a Radio Club

The Installation of Stations

(Specially Prepared for the National Amateur Wireless Association)

By Elmer E. Bucher

ARTICLE XXII

MANY amateurs follow the practice of commercial companies by mounting their apparatus compactly on an insulating panel, but others prefer to have the various parts of the equipment placed so that they are easily accessible for repair or adjustment. For those who follow the latter plan a suggested lay-out for the apparatus of a station is shown in the accompanying drawing, wherein particular care has been taken to place the oscillation transformer, spark gap and condenser near to one another, thus allowing short connecting leads—a self-evident requirement for a 200-meter set. In addition, simplicity of installation was kept in view to avoid the usual bungling and criss-crossing of circuits often observed in amateur equipments.

The operating table is placed about 32 inches from the floor and is approximately 30 inches in width. It may be from 6 to 8 feet in length, according to the space available, and is, of course, supported at intervals by 2-inch by 4-inch uprights.

REQUIREMENTS OF THE TRANSFORMER

Under the table and to the left in the drawing is placed the high potential transformer, which, for the requirements of the amateur station, must not exceed the primary input of 1 k.w. with a secondary potential varying between 12,000 and 20,000 volts. The transformer shown in the drawing is of the open core type, and is of more suitable design for amateur installations than an instrument of the closed core type, unless the latter is constructed so that it has a certain amount of magnetic leakage. The secondary terminals of the transformer are insulated by corrugated hard rubber bushings, B-1, capable of withstanding an applied potential of 20,000 volts without leakage. A safety gap is provided to protect the windings of the transformer and the condenser in the event that the spark gap proper is abnormally lengthened. It merely consists of 2 discharge electrodes connected to the secondary terminals of the transformer and separated sufficiently to prevent discharge when the regular spark gap is in use.

The High Potential Condenser

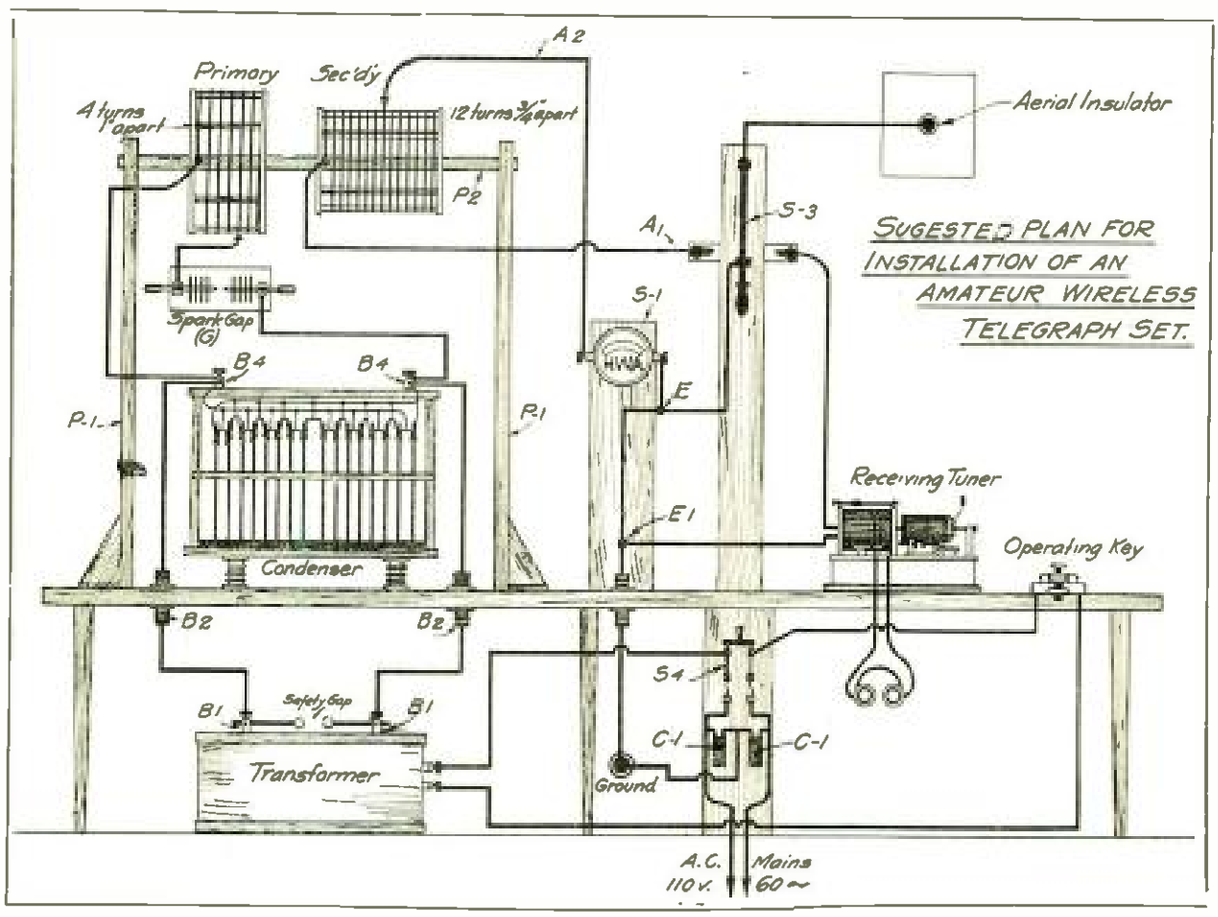
The condenser rack is mounted on the top of the operating table and is insulated from it by the corrugated porcelain or electrose legs, B-3. For operation at the wave-length of 200 meters, the unit may consist of about sixteen plates of glass, with an average thickness of one-eighth of an inch, the other dimensions being 14 inches by 14 inches, covered with tinfoil 12 inches by 12 inches. The plates are divided into two 8-inch banks, connected in parallel, and two banks finally connected in series. The leads from the secondary winding of the transformer are led up through the table through the insulating bushings, B-2, and are attached to the binding posts, B-4, which are mounted on hard rubber slabs on the edge of the condenser rack. No. 14 insulated D. B. R. C. wire will easily handle the output of the secondary winding, but a neater job will be effected if 3/16-inch copper tubing is employed, as it may be bent at right angles, wherever necessary, and is self-supporting when properly attached to the binding posts, B-1.

The connecting tabs of tinfoil from the plates of the condenser are attached to the binding posts, B-4. To afford

better protection for the plates the entire unit comprising the wooden rack and the plates may be immersed in a metal or porcelain tank filled with a good grade of insulating oil. However, this design often is not found suitable, as it is difficult, even with the best compound, to keep the tinfoil on the plates when they are thus immersed, unless they are stacked up and closely bound together with insulating tape.

To keep the connecting leads from the condenser and spark gap to the primary winding of the oscillation transformer at a minimum length, the oscillation transformer is mounted on a wooden rack supported by the pillars, P-1, with the cross rod, P-2. The primary winding is permanently fixed to this rod, but the secondary winding may be slid backward and forward, thus allowing a variation of the coupling.

The primary winding has about four turns of 3/16-inch copper tubing, with the turns spaced 1 inch apart. The winding may be from 8 to 10 inches in diameter. The secondary coil contains from eight to ten turns, spaced ¾ of an inch apart, and may have the same size of tubing. To keep the emitted wave pure and within the limits of the law, it generally is not necessary to have the secondary winding inside of the primary winding; usually there is an air space intervening of from 2 to 3 inches at the most effective degree of coupling. It is quite essential that both the primary and secondary turns be well insulated and, in consequence,



the supports of either must be made up of some good insulating material, such as a high grade of hard rubber, porcelain, bakelite or micarta.

A spark gap, G, is placed between the condenser and oscillation transformer and may take one of several designs. It is the custom at the more advanced amateur station to use an instrument of the non-synchronous type, which usually consists of an insulating disc, 6 to 8 inches in diameter, with eight discharge electrodes, mounted on

the shaft of a motor having a speed of 2,400 revolutions a minute. At stations lacking a source of direct current the terminals of the motor must be connected to the A. C. power mains, and since the majority of such motors have a synchronous speed of 1,800 revolutions a minute, the diameter of the disc may be slightly increased and fitted with from ten to fourteen electrodes.

How to Start the Motor

The terminals of the motor are connected to the top terminals of the 50-ampere power switch by means of which it can be started and stopped. Of course various methods can be devised for starting the motor, one being to fit the antenna switch with an extra set of contacts, so that when it is thrown into transmitting position, the circuit to the motor is closed. For the sake of simplicity, however, the beginner is advised to employ the method shown in the drawing. Owing to the noise from the gap, it is desirable to enclose it in a suitable muffling box, which may be constructed after various designs, but whatever the construction, particular care should be taken to allow short connecting leads to the condenser and oscillation transformer. It is obvious that the terminals of the spark gap must be well insulated from the containing box and also from the wall upon which the box is mounted. The gap can be effectively cooled by drilling two holes in the side of the box and fitting the rotor with a cooling fan. The burned gases are thus removed and a fresh supply of air constantly fed. This will tend to maintain the insulating qualities of the gap supports inside the box and prevent their burning out.

The antenna switch, S-3, is of the simplest possible design, merely consisting of a single blade, double-throw switch, which, when thrown to the left, connects the secondary winding of the oscillation transformer to the antenna and to the right makes contact with the connection to the receiving tuner. In the center position the blade of this switch connects the antenna to the earth lead of the transmitting apparatus at the point, E, making an efficient lightning switch. To comply with the underwriters' regulations, this switch must be capable of carrying a current of 100 amperes and, from the standpoint of wireless apparatus requirements, all studs should be separated at least 6 inches to prevent the direct discharge of antenna potentials over the insulating base. It is, of course, evident that the lever and studs of the switch must be mounted on a good insulating material, which in no case should be of slate. A good grade of hard rubber, bakelite or micarta will in this case fulfil the requirements.

A connection is extended from the aerial wires to the lever of the change-over switch through the insulator, I, which is a hard rubber tube with walls ⅜ of an inch in thickness, with a ¼-inch hole. A brass rod is threaded at both ends and fitted with nuts and connecting lugs, passed through the hole and firmly fastened in place. As an alternative a hole can be drilled through a window pane and a brass rod passed through the first named, but the incoming leads of the aerial must then be well backstayed to remove the strain from the glass.

The right hand stud of the antenna change-over switch is connected to the antenna post of the receiving tuner and the earth connection from the latter makes contact at the point, E-1, to the wire to which the transmitting apparatus ground lead is attached. With this type of switch in use it is intended that the receiving tuner be fitted with a shunt switch to protect the detector from the local oscillations of the transmitter during the period of transmission.

The Transmitting Key

The transmitting key is mounted immediately to the right of the tuner, being placed far enough from the edge of the table to allow the sending operator's elbow to rest on the ledge. It should be capable of carrying a current of 10 amperes without arcing. These keys are generally fitted with platinum or silver contacts.

The hot wire ammeter may be connected either in the aerial lead, A-1, or in the earth lead, A-2. If connected in the former, it should be mounted on an

insulating stand made of a sheet of hard rubber or other suitable material of the correct dimensions to support the meter. The base should be insulated from the wall by hard rubber legs. It is not entirely necessary that this meter be mounted on an insulating support when connected in series with the earth lead, but it is a requirement of the underwriters in many cities that this be done, regardless of the point at which it is connected. It should be noted in the diagram that the meter is mounted on an upright piece of 1-inch wood, which is fastened to the table by means of iron brackets in the rear.

The correct dimensions for an amateur's aerial to be operated at a wavelength of 200 meters is a matter of great importance, but the subject can be covered in a few words. Under favorable conditions it is of no advantage to use more than four wires. However, an exception is made at stations where the flat top portion is limited in respect to the length. Here it may be of value to have many wires in parallel in order that the capacity of the antenna system may be increased. For an aerial composed of four wires, spaced 2 feet apart, the flat top portion cannot exceed 60 feet in length by 40 feet in height. If of the "T" type, the flat top portion may be 120 to 130 feet in length and from 40 to 60 feet in height, providing the incoming leads are not of excessive length. It is, of course, understood that an aerial having lesser dimensions is suitable for the purpose.

The Earth Connection

For amateur stations located in isolated districts where there are no water mains or steam pipes for connection to the earth, a satisfactory earth connection can be made from 250 square feet of galvanized sheet iron or copper, laid in moist earth, let us say, to a depth of from 5 to 8 feet. A connection of copper strip 2 inches in width should be firmly attached and soldered to the plates and led directly to the oscillation transformer of the transmitting apparatus. Additional contact can be made with the moist earth by driving several lengths of galvanized iron pipe with a sledge hammer to a depth of 8 or 10 feet under the copper plates previously mentioned. Surface grounds have also been effectively employed at amateur stations. These consist of several copper wires laid directly under the antenna system, or galvanized wire netting. This is of the kind used in country places for fencing.

Gas Mains Not Desirable Connection

Connection should not be made to the gas mains of any house, as in many cities the gas mains are fitted with an insulating bushing near to the meter, which effectively disconnects the entire system from the earth. At every station where it is possible to do so, a piece of copper ribbon, let us say 2 inches in width, or a piece of heavily insulated No. 2 or No. 4 D. B. K. C. wire, should be attached to the water main on the street side of the house meter. In many homes and apartment houses it is not possible to do this, and, therefore, connection must be made to the steam pipes, to the water mains inside the house, or to the steel frame of the building, if such exists.

The underwriters require in some localities that the earth lead from the apparatus be thoroughly insulated up to the point where actual connection to the earth capacity is made; hence in many installations it is necessary to construct special insulators to hold the copper ribbon away from the structure to which it is attached.

The switch, S-4, breaks the main A. C. line and is of 50 amperes capacity. It is fitted with fuses of the enclosed type and connection from the main should be attached to the bottom side of the fuses. The connections from the switch to the transformer and key are of No. 12 lead covered cable, securely strapped in place by means of small brass pipe straps.

It will be noted from the drawing that the switch is mounted on a piece of timber attached to the edge of the table and fastened to the floor. In order to eliminate all danger of fire the underwriters usually require that this

switch be mounted in a metallic box or on an asbestos base.

Protective Devices

To remove from the primary power circuit destructive potentials, due to the electro-static influence of a wireless transmitter, it is customary to supply protective devices to neutralize these potentials and lead them to earth. A popular form at many amateur stations is the use of two one microfarad condensers connected in one series and grounded at the middle point, as indicated at C-1 in the drawing. A set of these can be connected to the power mains directly underneath the 50-ampere switch and an additional set placed in the basement of the house near to the power meter. The earth connection from these condensers can be attached to the same earth lead used for the transmitting apparatus proper.

In selecting a receiving tuner the builder should clearly decide for himself the range of wave-length over which he desires his apparatus to respond and in this matter he should be guided by the local conditions in his vicinity. For example, if the apparatus is only to be employed for amateur communication at a wave-length of 200 meters, the tuner should be built specifically for the purpose, as it will then give the highest possible degree of efficiency. For the general run of amateur aerials and for use with the 200-meter wave, it is not necessary for the primary winding of this tuner to be more than 3 inches in length by 3¼ inches in diameter, wound with about eighty turns of No. 28 D. S. C. wire. The secondary winding may be 2¾ inches in diameter by about 2 inches in length, wound with sixty turns of No. 30 D. S. C. wire. The secondary winding shunted by a small condenser will respond to wave-lengths somewhat in excess of 200 meters. Of course, for the reception of signals from high-power commercial stations, the tuner must have increased dimensions. Complete information concerning this subject is contained in the book, "How to Conduct a Radio Club."

The receiving telephones for the amateur station generally have a resistance varying from 2,000 to 3,000 ohms. A small hook should be screwed in the side of the operating table for holding the telephones when the station is not in operation.

To resume numerically the values for the set described in the foregoing the high potential transformer should have a primary rating of ¼ to 1 k.w., with the winding constructed for a potential of 110 volts. The secondary potential may vary between 12,000 and 20,000 volts. The high potential condenser should have a capacitance varying between .008 and .01 of a microfarad, while the primary winding of the oscillation transformer may have a maximum value of inductance of approximately 5,000 centimeters. The secondary winding of the oscillation transformer should total about 10,000 centimeters of inductance. The aerial hot wire ammeter has a maximum scale reading of 6 amperes and the antenna change-over switch a current-carrying capacity of at least 100 amperes. The primary power switch has a current-carrying capacity of 50 amperes and is fitted with 15-ampere fuses. The transmitting key must be capable of withstanding a current of about 10 amperes and should be fitted with either silver or platinum contacts. For amateur purposes the range of the receiving tuner need not exceed 250 meters, but for the reception of signals from commercial stations it should be adjustable to wave-lengths of 3,000 meters.

Importance of Correct Design

The writer does not maintain that the plan shown in the drawing is applicable to all amateur stations as local conditions in many cases will prevent it from being carried out. But the suggestions given may be of help to many who are not fully informed on the subject. Every amateur should thoroughly understand that the apparatus must be correctly designed and carefully mounted in order that the full range may be obtained.

(To be continued)

A Marconigram

By

Charles Poole Cleaves

Let us labor on with a right good cheer,
You at your post and I at mine.
Fling me a thought as I labor here;
Hark, O friend, to the countersign.
O, what is space but pulsing air
And what is the silence but the cheer
The toil-winged moments lift and bear
Across the ranges, far or near?

Whatever the morning cloud may spill,
Fretting my day, I know that you
Are working on with a cheerful will
Whatever the task you have to do.
And you—do you know that never unknown,
However unseen, is your work divine?
So I will to work, though I work alone;
As you at your post, so I at mine.

Wireless in the Movies

By Benjamin Baker

The naval lieutenant saves his country from the foreign plotters: Calling the fleet by wireless

Radio Sets and Their Operators Vital Necessities in the Staging and Plot Actions of the Silent Drama. Using the Marconigram to Bring About a Climax.

"IT'S a new sensation. It's a tingle, I tell you, it's a thrill."

The "exhibitor" in the lobby of the big Broadway playhouse looked impressed and impressive. He beckoned to me, and we entered the auditorium. The lighted screen within the proscenium arch was picturing a silent drama.

"There's been a flood of bookings for this," whispered the exhibitor. "They all want the first run."

The story the screen was telling was that of a pleasure yacht which had just struck a mine in midocean. We saw the rush to the lifeboats. We saw the craft abandoned—no, someone had been left aboard. It was a young woman, who had been imprisoned in the wireless room by the force of the explosion. There seemed to be no escape for her. The yacht began to sink, and water to pour through the porthole. The fair prisoner ran to the wireless apparatus and began to send out the S O S.

The yacht continued to sink and the water to rise. The girl still frantically signaled, so long as she was able. The water reached her waist, her shoulders, her chin. The wireless instruments had long been submerged. But had the signals been picked up?

Yes, the "flash-back" showed an American cruiser under full steam. A U. S. N. lieutenant put off with a boat's crew and arrived in time to rescue his sweetheart, just as the yacht went down.

It is the dramatic climax of a motion picture play, at this moment one of the big runs of the movie world.

It was, as my enthusiastic friend the exhibitor said, a new sensation. One could sense it in the gasping suspense of the audience.

Wireless telegraphy, in its many uses and phases, has added a new element of interest to the motion picture drama. A wireless outfit is now an important stage accessory; in fact, it is indispensable in every property room. Marconi operators are frequently engaged by moving picture studios to lend the added realism of

skill and technical training to the scene.

The motion picture play referred to is what is known as a "massive" production. There is a scene in a foundry, showing the casting of a gun; the bursting of one of the huge coast defense weapons while it is being tested; the sinking of a yacht at sea by contact with a floating mine; the scenes on the deck of a United States battleship. But the grand climacteric arrives with the S O S call, and the spectator is spellbound by the scene in the wireless room.

Of course, the art of the pantomimist must be called upon to interpret the dramatic possibilities of wireless, but even the mere addition of a wireless outfit to a scene impresses the beholder with an instinctive sense of the imminence of an important event. It is an elemental rule of stage psychology that woman should characterize the emotional climax. It taxes the skill of the scenario writer to give a quick, plausible explanation of the knowledge his heroine possesses of wireless telegraphy.

It is interesting to see how this obstacle is overcome. In the "tingle" I am writing about the heroine is the daughter of a wealthy ironmaster. One of the opening scenes reveals that she is an enthusiastic wireless amateur, and has had her father install a radio set in their home. Here she is seen practising, and her sweetheart, the lieutenant, who is an expert in the craft, coaches her in the use of the apparatus. This instruction is shown to stand her in good stead when she sends the S O S on the sinking yacht, and lends verisimilitude to the means she adopts in saving her life.

But young women can't all be supposed to have wealthy fathers, possess wireless equipments and be enthusiastic amateurs—no, not even in motion picture plays. In another production in which wireless is a feature, the young heroine is a professional wireless operator at Martinique. In this capacity, she saves a steamship during the Mt. Pelee eruption. As a survivor of the disaster, she is adopted by a wealthy woman, whose son, Neal, is in the Naval Training School at Newport. Together they travel to Newport, the girl carrying with her a packet containing a map showing the location of a lost island and its treasure trove. It is the stereotyped Stevenson romance, of course, with up-to-date trimmings, but the conventionality of the plot is effaced by the swift, vivid, clear-cut action of the screen.

We see the girl and her friends sail for the lost island and the buried treasure aboard the steamship Coronado, while the three R. L. Stevenson villains who are pursuing her, take passage as members of the crew. The Treasure Islanders concoct the inevitable mutiny. Now our heroine's professional training comes into play. In the midst of wild alarm, she flies to the wireless room and sends out the wireless call for help. It is picked up promptly. The gunboat Jackson is cruising in southern waters, and Neal and his crew effect a thrilling and timely rescue.

But wireless is not the exclusive prerogative of the Treasure Island idyll and the S O S romance. It is used as effectively in a modern society motion picture. This story deals with the problem of a very young woman, used to every luxury, who is confronted with the question of choosing the man of her heart or the man who can give her the life of ease and abundance to which she has become accustomed.

Mme. Petrova in the role of a multimillionaire's daughter meets a young officer, with whom she falls deeply in love. Another suitor has an immense fortune. The eternal triangle develops on shipboard, during a voyage from the Philippines. The wireless operator aboard the liner picks up a message from a Pacific coast station, announcing the financial ruin of the heroine's father. The dream of love in a cottage vanishes, and the spoiled young woman eventually weds her wealthy suitor. The wireless has interrupted the romance only temporarily, however, and the ending of the play is as it should be, for tragedies are rare in the movies.

The wireless call for help. The mutineers have seized the ship

The other night I witnessed a "preparedness" movie. Suddenly, not far from me, a feminine voice was raised in curious wonder: "Can you do all those things with wireless?"

The question was a poser. I shall let the reader reach his own conclusions. Wireless is actually the *deus ex machina* of the performance. The possibilities, and one is tempted to say, the impossibilities of the Hertzian wave, are here utilized to the limit.

The motion picture play shows us the operations of two secret agents working for the conquest of the nation by a foreign power. Colonies of hyphenates are in wireless communication with a great trans-Atlantic wireless station in the heart of the Maine woods, which, in turn, communicates with the foreign power. The wireless villains have a game preserve near Newport, in which is *their* wireless station and a privately installed battery, commanding the city's defenses. This is going some, even for wireless. But wait.

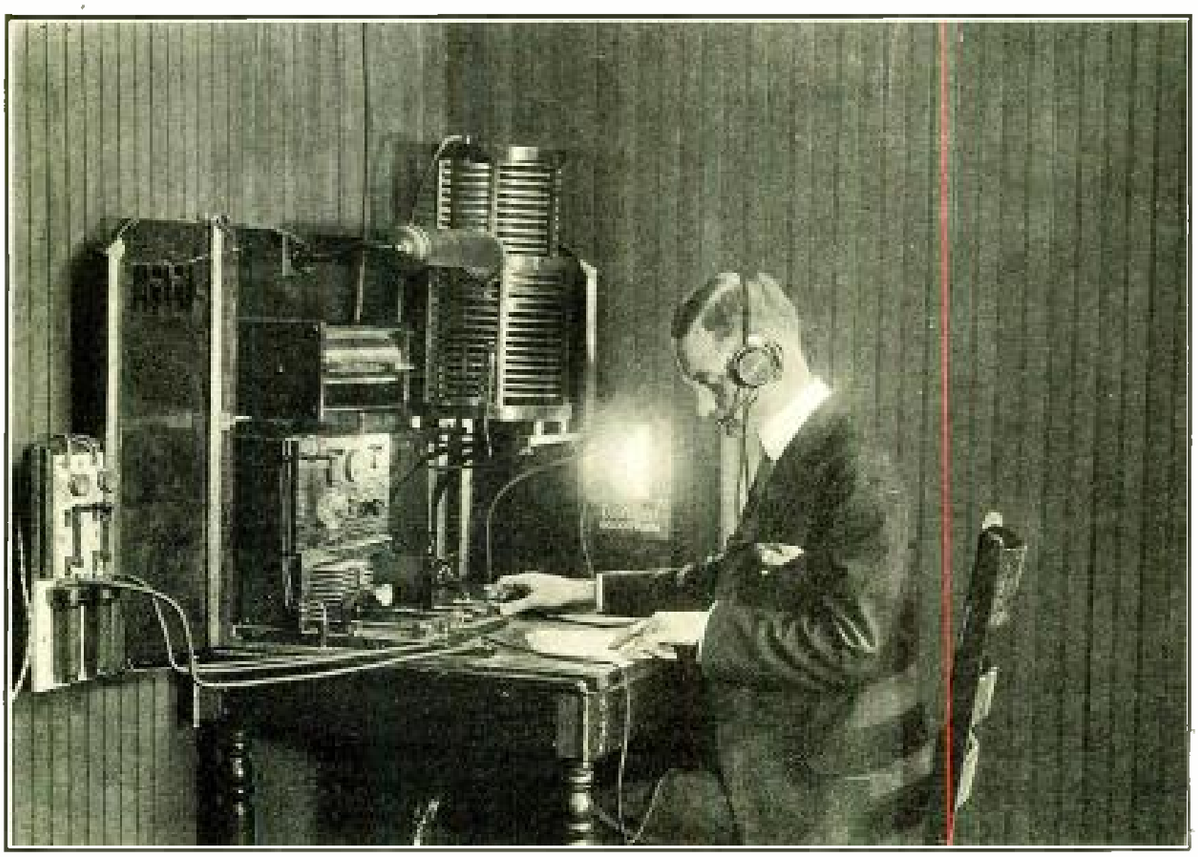
The wireless villains found a peace society, in order to retard preparedness. They induce an admiral's granddaughter, who has a congenital terror of war, to join their society. In fact, the too peaceful heroine prefers one of the wireless plotters to a patriotic lieutenant. This hero, however, comes into possession of the plans and model of an aerial torpedo, "controlled by wireless." The plotters overpower the lieutenant in his laboratory, abduct him and his model and confine him in their wireless station.

We now "cut-back" to the admiral's granddaughter, who has been persuaded that she can save the country from a dreadful war if she steals the plans of the aerial torpedo. This she does, but finally divining the true purpose of the sham peace advocate, she kills him with her father's sword, and becomes transformed into a preparedness patriot.

There is a "flash-back" to the imprisoned lieutenant, who, although bound, manages to electrocute the wireless operator in the secret station by short-circuiting the high tension current which enters the station. In the meantime Newport is attacked. The lieutenant frees himself, repairs the wireless and sends word to the fleet which is far down the coast. The nation is saved.

It must be admitted, the scenes of the play are stupendous. For more than six months the players, a corps of camera men, scenic artists, carpenters and hordes of "supers" were kept at work at Newport in its making. There was a continuous marching and countermarching of troops, the rattle of artillery, the working of wireless stations, the whirl of aeroplane propellers, and the boom of battleship guns. In order to bring realism to the scenes of the navy at its destructive work of bombardment, a ship was bought and sent to sea, and with it as a target, the battleship Utah, and the U. S. S. Patterson and U. S. S. Yankton played for the camera and their big guns soon sent the "Movie," as the craft was termed, to the bottom of the sea.

But it is in the sea tale, on the flowing tide, with the wind that follows fast, that wireless is utilized to the best advantage. In another motion picture play, Hamilton Revelle impersonates a radio expert, in the role of "one of the ablest men in the British Secret Service." Here wireless is adapted to a plot of deep intrigue and adventure. The Secret Service man is discredited through the theft of a document by his enemy. In his search for "File 117," he disguises himself and gets aboard a yacht bound for Labrador. The vessel is struck by an iceberg, and the Secret Service man saves all on board by despatching a wireless call as the yacht goes down.



The wireless ends a dream of love in a cottage. It tells of the bankruptcy of the wealthy heroine's father

The pictures taken for this film were obtained from a yacht actually sunk by the motion picture producers, at the expense of many thousand dollars. While the rest of the party are taken off in lifeboats, the Secret Service man and the heroine save themselves on a raft, which lands them at an island

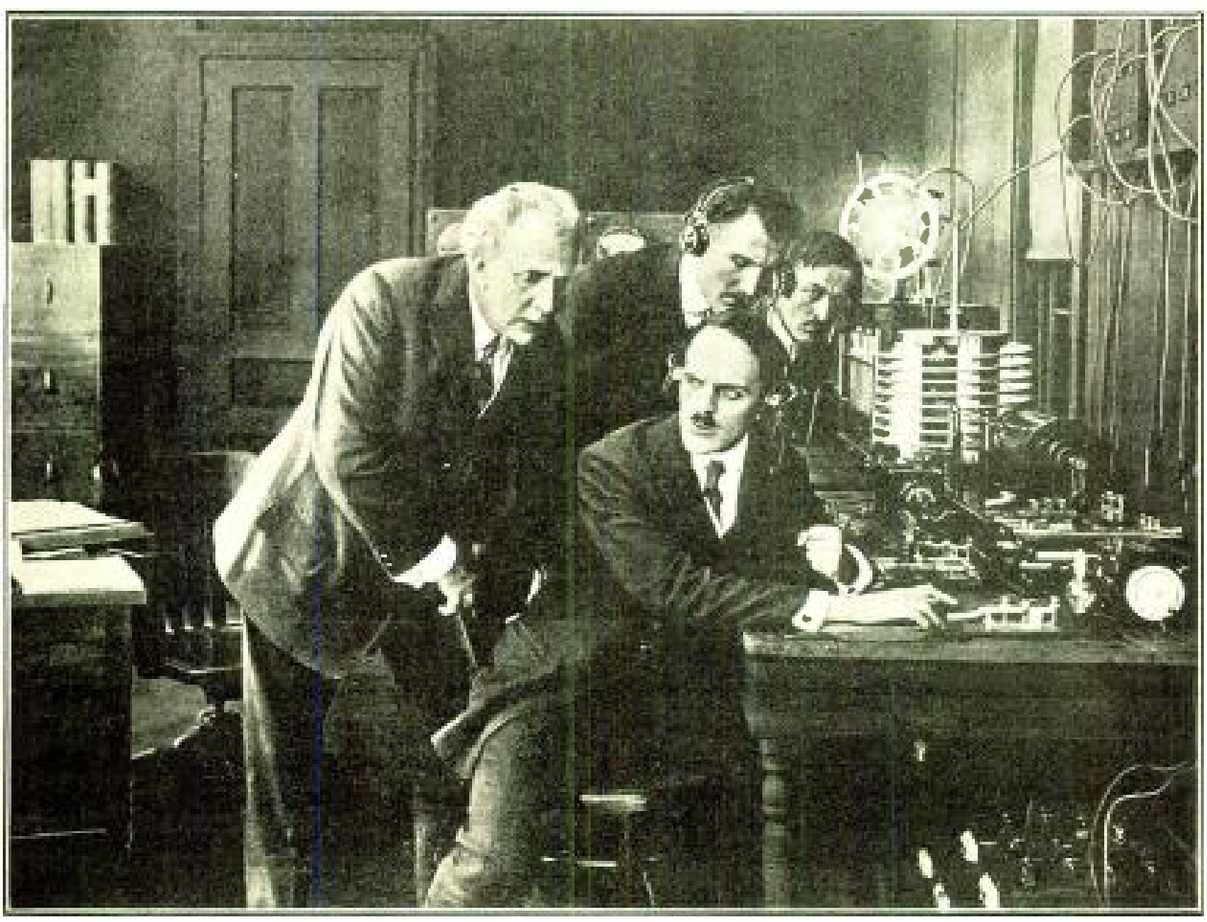
near the coast. Here they are marooned for some time, during which the radio expert learns that his fair companion has the missing document in her possession. When eventually rescued, they send a wireless to England, announcing the recovery of "File 117."

A novel use of the wireless is introduced in a feature play which tells the story of a wild college youth disowned by his father, who rises from his chosen calling of a sailor to the head of a fishing industry, afterwards to conquer Wall street, the little crooked lane with a river at one end and a graveyard at the other. It is a "fighting play." During a terrific storm the men are ordered aloft and grapple and fight in the fore cross trees. The hero is thrown to the deck below. An old skipper finds in the pocket of the injured youth a letter, which discloses his identity as the missing son of the Wall street financier, and he sends a wireless to the anxious father, announcing his discovery.

Another motion picture play has opium smugglers who conceal their booty in various hiding places aboard a vessel. A Secret Service agent sends a wireless ashore, indicating the location of the contraband, and causing the detection and arrest of the smugglers.

That venturesome and adventurous young person, Lucille Love, whose escapades were recorded at length in serial films was assisted from many a scrape and entanglement by the fortunate connivance of the radio message.

In her world-wide pilgrimage, Lucille encountered Hugo Lebeque, the international spy. The spy had placed his valet in the home of Lucille's father as the family butler. With the latter's aid, Lebeque abstracted the plans of the fortifications in the Philippines and escaped on a steamship bound for Hong Kong. The filial Lucille, firm in the determination of sav-



The conspirators at work in the preparedness movie

ing her father from disgrace, pursued the spy. By means of an airship she actually overtook the China-bound steamship. Nothing could ever stop Lucille. Once on shipboard, she quickly recovered the stolen plans, and "wirelessed" her father of her success and her whereabouts. Lucille wasn't either an amateur or a professional operator. She merely "did things" as they came her way.

So soon as the spy discovered her doings, he put the wireless apparatus out of commission. The ship was wrecked, but the fair adventuress and Lebeque were cast up on a desert island. Enough of the wreck was saved to enable them to rig up the wireless outfit, and after having been given up as dead by the outside world, the marooned pair communicated with a vessel that took them home.

All of the foregoing, therefore, informs us of the interesting fact that numerous stars of the movie world are wireless operators of no mean ability. In fact, their managers will assure you that Miss So-and-so and Mr. So-and-so, spent months of intensive study in mastering the wireless art in preparation for their parts. Be that as it may, it will be of interest to many to glance at the names of the most famous wireless operators appearing in the silent drama.

The charming Gail Kane, who starred in "The Miracle Man," is the wireless amateur in "Via Wireless." In "Neal of the Navy," it is Lillian Lorraine, as the professional operator, who saves the Coronado's passengers from the mutineers. In "The Nation's Peril," Earl Metcalfe personates the lieutenant of the United States Navy whose phenomenal work with the radio saves his country from the invader. Hamilton Revelle is the wireless hero in the "The Price of Malice," while in "A Man's Making," George Clarke represents the skipper who communicates the discovery of the missing son to a distressed father by means of the radio. Grace Cunard, of course, depicted the ubiquitous and versatile Lucille Love.

An eminent dramatic writer has said of motion pictures, that "they can never reproduce the brilliant wit of Sheridan, the scintillating verbal sword play of Wilde, or the inimitable dialogue of Shaw." But the silent drama offsets its shortcomings and handicaps with other advantages—the countless variety of scenes, the numberless changes in situations, the swift succession of events.

What an amazing variety is revealed of the uses to which wireless telegraphy is put by the scenario writer. There is the drowning passenger on the sinking yacht—what an added zest is given to the denouement by the S O S signal. How the trite climax of a sea rescue is freshened and rejuvenated by the wireless call. What piquancy is added to the well worn situation of the social drama, by the introduction of a radio message. What a multiplicity of situations is developed by the introduction of wireless in the military play. How the charm of the sea romance is heightened by means of wireless communication with distant sails and shores.

An audience, it is said, is always waiting for something to happen. Well, it happens in the movies when the wireless is at work.

THE NAVIGATION COMMISSIONER ON WIRELESS

In the annual report of the Commissioner of Navigation, it is declared that the bureau has begun to assemble records of marine casualties in which the wireless system on ships inspected by the department contributed to the saving of life and property. Incomplete returns for the past fiscal year show thirty-six such casualties and in every instance the apparatus worked satisfactorily, the auxiliary set taking up the work of communication when the main set, through the nature of the casualty, was put out of commission. "Radio operators," the report says, "have set for themselves high standards of courage and devotion to duty."

Vessels Recently Equipped with Marconi Apparatus

NAMES	OWNERS	CALL LETTERS
Shimosa	Barber & Co.	YOP
Texas	Texas Co.	KUM
New York	Texas Co.	KUW
Floridian	American-Hawaiian Steamship Co.	WLR
Artisan	American-Hawaiian Steamship Co.	WKW
Arborean	American-Hawaiian Steamship Co.	WLS
H. H. Rogers	Standard Oil Co. of New Jersey.	KSI
Frederick Luckenbach	Luckenbach Steamship Co.	KGV
Nevada	Goodrich Transit Co.	WFD
Montcalm	Frederick Leyland & Co.	YPK
Manila	S. L. G. Knox.	CEZ (temporary)
Luz Bianca	Imperial Oil Co.	VEU
Tormentor	Freeport & Tampico Fuel Oil Trans. Corporation.	KFN
Buccaneer	Freeport & Tampico Fuel Oil Trans. Corporation.	KFO
Barge No. 1	Inland Navigation Co.	(Not assigned)
Lakewood	Port Huron & Duluth Steamship Co.	(Not assigned)
Lakeport	Port Huron & Duluth Steamship Co.	(Not assigned)

THE SHARE MARKET

NEW YORK, March 15.

Since last month all Marconis have been inactive, both American and English shares having a somewhat lower tendency. This, in the best opinion, is the natural result of the paralysis of the war and of the steadily increasing burden of taxes on European investors.

Bid and asked prices today: American, 3⅝—3⅞; Canadian, 1⅝—1⅞; English, common, 9—11½; English, preferred, 8—10½.

OBITUARY

Edward L. Young

Edward L. Young, who for eight years was a director of the Marconi Wireless Telegraph Company of America, died at his home in West Thirty-eighth street, New York City, on March 16. He was born in New York in 1855, and was graduated from Columbia University as an engineer. For the last twenty years Mr. Young had been the resident partner of the firm of Takata & Co. He was a member of the Engineers' Club, Nippon Club, Columbia Yacht Club and the Bellport Yacht Club, of Bellport, L. I., his summer home.

The Cretan and Dorothy Crash

Wireless telegraphy and wireless men worked with their usual effectiveness when the steamships Cretan and Dorothy came into collision off Wimble Shoal, near Cape Hatteras, at fifteen minutes after two o'clock on the morning of February 25. A dense fog prevailed at the time. J. N. Onens, senior Marconi operator on the Cretan, and Alvin Rosenberger, his junior, promptly flashed the S O S and it was answered by the San Jacinto which volunteered to render aid.

While the latter ship was picking her way through the fog, the passengers were transferred to the Dorothy in small boats. There was a gaping hole in the Cretan's side, made by the bow of the Dorothy, and the water which entered the hold had given the vessel a dangerous list to port. The starboard boats were filled with water, and enough of the cargo was shifted to heel the Cretan over until the hole in her side was above the waterline. The San Jacinto was then notified that no further aid was needed and the Cretan limped into port under her own steam. The Cretan's passengers, meanwhile, were transferred from the Dorothy to the steamship Apollo, which was bound for Norfolk, their port of destination.

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.

L. T., New Orleans, La.:

From the best information obtainable the following values of antenna current may be expected from 500-cycle transmitters. The usual 1 k.w. equipment will supply to the antenna from 7 to 10 amperes; the 2 k.w. sets from 10 to 18 amperes; the 5 k.w. sets from 15 to 25 amperes; the 25 k.w. sets from 35 to 50 amperes; the 50 k.w. sets from 65 to 80 amperes, and the 100 k.w. sets from 95 to 110 amperes. The Goldschmidt alternator at Tuckerton, N. J., supplies from 110 to 140 amperes to the aerial wires. The Marconi station at New Brunswick, N. J., has registered as much as 280 amperes in the antenna circuit.

Regarding the efficiency of wireless stations: A well designed quenched spark transmitter will supply to the antenna circuit fifty per cent. of the energy taken in by the exciting transformer. Apparatus of ordinary design operated at lower spark frequencies generally represents an efficiency in this respect of from twenty-five to thirty-five per cent. The Poulsen arc type of transmitter is said to transfer twenty per cent. of the energy consumed by the arc to the antenna circuit. The average radio transmitter radiates in the form of electric waves eighty per cent. of the energy supplied to the aerial wires.

An exceedingly small amount of the energy radiated by the transmitter is picked up by the receiver aerial. Approximately 40 microamperes of current must flow in the receiving antenna to make a good readable signal.

The relations existing between the current sent out by the transmitter and that absorbed by the receiver are given in the formula evolved by Dr. Austin, namely:

$$I_r = \frac{3.921\ I_s\ h_1\ h_2}{\lambda\ D\ \varepsilon^{.0474\frac{D}{\sqrt{\lambda}}}}$$

Where I = the current in the sending aerial in amperes;
I^s = the current in the receiver aerial in micro-amperes;
h_1 = the height of the sending aerial in feet;
h_2 = the height of the receiving aerial in feet;
D = the distance of transmission in kilometers;
λ = the wave-length in meters;
ε = the base of the Naperian system of logarithm.

A small amount of the energy absorbed by a receiving aerial flows in the head telephones depending of course upon the type of detector in use. With the larger type of detectors the antenna current varies the current flow of a local battery; hence the windings of the telephones may be traversed by a greater value of current than that picked up by the aerial.

* * *

S. E. C., Jr., Sherborn, Mass., inquires:

Ques.—(1) In connection with an inductively-coupled receiving tuner does it make any difference which end of the coil is grounded?

Ans.—(1) Either end of the coil may be grounded, but it is customary to connect the end or the primary winding nearest to the used turns of the secondary winding, to earth.

Ques.—(2) Is there any advantage in a closely coupled tuner and should the secondary contain as many turns of wire as the primary?

Ans.—(2) If broadness of adjustment is desired and the tuner is to be made responsive to several wave-lengths simultaneously, it is of advantage to construct one that will allow a close degree of coupling. The primary and secondary windings do not necessarily contain the same number of turns because they are used with different values of capacity. For example: The capacity in microfarads of the average ship's aerial is rather low, approximately .001 of a microfarad. The capacity of the amateur aerial is still less, approximately .0005 of a microfarad. It is the general method to connect a variable condenser in shunt to the secondary winding and in consequence the number of turns required in that winding will be gauged by its capacity.

It may be, with certain aerials, that the fundamental wave-length is of such value that only a very few turns are required for obtaining resonance with a distant transmitting station. In this case the primary may consist of a very few turns while the secondary would have a greater number of turns, depending upon the value of capacity connected in shunt. You are advised to purchase a copy of the book "How to Conduct a Radio Club" and familiarize yourself with the principles underlying the actions of receiving apparatus.

Ques.—(3) Why should the receiving range of my station be almost doubled when the apparatus is located on the ground floor of a building instead of in the third story of the house I live in?

Ans.—(3) The distribution of potential and current along a vertical aerial wire is not uniform and in consequence the amperes of current reach their maximum value near to the base of the aerial. If the primary winding of a receiving tuner is connected in series at this point a greater number of lines of force will be set up for the secondary winding than if it were connected in series at some point further up on the aerial wire. The received energy is distributed more uniformly in a flat top aerial than in one of the vertical type; hence in this case the point at which the tuner is connected is not so important.

Ques.—(4) What is the fundamental wave-length of an aerial 60 feet in height, 240 feet in length, with a lead-in of 40 feet, composed of four wires spaced 3 feet apart

Ans.—(4) Approximately 470 meters.

Ques.—(5) What stations other than Cape Cod send out press reports and what is the wave-length used?

Ans.—(5)

Stations.	Week-Days. A. M.	P. M.	Sundays. A. M.	P. M.	Average time required.
Cape May, N. J.	9:15	9	9:15	9	35 minutes
Virginia Beach, Va.	7:45	5	10		20 to 45 minutes
Cape Hatteras, N. C.	8:30	6:15	11		20 to 45 minutes
Savannah, Ga.	7	7:30	7	7:30	40 minutes
Miami, Fla.	10	midnight	10	midnight	40 to 60 minutes

Miami will repeat the midnight press schedule once and will transmit at full power on a wave-length of 550 meters. The other stations also work on 550 meters.

* * *

V. B., Jamaica, N. Y., inquires:

Ques.—(1) Please advise the natural wave-length of an aerial 100 feet in length with an average height of 28 feet.

Ans.—(1) Assuming that it consists of four wires with the usual spacing, it will have a fundamental wave-length of approximately 235 meters.

Ques.—(2) Please tell me how I can increase the pitch of the spark note from an induction coil. I have tried several methods but have failed.

Ans.—(2) It is customary to do this by making the spring on the vibrator more rigid. A small adjusting screw may be attached near to the base of the spring in such a manner as to increase the tension of the spring. It is also effective to reduce the size of the small pieces of soft iron mounted on the end of the spring. An electrolytic interruptor operated from a direct current source of supply will give a high pitched spark note from an induction coil.

Ans.—(3) The accompanying diagram of connections was not understood, but to say the very least it would be difficult to compute the wave-length of a freakish aerial such as your diagram would indicate.

F. H. S., Newfane, N. Y.:

You have neglected to give us the length of the flat top portion of your aerial; consequently we cannot advise concerning the fundamental wave-length. The wave-lengths of four wire aerials are fully covered in the table given in the book "How to Conduct a Radio Club." For the same reason we cannot advise you regarding the range of your transmitting apparatus. It is believed that the capacity of your condenser is too great for a ½-inch spark coil. The coil will cover a greater distance if you will connect the spark gap directly in series with the antenna system and eliminate the condenser.

* * *

J. E. B., Dayton, Ohio, inquires:

Ques.—(1) Can you tell me approximately how many times per second the vibrator on an induction coil makes and breaks the circuit?

Ans.—(1) The number of actual interruptions depends upon the rigidity of the spring of the interruptor and its overall construction. The average interruptor of this type produces about 100 breaks per second, although by shifting the spring frequently, as many as 300 breaks per second are obtained.

Ques.—(2) Can you tell me how far a coherer will respond to a wireless telegraph wave?

Ans.—(2) Contrary to the opinion expressed by many experimenters, the coherer properly constructed is a sensitive receiving detector and will give results comparable to many of the present day detectors. However, it is not amenable to sharp tuning and presents other difficulties which are not in agreement with the requirements of a modern wireless system. A transmitter giving off highly damped waves is more suitable for cohering the particle of the coherer than one giving off more feebly damped waves.

* * *

H. F. W., Chicago, Ill., inquires:

Ques.—(1) What is the wave-length of a three-wire aerial 50 feet in length, 25 feet in height with the wires spaced 2 feet apart? The lead-in wire is 20 feet in length.

Ans.—(1) The fundamental wave-length of this aerial is approximately 120 meters. This aerial connected to the tuning coils you describe will permit adjustments in the antenna circuit to 3,000 meters. Similar adjustments will be obtained in the secondary winding. We do not, however, regard your tuner as representing the best design. It is customary to wind the primary with No. 24 or No. 26

wire and the secondary with No. 30 or 32 wire.

* * *

G. G. S., Los Angeles, Cal.

The following is an interpretation of the prefixes which you heard:

S is the prefix for a Government message, P for a fully paid commercial message, A for a service message, X for a paid relay message.

The signal, AS, is an intimation for the receiving operator to stand-by or wait a minute. The abbreviation, RDO, is quite universally used for radio; also STR for steamer. The expression "To log an operator" signifies that the activities of the operators on the high seas, particularly if they violate some of the company's rules, are being noted by the operators at a shore station or by one of the traveling inspectors.

It is our understanding that the Los Angeles station to which you refer communicates with a corresponding station in San Francisco.

The salaries paid ship operators are given in the bulletin issued by the Marconi School.

* * *

E. M. S., San Francisco, Cal.:

In the Electrician of February 21st, 1913, formulæ developed by Dr. Louis Cohen are given for the computation of the inductance and capacity of the aerial and hence its fundamental or natural wave-length. If the receiving aerial you refer to is, as you say, placed 50 feet above the earth and consists of four wires spaced 2 feet apart, it will have a capacity of .000000105 of a microfarad for every centimeter of length. The inductance value will be approximately 10½ centimeters for every centimeter of length of the flat top portion. The capacity of the lead-ins will be approximately .00007 microfarads and the inductance about 20,000 centimeters. Add these values and substitute them in the following formula for the approximate wave-length of the antenna system, viz:

$$\lambda = 59.6 \sqrt{L\ C}$$

where λ = the wave-length in meters,

L = the inductance in centimeters,

C = the capacity in microfarads.

In the case of an open circuit oscillator a certain correction must be made for the foregoing formula, the matter being fully discussed on pages 209, 210, 211, 212 of the "Wireless Telegraphist's Pocketbook of Notes, Formulae and Calculations," by J. A. Fleming. This volume is sold by the Marconi Publishing Corporation.

With a small condenser connected in shunt to the secondary winding of your receiving tuner it would be adjustable to wave-lengths of 3,500 meters. The receiving range, of course, depends upon the type of receiving detector employed and the local conditions surrounding your station. By this time you have no doubt determined the overall efficiency of your apparatus.

Exceedingly good results are obtained from a vacuum valve bulb employed to amplify the signals received by a crystalline detector, but still better results are obtained by the use of some form of an oscillating vacuum valve, the circuits for which are published in the book "How to Conduct a Radio Club."

We lack detailed information concerning the connection for the high frequency buzzers for communication between battleships, but it is customary to connect a condenser in series with the antenna system and shunt it across the contacts of the buzzer. If the receiving apparatus consists of some form of the vacuum valve amplifier a small buzzer transmitter should cover from 30 to 40 miles.

Concerning the schedules employed by the Key West naval station, you should communicate direct with the commandant at that point.

* * *

C. L. O., Hillsboro, N. H.:

Your transmitting condenser of eleven plates, 4 inches by 5 inches, covered with tinfoil 3 inches by 4 inches, has a capacity of approximately .0012 of a microfarad. The helix, or oscillation transformer, has an inductance of about 15,200 centimeters.

The antenna system 80 feet in length, with an average height of 55 feet, comprising 4 wires, has a fundamental wave-length of approximately 248 meters. The inductance is about 55,000 centimeters and the capacity approximately .00033 of a microfarad. You will now understand that the emitted wave from your transmitter is in excess of that value allowed by law. You might insert a short wave condenser in series with the antenna system or attach the lead-ins in the center of the flat top.

* * *

L. R., Fulton, N. Y.:

Attach the lead-ins from your aerial to the center instead of to the end and the fundamental wave-length will be reduced to a value suitable for operation at a wave-length of 200 meters. To handle the full output of your high potential transformer, you will require a condenser having a capacity so far in excess of that necessary for the 200-meter wave, that your spark gap circuit will be out of resonance with the antenna system.

Connected as an inverted "L" aerial, the fundamental wave-length of your antenna is approximately 290 meters, but if changed to one of the "T" type it will have a natural wave-length of approximately 180 meters.

* * *

J. E. P., Irvington, N. J.:

The diagram of connections accompanying your query is quite correct for an inductively-coupled receiving tuner. The used turns of the primary winding should always face or be placed next to the used turns of the primary winding. In this manner you are assured that the flux of the primary will act directly upon the secondary. Either magnet wire or ordinary copper wire is useful for the windings of receiving tuners.

Your receiving tuner seems to be correctly designed and should give good results.

A dead-end switch will increase the strength of signals when the lower values of an inductance are in use.

A variable condenser to be connected in shunt to the secondary winding may be built up of 20 or 25 plates, interleaved, having the dimensions you give, namely, a 1½-inch radius.

* * *

H. M. W., Glen Roy, Pa.:

A single coil 3-slide tuner, 10½ inches in length by 3 inches in diameter, wound closely with No. 26 wire, will respond to wave-lengths of 2,500 meters. If desired, a condenser may be connected in shunt to the leads of this tuner to the receiving detector.

It is customary to apply the insulating compound to the coils of receiving tuners, after the winding has been completed. Shellac is generally used. If the tube is to be threaded, as you say, the insulating compound is not required. The terminals of the coil may be fastened to the tube by drilling a small hole in either end and tying the wire in a knot.

The following dimensions are given for a spark coil that will satisfactorily communicate a distance of ten miles. The core consists of a bundle of fine iron wires, ¾ of an inch in diameter by 8 inches in length, wound with a few layers of Empire cloth. Over this is wound 210 turns of No. 16 magnet wire, which is again covered with several layers of Empire cloth. The secondary winding should be made of 1½ pounds of No. 30 enameled wire, which is wound in two sections, each section having a diameter of about 3 inches. The condenser connected across the vibrator should have about 2,500 square inches of tinfoil, separated by thin paraffin paper.

* * *

A. S., Austin, Texas:

Your aerial, 100 feet in length by 45 feet in height, has a fundamental wave-length of approximately 267 meters. If it were reduced to a single wire the wave-length would be slightly less but insufficiently reduced for operation at a wave-length of 200 meters. You might allow this aerial to remain as it is and reduce the fundamental by inserting a short wave condenser in series. Try three plates of glass ⅛ of an inch in thickness and 8 inches square, covered with tinfoil, 6 by 6 inches. Connect these plates in series and then in series with the antenna system. Vary the number of turns of inductance in the antenna system until a wave-length of 200 meters is obtained. If you can arrange to bring the lead-ins from the center of the antenna the fundamental wave-length will be less than 200 meters and therefore satisfactory for operation at the restricted wave.

Ques.—(3) Should a lightning protection ground be separate from the transmitter earth connection, or can these two be connected to the same wire? In the case referred to the wire is attached to the water pipe. If the lightning protection should have a separate ground would a 6-foot iron rod driven into slightly moist earth be sufficient?

Ans.—(3) A connection of at least No. 4 wire should be extended from the lightning switch directly to the earth plate. The earth connection from either the transmitting or receiving apparatus may be attached to the same wire at the most convenient point. A lightning ground should have at least 250 square feet of surface in moist earth.

* * *

H. B., Ashland, Ore.:

Your aerial has a natural wave-length of 215 meters which may be reduced for operation on the 200-meter wave by the insertion of a short wave condenser in series.

Full information for receiving tuners to cover definite range of wave-length is given in the book "How to Conduct a Radio Club," which you must have obtained as a member of the National Amateur Wireless Association. Ascertain definitely the wave-lengths of the stations in your vicinity and be guided by them in the construction of the receiving tuner.

* *

J. P., Sanford, Maine, inquires:

Ques.—(1) Please give me the specifications and directions for constructing a 1½-inch spark coil; also the number of batteries required to operate it and the approximate range that may be obtained with a 100-foot aerial.

Ans.—(1) The length of the core should be 5½ inches, the diameter ½ inch. It should then be covered with a small cardboard tube or two layers of Empire cloth. The primary winding should consist of 220 turns of No. 20 wire which is then covered with one or two layers of Empire cloth. The secondary winding requires 4 ounces of No. 38 B. & S. gauge wire wound in the form of a single section which will have an approximate diameter of 1⅜ inches. The condenser in shunt to the vibrator requires between 300 and 400 square inches of tinfoil separated by a thin sheet of paraffine paper. This coil will operate satisfactorily on a 6 or 8-volt storage cell, or on two groups of dry cells, each group consisting of six cells connected in series and the two groups then connected in parallel.

* * *

A. D., Scranton, Pa.:

The entire round of information you desire concerning a receiving tuner adjustable to 10,000 meters is covered in "How to Conduct a Radio Club." The necessary diagram of connections is supplied, together with the dimensions of the coil. The list of the high power stations from which you can receive signals on this apparatus is fully covered on page 850 of the August, 1915, issue of THE WIRELESS AGE. The call letters and the wave-lengths of prominent wave-lengths of prominent wireless stations are given.

* * *

G. L., Poughkeepsie, N. Y., inquires:

Ques.—(1) Will it make any difference in the tuning quality of an aerial system if I attach the lead-in wires about one third from the end? The aerial in question is of the flat top type, 120 feet in length.

Ans.—(1) This will not seriously affect

the tuning qualities of your aerial, but will decrease the fundamental period or wave-length.

A press report is sent out nightly by the Arlington station at half past eight o'clock, Eastern Standard time.

* * *

L. A. L., Carrington, N. D., inquires:

Ques.—(1) What is the wave-length and capacity of an aerial consisting of six wires spaced 1½ feet, length 80 feet, height 48 feet, with a lead-in of 10 feet?

Ans.—(1) The fundamental wave-length is approximately 236 meters and the capacitance about .000396 of a microfarad.

Ques.—(2) What size spark coil is required to communicate with another station at a distance of ten miles? It is to be used with the aerial described in my first query.

Ans.—(2) To insure continuous and satisfactory communication we advise the use of a 3-inch spark coil.

Ques.—(3) Can I purchase a current reducer to operate either a 1-inch or 3-inch spark coil?

Ans.—(3) You may be able to operate these coils from 110 volt D. C. by means of a proper series rheostat. but because the average amateur spark coil is constructed for use with a 6 or 12 volt storage cell it is advisable to follow suit. A series parallel connection of dry cells can be employed in the same manner. For example: Connect eight cells in series and join three of these sets in parallel.

* * *

W. J. G., Allentown, Pa.:

There is considerable argument in the amateur field regarding the most sensitive of the crystalline detectors. Cerusite and galena are known to be very sensitive, but many amateurs report that for making audible a long distance station, the crystaloi excels all of them.

The cause of static has not yet been discovered. It is sufficient to say that when an aerial wire is erected and connected to sensitive receiving apparatus, it is traversed by a series of electrical discharges more or less intermittent, which seriously interfere with the reception of signals. A series of investigations are now being made by the British Association for the Advancement of Science. and it is hoped from the data being collected that more specific information will be obtainable concerning the causes of atmospheric electricity.

Because you have neglected to give us the diameter of your tuning coils we cannot advise the probable wave-length adjustment. If they are at least 4 inches in diameter the tuner will respond to wave-lengths up to 9,000 meters.

* * *

H. K., Eureka, Ill.:

Your aerial system has a fundamental wave-length of approximately 270 meters and connected to the apparatus described in the second query will, without doubt. allow the reception of signals from commercial stations in the Great Lakes district. If the telegraph wires in the vicinity of your aerial set up interfering sounds, the disturbance can be reduced by placing the antenna proper at right angles to the telegraph wires. If the primary winding of a receiving tuner is fitted with a sliding contact for variation of the inductance value there is no necessity for two multi-point switches, or for a second slider. Connect the earth leads to the terminal of the primary winding nearest to the used turns of the secondary winding.

* * *

E. K., Gloversville, N. Y.:

It would help you in your experiments to purchase a simple text book on wireless telegraphy and study the fundamentals. The dimensions for aerials in compliance with the United States statutes are fully covered in the book "How to Conduct a Radio Club." For operation at the restricted 200-meter wave and if the aerial is to be of the inverted "L" type the flat top portion cannot exceed 50 feet in length. If of the "T" type, the flat top portion may be from 80 to 110 feet in length. Spacing the wires by 2 feet is considered sufficient and it will not help matters to use very large spreaders.

Your second question is an important one. You have already demonstrated to your satisfaction that slate is an improper insulating material for high potential work. You might remove the contacts and switch blade from your present lightning switch and remount them on a piece of good insulating material such as bakelite, dilecto or micarta.

The information you request in your third query is generally covered in text books on wireless telegraphy. If a variable condenser is connected in shunt to a coil of wire it has the effect of increasing the wave-length or time period of oscillation. A variable condenser connected in series with an antenna system will reduce its fundamental wave-length. Connected in shunt to the primary winding of the receiving transformer it will raise the wave-length of the aerial system. If your aerial is so long that its fundamental wave-length is in excess of the wave-length at which it is desired to receive, then a variable condenser becomes necessary. But if the natural wave-length of the antenna is less than that of the distant transmitting station a short wave condenser is not required.

* * *

F. L., Clearfield, Pa.:

No one has so far been able to completely eliminate the effects of static at the receiving apparatus. Many circuits and arrangements of aerials have been devised, but they have the effect of reducing the received signals as well as the static. On a commercial receiving tuner the disturbances from this cause may be reduced by employing between the primary and secondary windings the loosest possible coupling consistent with the strength of signals in the head telephone. In connection with the carborundum crystal, the

effects of static may often be reduced by causing an abnormal value of battery current to flow through the crystal during the reception of signals.

* * *

C. L., North Adams, Mass.:

Your three-wire aerial, 50 feet in height by 57 feet in length, has a natural period of approximately 195 meters. The capacitance is about .00025 of a microfarad.

Ques.—(2) I have one of the E. I. Company's junior tuning coils, which has metal bars extending through its entire length. Will not this deduct from the strength of signals?

Ans.—(2) It will have no appreciable effect, provided they are of brass or non-magnetic material.

* * *

D. W. G. L., East Orange, N. J.:

To reply to your queries in detail would require too much space in these columns. The information you request is covered in various chapters in "How to Conduct a Radio Club." You are quite correct in believing that the dimensions of the flat top portion of an inverted "L" aerial must be considerably less than that of one of the "T" type for a given wave-length. The purity of the wave emitted from a transmitter is not wholly dependent upon the condenser in the spark gap circuit. It is a function of the radiation decrement and the radiation resistance. Practically any type of aerial will emit a pure wave if the coupling between the primary and secondary windings is sufficiently reduced. The dimensions for the condenser to be used in a spark gap circuit are restricted by the wave-lengths to be employed and the power of the high potential transformer.

The frequency of a Leyden jar or condenser can be computed from the following formula:

$$N = \frac{5{,}033{,}000}{\sqrt{LC}}$$

Where L = the inductance of the connecting leads to the spark discharger

and C = the capacity of the condenser in microfarads.

A table of wave-lengths for small aerials is given in "How to Conduct a Radio Club."

* * *

J. A. K., Tacoma, Wash.:

The fundamental wave-length of your aerial is 210 meters and the capacitance approximately .000268 of a microfarad. With the receiving apparatus you describe you should have no difficulty in receiving the time signals from Mare Island during the night hours. Your daylight receiving range is problematical, depending upon local conditions. You should also be able to hear during the night hours the prominent high-power stations located in Alaska.

The range of your transmitting apparatus will be increased by fitting either a quenching or rotary gap, but it must be carefully designed.

The complete design for a quenching gap and instructions are given in the article of the series, "How to Conduct a Radio Club," published in the February, 1916, issue of THE WIRELESS AGE.

We do not believe that you will be troubled by the alternating current induction motor which is in operation next door to your station; you might be interfered with by mechanical vibration which, of course, you can take steps to remedy.

* * *

F. H. Y., Weyanwega, Wis.:

Your aerial, 58 feet in length with an average height of 45 feet comprising, as we suppose, four wires with the ordinary spacing, has a fundamental wave-length of approximately 185 meters. If the flat top portion is extended to 87 feet, as stated in your second query, the emitted wave will not comply with the restrictions. You might extend the flat portion to this length and attach the lead-ins to the center. With this connection the emitted wave will be within the bounds.

Regarding the reconstruction of the Wood system type "A" transformer you should communicate with the makers of this direct to obtain the required information. An excellent article on amateur transformer construction appeared on page 193 of the December, 1915, issue of THE WIRELESS AGE. The advice given therein may solve your problem.

* * *

J. T., Portland, Ore.:

Communicate with any electrical supply house which makes a specialty of amateur apparatus and determine where the secondary winding can be purchased for your purpose. Note also the announcements of advertisers in this magazine.

* * *

R. U., New Haven, Conn.:

A complete interpretation of the time signals and the accompanying weather reports is given in the booklet issued by the United States Naval Radio Service, entitled "Commercial Traffic Regulaions"; a copy of this can be secured from the Government Printing Office, Washington, D. C.

It is a hard matter for us to trace down the signals you hear from certain stations at a wave-length of 8,000 meters. There are a number of stations operating in the neighborhood of this wave length. A complete list appeared in the Queries Answered Department of the August, 1915, issue of THE WIRELESS AGE.

Your queries concerning condensers, aerials, etc., are covered in "How to Conduct a Radio Club."

* * *

A. D. V., Earlville, Ill.:

A receiving tuner primarily constructed for the reception of signals at a wave-length of 1,000 meters cannot be sufficiently loaded in the primary and secondary circuits for the reception of Sayville signals. A complete

redesign of equipment is essential and you are therefore advised to construct an apparatus of the type described in "How to Conduct a Radio Club" under the subject of "Beat Receivers." To receive signals at wave-lengths in the vicinity of 8,000 meters a single wire aerial at least 500 feet in length should be erected.

* * *

R. A., deV., Atlanta, Ga.:

There are no spark stations you could hear that operate on wave-lengths in excess of 2,500 meters and in consequence there is no advantage in building a tuning coil to cover an enormous range of wave lengths. A receiving tuner for Arlington time signals and lesser wave-lengths is described in the National Amateur Wireless Association Bulletin for January, 1916. Maximum efficiency at all wave-lengths cannot be expected from a single tuner unless it is fitted with dead-end eliminating switches or constructed in such a manner that the unused portions of the coil can be completely removed from the used portions. Your 300-meter antenna is particularly suitable for the reception of signals from long wave-length stations operating at 2,500 meters and upwards. You are advised to construct a supersensitive receiving set after the plans described in "How to Conduct a Radio Club."

* * *

F. T., Philadelphia, Pa.:

The 150-foot flat top aerial with a vertical height of 50 feet will have a fundamental wave-length of 375 meters. The smaller aerial 35 feet in height by 60 feet in length will have a fundamental of approximately 170 meters. It is not advisable to connect the two aerials in parallel for the longer wave-lengths. The larger aerial will be sufficient for these purposes. When transmitting on the shorter wave-lengths you should disconnect the large aerial by means of a high potential switch. The average ½-inch amateur spark coil will cover from five to ten miles, while a ½ k.w. transformer may do from twenty to thirty-five miles in daylight and considerably further during the night hours.

A receiving transformer for 3,000-meter wave is described in "How to Conduct a Radio Club" and also in the National Amateur Wireless Association Bulletin for January, 1916.

* * *

T. B. T., Jr., Jacksonville, Fla.:

We have had no experience with spirally wound aerials and have only heard of a single instance where one of this type has been employed. Good results are said to have been obtained, but we have never verified them. We can see no advantage in this type of construction.

* * *

C. F. F., Newark, N. J.:

Your aerial has a fundamental wave-length of approximately 100 meters and unless you make use of an extremely sensitive receiving set you will have difficulty in receiving Arlington time signals. Any type of vacuum valve amplification circuit will aid you in obtaining the desired results, but, if possible, you should erect an aerial of increased dimensions.

A receiving aerial only 20 feet above the surface of the earth will probably not give good signals from the Arlington station. It is advisable, if possible, to erect an aerial of at least 40 to 50 feet in height for good signals. A 1½-inch spark coil should enable you to cover from five to ten miles under the ordinary conditions.

* * *

H. C., Palo Alto, Cal.:

The fundamental wave-length of your aerial, 58 feet in length by 38 feet in height, is approximately 170 meters.

An earth connection for a portable set may consist of galvanized iron wire netting or a number of copper wires spread radially over the surface of the earth and directly underneath the antenna system.

As you state, results obtained would indicate that a given transmitting set will cover a greater distance on the Pacific coast than on the Atlantic coast, but no specific comparisons have been made. We frequently hear that amateurs in your district communicate at a distance of several hundred miles with a ½ k.w. transformer.

* * *

A. J. S., San Francisco, Cal.:

The current input to any device taking energy from an alternating current source of supply can be reduced by connecting a reactance or "choke" coil in series. The actual dimensions for this coil cannot be given unless the current in amperes and the range of adjustment required is definitely known.

A reactance coil is of very simple construction, consisting merely of an iron core with several layers of wire from which tapoffs are brought out to the points of a multiple-point switch. You may even do away with the multiple-point switch and regulate the current flow by drawing the iron core in and out of the winding.

* * *

R. T. S., Waterford, N. Y.:

The degree of brilliancy of the incandescent lamp connected in your antenna system is a good indicator of the relative values of energy flowing. The fact that you obtain a brighter light with an ordinary helix than with an inductively-coupled oscillation transformer indicates that the helix permits a closer degree of coupling and therefore passes more energy to the antenna circuit. It may be that the primary and secondary windings of your inductively-coupled oscillation transformer are not in exact resonance; hence the decreased current flow.

Your third query again brings to light a condition which has been observed at many

stations employing a non-synchronous rotary spark discharger in connection with 60-cycle apparatus. There is a certain number of sparks per second of time that will give the best signals at the receiving station. In addition the sensitiveness of the receiving telephone must be taken into consideration. When the speed of the rotary spark gap is decreased it is very probable that you secure increased amplitude of oscillation for each spark discharge and in consequence better signals are received.

For information concerning the use of the crystaloi detector you are referred to the article on the subject, which appeared in the March, 1916, issue of THE WIRELESS AGE. Due to the fact that this is a detector of low resistance a condenser of a certain capacity is required in shunt to the head telephones.

* * *

W. B., Lima, Ohio:

Your receiving will be considerably improved if you will decrease the flat top portion of your aerial to a length of, say, 40 to 50 feet; also the fundamental wave-length of the antenna can be reduced by attaching the lead-ins to the center of the flat top portion.

A receiving set for a portable equipment is described in "How to Conduct a Radio Club." The windings of this tuner are designed specifically for wave-lengths in the neighborhood of 200 meters. Duplicate the design given and you will have a receiving apparatus that will be particularly responsive to amateur stations. There is no particular advantage in spacing the turns of the wires on a receiving tuner, with the exception that it has the effect of decreasing the distributed capacity. With small windings the effects of distributed capacity need not be taken into account.

* * *

V. C. M., Bucyrus, Ohio:

Your flat top aerial with a horizontal length of 100 feet and an average height of 35 feet has a natural wave-length of approximately 237 meters. If you will attach the lead-ins to the center portion of the flat top you will not require a short wave condenser. The sensitiveness of a crystal is not affected by submerging it in oil and it is often an advantage to do so when the crystal is used in a damp climate. The series of articles entitled "How to Conduct a Radio Club" to which you refer can now be purchased in book form from the Marconi Publishing Corporation.

* * *

N. M., Waynesboro, Pa.:

The time signals cannot be received from the Mare Island Navy station at your receiving station. The range of this station is limited in an easterly direction.

Galvanized wire often has been used for a receiving aerial, but it is not recommended. If possible copper wire should be employed.

* * *

S. N., New York City:

The fundamental wave-length of an antenna is changed very little by the addition of wires in parallel. Your aerial, 125 feet in length with an average height of 45 feet, has a fundamental wave-length of approximately 295 meters. The time signals from Arlington will be received with increased strength on your tuner by connecting condenser in shunt to the secondary winding. With a condenser of .0005 of a microfarad it should be responsive to wave-lengths of approximately 3,000 meters. The range of a 1-inch spark coil transmitting set varies with the location. You may expect to cover from five to ten miles under normal conditions.

* * *

L. H. M., Skagway, Alaska:

Either copper or brass strip may be employed for an oscillation transformer. Of course, the copper will have a higher degree of conductivity.

* * *

F. L. M., Palo Alto, Cal.:

It is next to impossible to estimate the wave-length of a freakish aerial of the type you have described. You are advised to connect a spark gap in series with this antenna and excite it with a small induction coil. Then place a wave-meter in inductive relation to the earth lead and measure its fundamental wave-length. The effective capacity and inductance can be determined by the method described in the book, "How to Conduct a Radio Club." This measurement is very simple and requires only an accurate wave-meter and a Leyden jar of known capacity.

* * *

H. I. W., Canal Dover, Ohio:

Ques.—(1) Approximately, what is the wave-length of an aerial 70 feet in height at both ends, consisting of four wires. The flat top portion is 300 feet in length and the lead-ins are brought from the center of the aerial.

Ans.—(1) The fundamental wave-length of this aerial is approximately 300 meters.

Ques.—(2) Can a 3 k.w. transformer with secondary voltage of 25,000 be used on this aerial and work efficiently on 450 and 600-meter waves?

Ans.—(2) The proportions of this aerial are quite correct for operation at these wave-lengths. The 3 k.w. transformer can be used.

Ques.—(3) What is considered a good value of antenna current on the 600-meter wave with a 3 k.w. transformer operated at full power, the apparatus being fitted with a non-synchronous rotary spark discharger?

Ans.—(3) If the apparatus is efficiently designed throughout and in accordance with the best knowledge of the art, you should obtain from 6 to 9 amperes of current in the average aerial.

* * *

M. A. C., Elkhorn, Wis.:

The fact that your apparatus already receives the time signals from Arlington at noon indicates that it must be fairly well designed. We note from the diagram of con-

nections accompanying your query that a fixed condenser is not connected in shunt to the head telephones. We are certain that you would receive increased strength of signals if you supplied one of a capacity varying from .003 of a microfarad to .04 of a microfarad. Condensers of this type can be purchased from any electrical supply house at a very reasonable price. We have no additional suggestions to make permitting the reception of signals from Key West, except that you should take into account that this station now operates at certain periods with undamped oscillations at a wave-length of approximately 6,000 meters.

For a condenser to be connected across the telephones, you might try two sheets of tinfoil 66 by 24-inches, separated by a thin piece of paraffin paper. This condenser may then be rolled up in circular form and connections brought out from the two sheets of foil to binding posts. You, of course, understand that the condenser units cannot be rolled up in circular form, unless the foil is completely covered with paraffin paper to prevent short circuiting. It may be to your advantage to secure a copy of the National Amateur Wireless Association Bulletin for January, 1916, in which the dimensions of a receiving tuner particularly suitable for the reception of time signals from Arlington are given.

* * *

F. K. O., Jr., Springfield, Mass.:

You are experiencing the usual amateur difficulties when the house wiring is in proximity to the antenna wires of your transmitter. We fear that your aerial is so close to the power circuit that no amount of protective devices will fully eliminate the induced potentials. Are you sure that you have a perfect earth connection? An excessively long earth lead may set up disastrous inductive potentials in the power wires and this may be the cause of your trouble. Can you not erect your aerial so that the power wires of the house will not be in inductive relation to it?

* * *

W. O., Covington, La.:

We have no suggestions to offer for improvement of your receiving apparatus. The outfit you have purchased is made by a reputable company and should give good results from commercial stations located within your vicinity. Of course, if you expect to do extremely long distance receiving work, you should construct a tuner connected up after some form of the vacuum valve oscillating circuit, which when understood and properly adjusted, gives exceedingly good results from high power stations.

The fundamental wave-length of your aerial is 350 meters, making it particularly effective on commercial wave-lengths.

* * *

P. S., Gilman, Ills.:

Your aerial is well constructed and has a fundamental wave-length of approximately 170 meters which, in connection with the two-slide receiving tuner, supposed to have a capacity of 800 meters, should permit response from commercial stations located in your vicinity.

Regarding your fourth query: Better results are generally secured when the telephones are connected across the fixed condenser, which is in series with the secondary winding of the receiving tuner.

Galena crystals can be purchased from Eimer & Amend, Third Avenue, New York City.

It is a problem to calculate the wave-length of coils from the dimensions you have given. You have not stated the spacing of the wire in either the primary or secondary windings. The information given would indicate that there must be considerable spacing between the turns. Again, we do not know the type of circuit in which these coils are to be used. Are they to be employed as the primary and secondary winding of a receiving tuner, or are they merely single slide or double slide tuning coils to be used in the ordinary manner?

Since a number of days have passed since your query was sent in, you no doubt have by this time ascertained the night range of your receiving apparatus and require no advice from us.

* * *

W. J. H., Brooklyn:

Specific instructions for the dimensions of a loading coil to raise the wave-length of an unknown aerial 400 meters cannot be given unless the exact inductance and capacity of the antenna system with which it is to be employed are known. Litzendraht wire is practical and will give a minimum value of high frequency resistance. If you have available a wave-meter, shunt it with a buzzer and a battery connected in series and set it into excitation at the wave-length desired. Place the coil of the wave-meter in inductive relation to the earth lead of the antenna system and add turns of wire in the aerial circuit until the desired wave-length is obtained. The point of resonance betwen the wave-meter (used as a transmitter) and the antenna system can be obtained by attaching a crystalline detector to one end of the loading coil. The detector is shunted by a pair of head telephones.

* * *

J. E. P., Irvington, N. J., asks:

Ques.—Does the Marconi Company employ draughtsmen, and to whom should one apply for a position?

Ans.—Yes. Apply to the Chief Engineer, 233 Broadway, New York City.

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.

ONLY 30 DAYS MORE
For Charter Members

National Amateur Wireless Association

CHARTER MEMBERS ACCEPTED TO MAY 1, 1916.

So that clubs may have time to complete organization work now under way, and also to give ample opportunity to all who wish to become Charter Members, an extension has been allowed by the Officers and applications will be received up to May 1, 1916. After May 1, 1916 the Initiation Fee of $1.00 will be required from all new members.

OFFICERS OF THE ASSOCIATION.

PRESIDENT, Guglielmo Marconi.

NATIONAL ADVISORY BOARD OF VICE PRESIDENTS

Professor A. E. Kennelly,
Harvard University.
President, Institute of Radio Engineers.

Professor Alfred N. Goldsmith
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Professor Samuel Sheldon.
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Professor Charles R. Cross,
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Capt. W. H. G. Bullard, U. S. N. Superintendent, U. S. Naval Radio Service.

Col. Samuel Reber, U. S. A., Chief Radio Signal Officer U. S. Army.

E. E. Bucher, Instructing Engineer, Marconi Wireless Telegraph Company.

ADMINISTRATIVE OFFICERS:

ACTING PRESIDENT,
J. Andrew White,
Editor, THE WIRELESS AGE.

MANAGING SECRETARY,
Clayton E. Clayton,
450 4th Avenue, New York.

A national organization of wireless amateurs was announced in the October, 1915, number of THE WIRELESS AGE. Further details of the organization are given in an address made by J. Andrew White, which was published in the November WIRELESS AGE. Reprint copies sent upon request.

ENROLLMENT OF CHARTER MEMBERS.

Charter members of the National Amateur Wireless Association will be enrolled on special arrangement. Charter members will receive the following:

CHARTER MEMBERS' EQUIPMENT.

1st. CERTIFICATE OF MEMBERSHIP.

The handsomely steel-engraved Certificate, with shadow background half-tone, is sealed and signed by Officers, with the endorsement of Senatore Marconi, as President. Every member will want to frame and place it alongside of his Government License certificate, two documents establishing status as wireless amateurs.

2nd. AERIAL PENNANT.

The 36 inch aerial pennant, painted in four colors on scarlet felt, will stand long service at your aerial mast head. Every member will be proud of the National Insignia flying from his aerial.

3rd. MEMBERSHIP PIN.

The National Amateur Wireless Association Pin in gold and enamel is the National emblem of the Association. The design shown on this page can but faintly describe its handsome appearance in three colors and gold. The pin has a special patented hub and shank which permits it being securely fastened on the coat lapel or on the vest without turning upside down.

4th. HOW TO CONDUCT A RADIO CLUB.

This splendid book, which has been months in preparation and incorporates portions of articles running under the same title in THE WIRELESS AGE, is re-written to cover every new development, and with a large proportion of new matter. It is the foundation stone of the National Amateur Wireless Association activities. Price of this book 50c.

5th. LIST OF RADIO STATIONS OF THE WORLD.

Revised Edition just published. See advertisement. Regular 50c edition.

6th. HOW TO PASS U. S. GOVERNMENT WIRELESS LICENSE EXAMINATIONS.

Regular 50c edition of this popular book. Members who already have a copy, see concessions below.

7th. MONTHLY BULLETIN SERVICE.

It is intended to make the monthly bulletin service for members of the National Amateur Wireless Association one of the most important features of the Association. This bulletin is to be used in connection with "List of Radio Stations of the World" described above. It will carry all additions (both amateur and commercial) to "List of Radio Stations of the U. S.", issued by the Bureau of Navigation, U. S. Department of Commerce, and secured for members at 18c a copy. The Government list is issued only once a year. The Association Bulletin will keep both lists up to date for you month by month, and in addition, will carry other special and invaluable Association features not obtainable elsewhere

8th. ONE YEAR'S SUBSCRIPTION TO THE WIRELESS AGE.

THE WIRELESS AGE is the Official Organ of the National Amateur Wireless Association and will contain full reports of wireless amateur activities, both national and local. It is planned to give published recognition to individual amateur achievement.

CONCESSIONS:

Those who, *during the past six months,* have become subscribers to THE WIRELESS AGE, or have renewed their subscription, or have purchased any portion of the Charter Membership Equipment, may consider such payment as partial payment of Charter Membership Application as given below. If you have paid for a subscription to THE WIRELESS AGE which includes books which are not a part of the Membership Equipment, then you may credit $1.25 of the remittance as partial payment on the Charter Membership. For example, you may have remitted $2.25 for the combination offer of the 1915 Year Book with one year's subscription to THE WIRELESS AGE. In this combination, the price of both the book and the subscription was reduced, to make the special offer; therefore, you may be credited only with that part of the payment which went to the magazine—that is, $1.25. Coupon subscribers receive no credit for trial orders. Subscribers to THE WIRELESS AGE who *began or renewed more than six months ago,* will secure through full Charter Membership fee a renewal for another year; and their subscriptions will be extended for one year from the time the present subscription expires. After May 1, 1916, concessions will be given only on account of previous purchase of the three 50-cent books included in the equipment.

ANNUAL DUES FOLLOWING FIRST YEAR.

The annual dues are to be not more than $2.00, after the first year. For this, all members are to receive:

1st. The Monthly Bulletin Service.

2nd. THE WIRELESS AGE for one year.

3rd. Special 50c. Instruction Books at 30% off list price.

4th. 10% discount on any book on wireless published, and other features to be announced later.

SPECIAL NOTICE REGARDING CORRESPONDENCE.

As the National Amateur Wireless Association is in no sense a money making enterprise, and as the nominal dues will cover a very small amount of handling expense, it is desired that the correspondence be limited to only the most essential necessities. Many general questions will be answered in the Service Bulletins; special matters pertaining to local questions should be handled through the Corresponding Secretary of Local Clubs and Associations. A cordial invitation is extended to all club officials to write on matters pertaining to organization. This invitation also includes those who are interested in starting new clubs. **Charters:** Out of the amount paid by each member for annual dues, it is purposed to allow organizations that have become part of the National Amateur Wireless Association a rebate of 50 cents out of each $2.50 for their own treasury—a fund to take care of local expenses. Please note that this is a rebate, not a deduction. In order to qualify for recognition as a unit in the National Amateur Wireless Association, a club must have at least five active members and at least one-quarter of its total membership become members of the National Amateur Wireless Association. Clubs securing a charter will have representation in the National Council; this means that they elect their own delegate and thus secure a voice in the management of the Association and in the planning of its future development and activities.

Clayton E. Clayton, Managing Secretary,
450 4th Ave., New York.

Checks and money orders should be made payable to: Natl. Amateur Wireless Assn.

APPLICATION FOR MEMBERSHIP.

CLAYTON E. CLAYTON, Managing Secretary,

NATIONAL AMATEUR WIRELESS ASSOCIATION, Date.....

450 4th Avenue, New York City.

As I desire to receive full recognition as an amateur wireless worker of the United States, I ask the privilege of enrollment as a Charter Member in the National Amateur Wireless Association and request that you send me the Charter Members' Equipment for which I enclose herewith remittance of $2.50.* (Option.)

I trust that you will act upon my application promptly and forward the equipment to me at the earliest possible date.

My qualifications for membership are given in blank spaces below.

Signature ....Age.....

Street Address .....

Town and State.....

Please credit me with $..... paid for.....

* Option.

In the event that an applicant is unable to send the entire amount of the membership dues with this application, the figure $2.50 may be crossed out and $1.00 written in its place. This will be considered an agreement on the part of the applicant accepted for Membership that the balance of dues ($1.50) will be paid at the rate of 50c per month for the next three months, at which time pin, pennant and Certificate of Membership will be issued. The other equipment will be sent at once.

FILL IN ANSWERS TO THESE QUESTIONS.

1—Have you a Government License (give number.....) or do you purpose applying for one?.....

2—If you are under 21 years of age, give names of two adults for references as to character.

Reference.....

Reference.....

3—If you are a member of any Local, State or Interstate wireless club or association, give its name, and name of Secretary with address.

.....

4—Are you now a subscriber to THE WIRELESS AGE?.....

5—If you already have any books included in the equipment, state which ones.....

.....

Note: After May 1, 1916, New Members will be required to pay $1 Initiation Fee and $2 Annual Dues.

National Amateur Wireless Association

A DIRECTING ORGANIZATION DEDICATED TO THE PROMOTION OF RADIO COMMUNICATION

GUGLIELMO MARCONI, PRESIDENT

CALL LETTERS 9PY
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For Clubs and Members of National Amateur Wireless Association

The following list of items of optional equipment is listed at cost price in order to give members and clubs of the Association every material advantage in the way of a complete equipment that may be desired. Prices include transportation charges to 5th Parcels Post Zone. Postage extra to 6th, 7th and 8th Zones.

LETTER HEADS AND ENVELOPES:

100 National Association Letter heads with imprint of member at left hand side, as illustrated above **75c**
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Special prices on 1000 Letter Heads to Clubs.

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A record book in which to keep track of all your operations and communications, in paper..... **15c**
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RADIO STATIONS OF THE U. S.:

Call list issued by the U. S. Department of Commerce, postpaid.. **18c**

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Photographs of important stations, such as Belmar, Arlington, Sayville, Honolulu, etc., 9" x 12", each **$1.00**

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N. A. W. A. emblem..... **$1.75**

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in colors **50c**

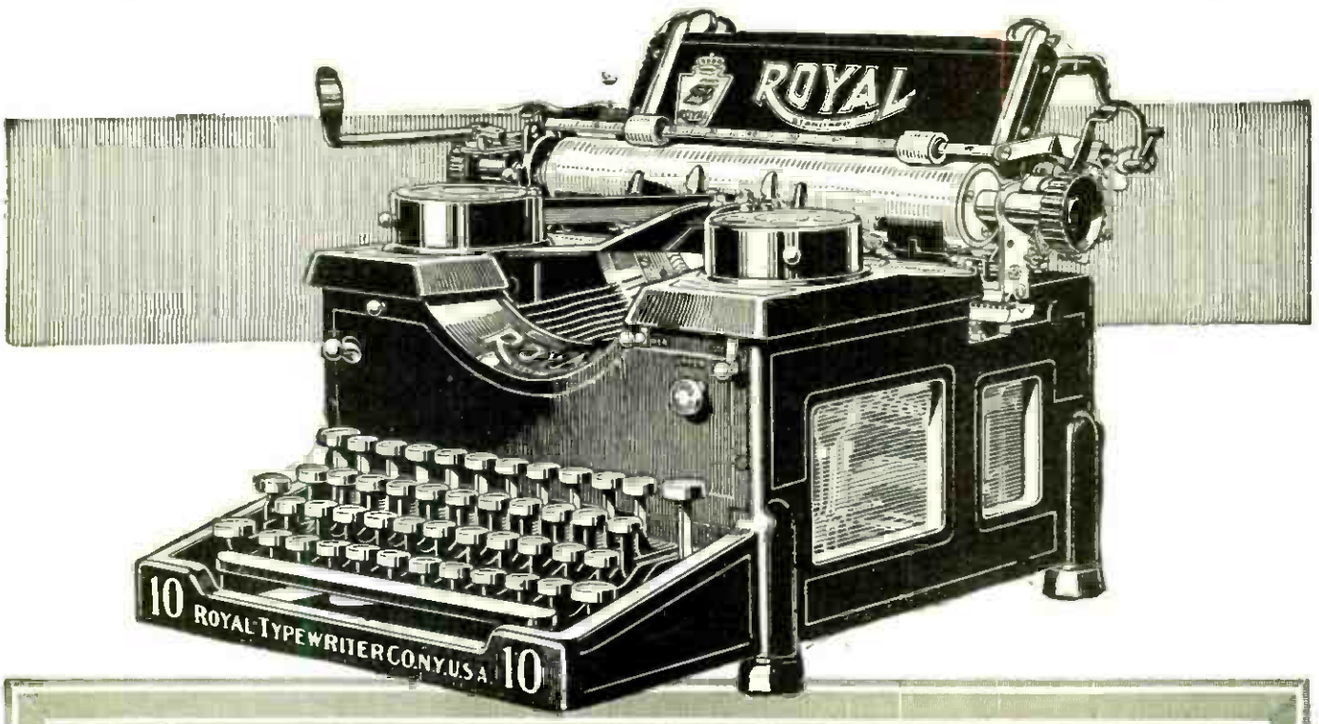
YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY,
published at $1.50, special to members and clubs **$1.10**

CLUB PENNANTS: Made of first quality wool bunting, letters and emblem sewed on with cut outs in color and name of club added, prices on application.

Extra pennants for members 30c each

Fac-simile of 36 inch Pennant.

Send all orders to Clayton E. Clayton, Managing Secretary, National Amateur Wireless Association, 450 Fourth Ave., N. Y. City.



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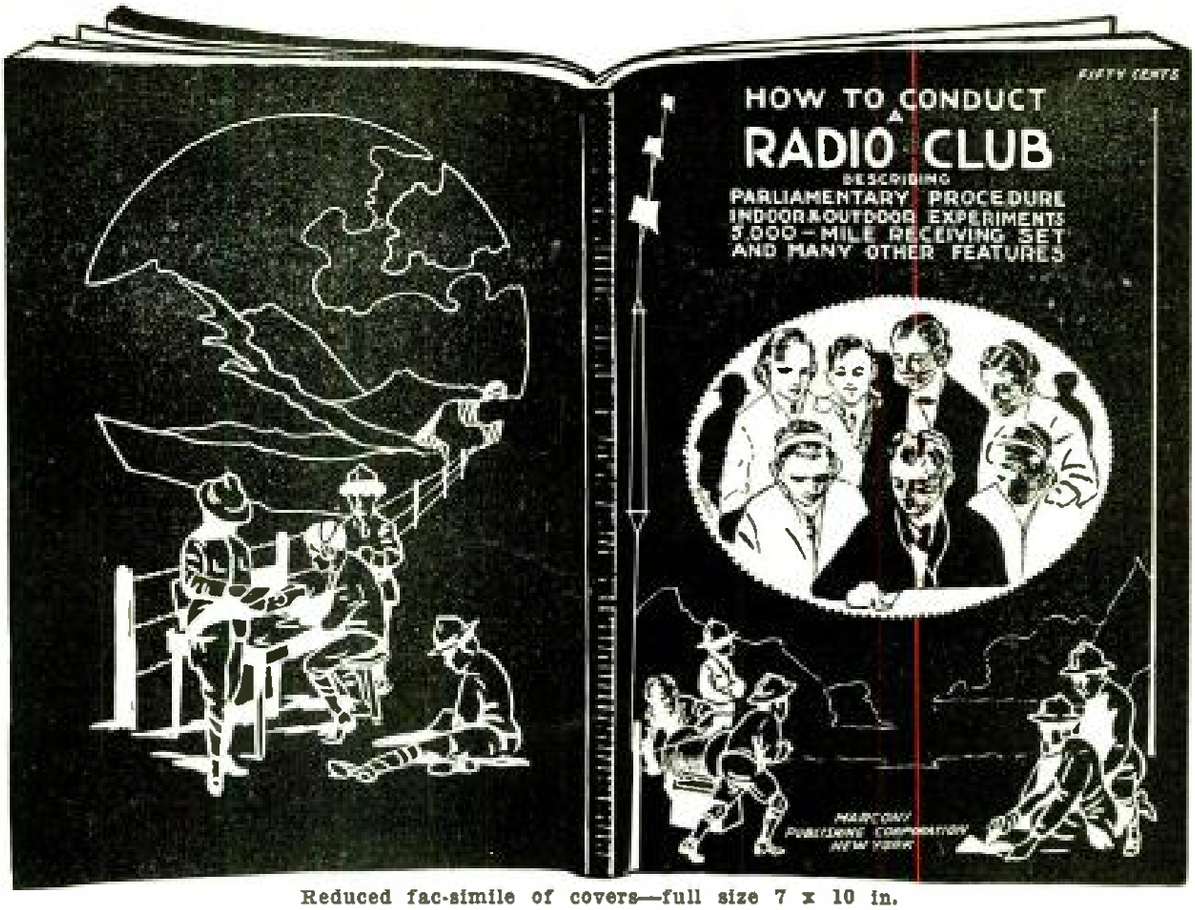

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