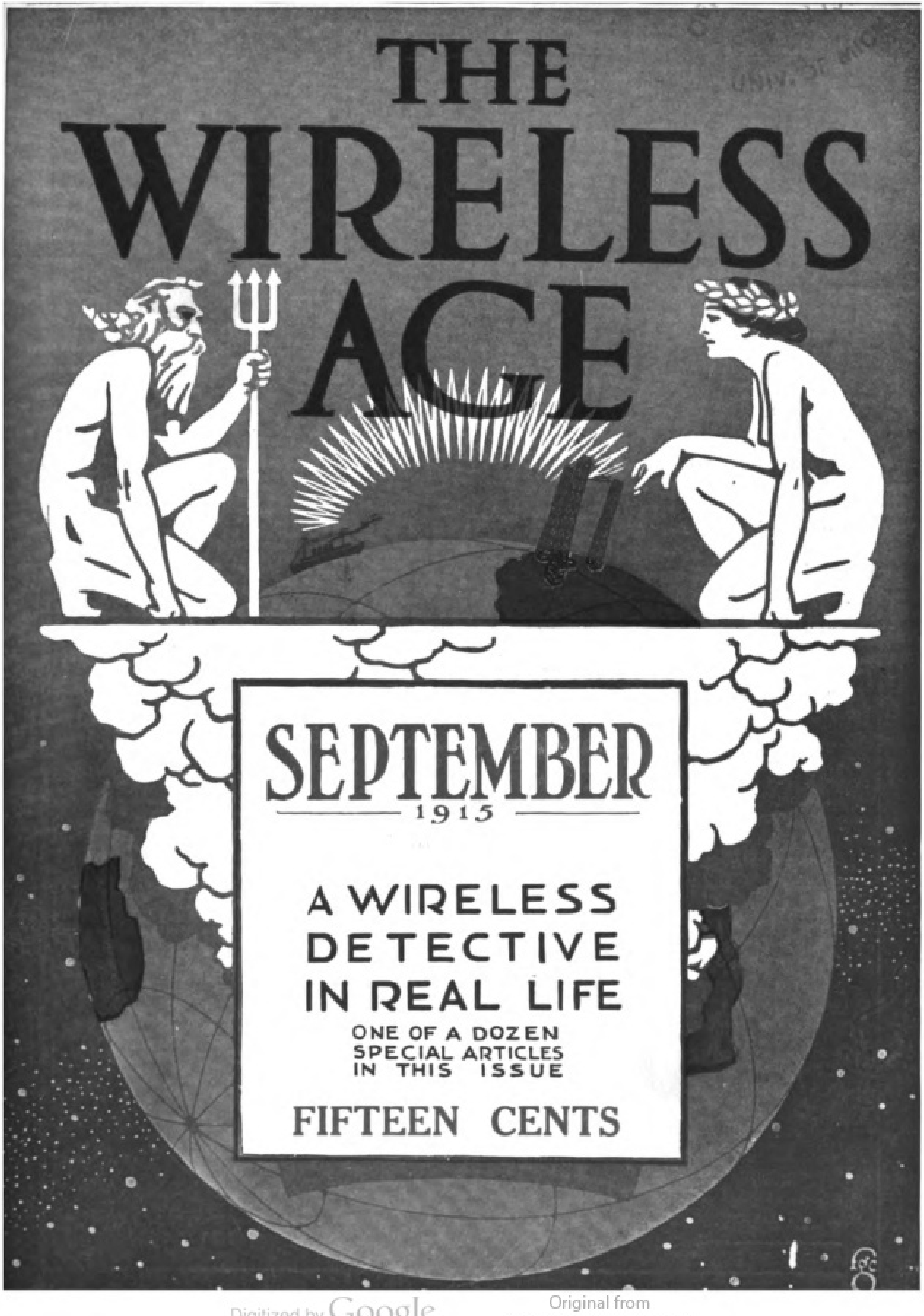

THE
WIRELESS
AGE
SEPTEMBER
1915
A WIRELESS
DETECTIVE
IN REAL LIFE
ONE OF A DOZEN
SPECIAL ARTICLES
IN THIS ISSUE
FIFTEEN CENTS

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.

SEPTEMBER, 1915

When the Pacific Belied Its Name

Being the Outline of a Voyage Which Included Two Wrecks and a Rescue by Wireless

By A. R. Short.

WHEN is the Pacific not pacific? The answer is, when I am on it. So if you believe that life aboard a one-man ship may become monotonous, consider the voyage I have just returned from as this is written. In only one way was there monotony, that was in the regularity with which we postponed our meals. For three days we lived solely on expectations.

Sailing from San Francisco on April 29, the freighter Edgar H. Vance had the Norwegian ship Aggi in tow. Despite dual neutrality we were challenged by heavy northwest gales from the time we poked our noses outside the Golden Gate. We gave battle. After a three days' encounter we won, but we were just about ready for "taps" by then.

First, when but a short distance out, our steering gear refused to work and we drifted almost on to our tow; the wind pressure against her rigging fortunately caused her to pass barely clear of our starboard quarter. The next morning we had to cut the Aggi loose, her sails gone and decks awash. She was a pitiful looking spectacle, but we could hold on to her no longer. She went ashore on Santa Rosa Island—a total wreck.

With over eight feet of water in the hold, bulkheads broken open, food and water gone, deckload overboard, bridge and engine room telegraph broken and the engine room filling with water, we were in nearly as bad a predicament as that of the Aggi. To add the finishing touches, the rudder broke in the afternoon, leaving us floundering around out in the ocean, perfectly helpless, a mass of floating wreckage.

I had already notified land regarding the Aggi's distress, and opened up the key again to forward messages of our plight. Fortunately, I was given a reassuring answer soon after.

Then we rigged up two jury rudders, but these were of no avail. Appreciating the danger of taking a sea broadside, we next tried to keep her "head-on" by hoisting the sails of the lifeboats aft.

But for the Marconi equipment we would never have been rescued, for our position was uncertain. By wireless we were notified to make black smoke by day and blue fire at night and the rescuing tug thus located us early in the following evening; its arrival being gladly welcomed and duly celebrated with "coffee an'"—nectar of the gods to us!

So, leaving 'Frisco with a tow, we arrived back *in* tow. Including the efforts of the return escort, three seagoing tugs, the Edgar H. Vance had managed to make in five days a voyage to a point about 130 miles southwest of San Francisco and a return to that port.

All hands had been on deck for three days and nights, without sleeping or eating, injured, wet and expecting to go down any minute. Maybe that wireless set wasn't appreciated!

Most of those aboard saw for the first time its real value, and saw it so well that many of them vowed never to sail on a ship that had no radio equipment.

WAR INCIDENTS

True Stories of Exciting Experiences of Operators

THE American steamship Leelanaw was destroyed by a German submarine on July 25. Shannon Morgan, Marconi operator on the former craft, has written the following account of the sinking of the Leelanaw for THE WIRELESS AGE:

The Leelanaw left New York on May 17, bound for Gothenberg, with a cargo of cotton to be transferred through Sweden to Moscow, Russia. Little occurred beyond the routine happenings of life aboard ship during the earlier stages of our voyage. When we neared the Shetland Islands, however, the Leelanaw was boarded by a British prize crew and taken to Kirkwall. We spent twenty-eight days at that port, the destination of our ship being changed by the British Admiralty to Archangel, Russia. Here we discharged our cargo of cotton and took on a load of flax for Belfast.

As we passed through the Straits ot the White Sea we saw along the shore the wrecks of several ships that had been blown up by mines—grim reminders of the fact that a world war was in progress. This was impressed upon me still more vividly at about fifteen minutes to two o'clock on the afternoon of July 25, when I heard the report of a gun nearby. It sent me scurrying to the port side where I saw a submarine ploughing toward us. Then the underwater craft fired a shell which fell some 300 yards short of us. It was an unmistakable order for the Leelanaw to heave to and Captain Delk, our commander, ordered the engines of the steamship stopped.

As I interestedly awaited the next development in the incident my eyes encountered another steamship in the distance. The next instant the place where she had been steaming through the waters was marked by a flying mass of splinters and smoke—an apt illustration of the effective torpedoing practiced by the submarine which had halted the Leelanaw. I afterwards learned that the ill-starred steamship was a Norwegian craft. But this was not the only exhibition shown of the prowess of the submarine, for even as I was wondering at the complete demolition of the Norwegian ship the former craft began shelling a large trawler to our port, the latter sinking twenty minutes afterwards. Then I went back to the wireless room and listened in. I heard no signals, however, and soon orders came from the commander of the submarine to lower a boat and brings the papers of the Leelanaw for examination.

These of course disclosed the fact that we carried a cargo of flax which Germany has declared to be contraband. All hands were therefore ordered to abandon the Leelanaw, a large parrot, our mascot, which speaks excellent Spanish, being included in the order. We tumbled into our small boats and went aboard the submarine which, after dropping about fifty yards astern of the Leelanaw, opened fire on the starboard side of the steamship. The latter listed heavily and the underwater craft made her way alongside near the wireless room and fired a torpedo amidships The Leelanaw then began to sink rapidly. Two more shells were fired at her and about an hour and a half afterwards she disappeared from view.

The submarine, we found, was a large sized specimen of her kind. She was equipped with wireless, the aerial being a telescoped mast which was arranged so that it could be raised or lowered from below deck. More than 100 feet in length, it had two wires of seven-stranded bronze.

The treatment we received aboard the submarine left no reason for complaint. The commander of the German craft seemed particularly interested in radio-telegraphy, one of his first questions being, "Did you make any wireless signals?" After the Leelanaw's men had been on board the submarine for about five hours, land was sighted and another steamship also appeared. They were the signals for the captain of the submarine to order us again into our small boats. We left the underwater craft making toward the new prospective object of attack and headed for Kirkwall, the Orkney Islands, which we reached at six o'clock in the morning of July 26. Thus ended my war adventure.

An attack on the Cunard liner Orduna was made by a German submarine on July 9, the Marconi operator on the steamship being called upon to send distress signals which were responded to by the armored yacht Jeanette. The Orduna, which was bound from Liverpool to New York, arrived at the latter port undamaged, her escape, it is believed, being due to the fact that the Germans miscalculated the speed of the liner.

The Orduna was thirty-seven miles south of Queenstown when the attack was made. Captain Thomas McComb Taylor, the commander of the steamship, told the following story of the incident:

"At ten minutes to 6 A. M., the lookout man on the after bridge rang the telegraph, at the same time pointing his hand downward and out on the port beam. The third officer was immediately sent aft to inquire what was seen. He returned quickly and reported both men had seen a torpedo pass across the stern from port to starboard only ten feet clear of the rudder. In the meantime both the chief officer and myself distinctly saw the trail of the torpedo, extending from the stern to about two hundred yards out on the port beam. About eight minutes afterward the chief officer and I saw the submarine come to the surface about two points on the starboard quarter, distant about three-quarters of a mile, with five or six men on her deck getting her gun ready. I immediately ordered all possible steam, altered the course and brought her right astern, when they began shelling us. The first shot struck the water abreast of the forecastle on the starboard side, about thirty feet off. The second dropped just under the bridge, the third abreast of No. 5 hatch, quite close alongside; the fourth under the stern, sending up a volume of water forty feet high. The fifth and sixth and last shells all fell short. The firing then ceased and the submarine was soon left far astern.

"Marconi distress signals were sent out at once. I got a reply that assistance would be with us in an hour, but it was four hours before the small armored yacht Jennette appeared. I account for the torpedo missing the ship to their misjudging the speed, allowing fourteen knots instead of sixteen, which we were doing at the time. The torpedo passed only ten feet clear."

The Wireless Age told last month of the sinking of the Leyland liner Armenian by a German submarine off Trevose Head, Cornwall, and the dangers attendant upon sending out the S O S. Additional details of the attack on the steamship reveal the complete story of the heroic efforts of the Marconi operators—John S. Swift, the senior, and James D. Murphy, his assistant—to save the British ship from destruction by the underwater craft. When the latter ordered the Armenian to stop, the commander of the steamship sent his vessel ahead at full speed and the German craft followed, repeatedly firing shells at the quarry. Murphy was at the wireless set when the submarine was first sighted, but Swift afterward took charge. He flashed signals of distress and the Armenian's position, sending the appeal broadcast for twenty-five minutes. Only when a shell demolished the roof of the cabin did he relinquish his efforts to summon aid. Another shell completely demolished the structure and Swift and Murphy found their usefulness as operators ended for the time being.

While they were assisting in lowering a boat a shell severed some of the ropes supporting the craft and the latter plunged into the water, carrying a considerable number of men with it. Several of the latter lost their lives. Other boats were lowered, but the Germans kept up a continuous firing and a number of the small craft were destroyed. Murphy struggled in the water for fifteen minnutes before he was rescued. The survivors of the Armenian, including the wireless operators, rowed about in the small boats until they were picked up. Swift and Murphy are none the worse for their experience beyond some slight injuries.

The Early Fall Crop

THE WIRELESS AGE is certainly the best thing out in the wireless line. I could hardly be without it now. It has opened my eyes to the technical side of wireless.—K. R. C., *Illinois*.

I cannot say too much in praise of THE WIRELESS AGE; in the issue just received, I found an answer to a question regarding the leakage effect of high power wires in damp or wet weather. This information was worth the price of the subscription to me.—R. M. P., *Connecticut*.

THE WIRELESS AGE has nothing but my best wishes for success; I think it is **IT** when it comes to wireless news.—J. B., Jr., *New Hampshire*.

I have read your magazine in the City Library since its first issues and believe it to be the most thorough and practical wireless amateur medium of to-day.—D. T. W. McC., *Oregon*.

I have been a subscriber to THE WIRELESS AGE for the last three years and think it is one of the best magazines published.—M. A. M., *New York*.

July issue of THE WIRELESS AGE just received. It is *excellent*.—W. K. M., *Canada*.

All you say about your magazine is true, and after I saw one copy I was convinced that I was missing something and immediately bought all the back numbers and subscribed for 1915.—W. B., *Massachusetts*.

Your magazine is sure the cream of all the others when it comes to what is required in the radio field. It is worth its weight, as the old adage has it.—W. R. C., *Iowa*.

I like the "Queries Answered" Department and read it first. I am only waiting about sending the questions, because I expect they will be answered in the next issue as some others I have been puzzled over have been answered.—E. L. B., *Kentucky*.

I am very pleased with THE WIRELESS AGE—so much so that I can hardly wait for the next issue.—E. M., *Louisiana*.

Please begin with the May issue of this year, as I want to get as much as possible of that "How to Conduct a Radio Club."—F. K. M., *Colorado*.

Our Club takes THE WIRELESS AGE, and we think it a fine magazine.—E. E., *Wisconsin*.

THE WIRELESS AGE is certainly a fine magazine. I don't see how I got along without it.—J. A. I., *Indiana*.

I have only taken THE WIRELESS AGE for four months, and never knew there was such a magazine published until a friend recommended it to me. I have many other books on radio work, but THE WIRELESS AGE is on top of the pile every time.—H. R. H., *Connecticut*.

A Wireless Detective in Real Life

How an Amateur, Working In the Interests of the United States Secret Service, Made Permanent Records of Some 25,000 Words Transmitted by the German Owned Sayville Station

Charles E. Apgar

WITH the control of the German-owned Sayville wireless station now in the hands of the United States Government and its operation governed by American naval officers, details of the acts which led to the seizure reported in the August issue are rapidly coming to light. Accusations of neutrality violation have followed thick and fast in the daily press and many disclosures made in unexpected quarters. That the principal evidence upon which the seizure was made was supplied by an amateur who has been a constant reader of The Wireless Age makes the story just that much more dramatic to our readers.

The story properly begins back in the early part of July when the first rumble of suspicion came from Washington officials and found its way into the newspapers. It had been hinted in certain quarters that the Government might refuse to issue a new license for the new and more powerful equipment then being installed at Sayville. Persistent rumors of messages of a military character sent under cover of ordinary commercial dispatches in plain English and German caused the situation to be viewed from an angle more serious than that which concerned the right of the Government to refuse to grant the new license on the ground that no belligerent nation or its agents has the right to establish a wireless station in a neutral country after war has been declared. Some of the messages filed had been rejected by the naval censors on the ground that they were too obviously not what they pretended to be. Commercial orders, or pretended commercial orders, that could not in the nature of things be executed in Germany on account of the present commercial isolation of that country, were rejected. Certain messages to persons in this country to execute orders for goods that could not be shipped to German ports or would be useless in Germany in this time of war, if it were possible to get them into German territory, shared the same fate.

The fear was expressed that through apparently harmless messages the Sayville station might be used to communicate military information to German submarines. In answer, Dr. Karl

G. Frank of the Atlantic Communication Company, which owns the station, said he did not consider this intimation worthy of serious consideration, for what it claimed was a physical impossibility. "In the first place," he said, "the wave length used at Sayville is eight or ten thousand meters, whereas the wireless equipment of submarines would produce a very much shorter wave length." When this statement appeared a newspaper editorial called attention to the fact that information sent first to Nauen could easily be re-transmitted.

And so the situation stood when, on July 9, the United States Government announced that in the future the plant would be conducted by American naval officers in the interests of its proprietors. The official memorandum from the Secretary of Commerce—published in full in the August issue—stated that the new license had been refused because it had been learned that the Atlantic Communication Company is owned by the Telefunken Company of Germany, the controlling interest in which is owned by powerful German electrical concerns. Dr. Frank was identified as the New York representative of these controlling companies and Prof. J. Zenneck, who had been conducting so-called experiments at Sayville, was known to be a captain of marines in the German army and had been during the present war in the trenches in Belgium. The opinion of the department as stated was: "To grant a license for a new station, erected since the war began, with German apparatus, avowedly under German ownership and control, communicating avowedly with stations known to be under the control of the Imperial German Government . . . would be an unneutral act."

The seizure of the station was characterized a "precautionary measure" and rested as such in the public mind for ten days. Then, on a Sunday morning, New Yorkers were startled by reading in their newspapers what was announced by the World, "the real reasons" for taking over Sayville. Investigation by the Secret Service, the account said, had established a definite probability that unneutral uses were being made of the station, the exact nature and extent of these uses remaining an official secret.

Great was the astonishment of readers when they learned that in the course of the investigation by the Secret Service, phonographic records were taken by Charles E. Apgar, owner of a wireless experimental station at Westfield, N. J., for fourteen successive nights of every message, every signal, sent out from Sayville. These messages, according to the World, established the truth about Sayville. They showed exactly what had been transmitted.

Two days after this comparison had been made, Cabinet officers officially took up the situation at Sayville. One week later came the announcement that the Government was preparing to take over the station. Two weeks later this action was taken.

An interesting parallel is afforded in the progress of this investigation and the action taken by the government.

On June 7 the taking of phonograph records of the matter sent out from Sayville was begun.

On June 21 the taking of the phonograph records was completed. On June 22 they were sent to Washington by Chief W. J. Flynn, who had been in personal charge of the investigation.

On June 25 Secretary Redfield advised Secretary Lansing that to grant the long-pending application for a license for the reconstructed plant at Sayville "would be an unneutral act."

On June 27 Lieut. Walter S. Anderson of the Navy Yard staff took to Washington duplicates of the messages that had been filed at the Sayville station during the month. The value of the records caught by phonograph lay in variations or discrepancies they might show upon comparison with the messages as filed. Three days after Lieut. Anderson took the duplicates to Washington came the announcement that the Government was considering the taking over of the Sayville station.

On July 7 Secretary Daniels notified President Metz of the Atlantic Communication Company that the Navy Department would "take over the active control and operation of the Sayville Radio Station," and that "the necessary personnel will be sent to that station to take active charge of the administration and operation of the station.

By specific statute provision the contents of messages sent by wireless must be held inviolate. The World maintained, however, that the phonographic reproduction of the messages sent from Sayville from June 7 to 21 inclusive, showed these significant things:

That striking variations from the customary methods of sending were recorded, the possibility of system in these variations being made apparent.

That in the repeating of messages and in the sending of "message checks" there were similar variations from customary practice, with a similar possibility of system.

That these variations, undetected by the Government operators at Arlington and Fire Island, who "listened in" nightly on Sayville, were made unmistakable by the phonograph.

In long distance transmission what is known as a Wheatstone tape machine is used. This punches out the dots and dashes on a strip of paper, the sending itself being mechanical. By the closing of a switch, however, it is possible to cut in on such transmission and to send by key, as, for instance, when it is necessary to repeat a word.

The phonograph records showed that such repetitions as this were frequently made with so little loss of time that they must have been done by key. In the same way it would be possible, furthermore, to add a word or two, or even a sentence, in the middle or at the end of a message with no record to show for it.

Government inspectors had been visiting Sayville at intervals since April. Neither their reports nor those of the operators at Arlington and Fire Island were able, however, to disprove the allegations that continued to pour in regarding the uses to which the Sayville station was being put.

Chief Flynn was told to "find out" what really was going on at Sayville. He dropped over to the office of Chief Inspector L. R. Krumm of the radio service, and on June 5 this letter went from Mr. Krumm to Charles E. Apgar, of Westfield, N. J.

"My dear Mr. Apgar: Will you be kind enough to call me up Monday morning from your place of business? I am very desirous of getting in touch with you immediately, as I believe you can be of considerable service in a good cause."

Mr. Apgar was known to Inspector Krumm as a business man who had made wireless telegraphy his hobby for the past five years. With equipment made by himself his plant has shown extraordinary efficiency.

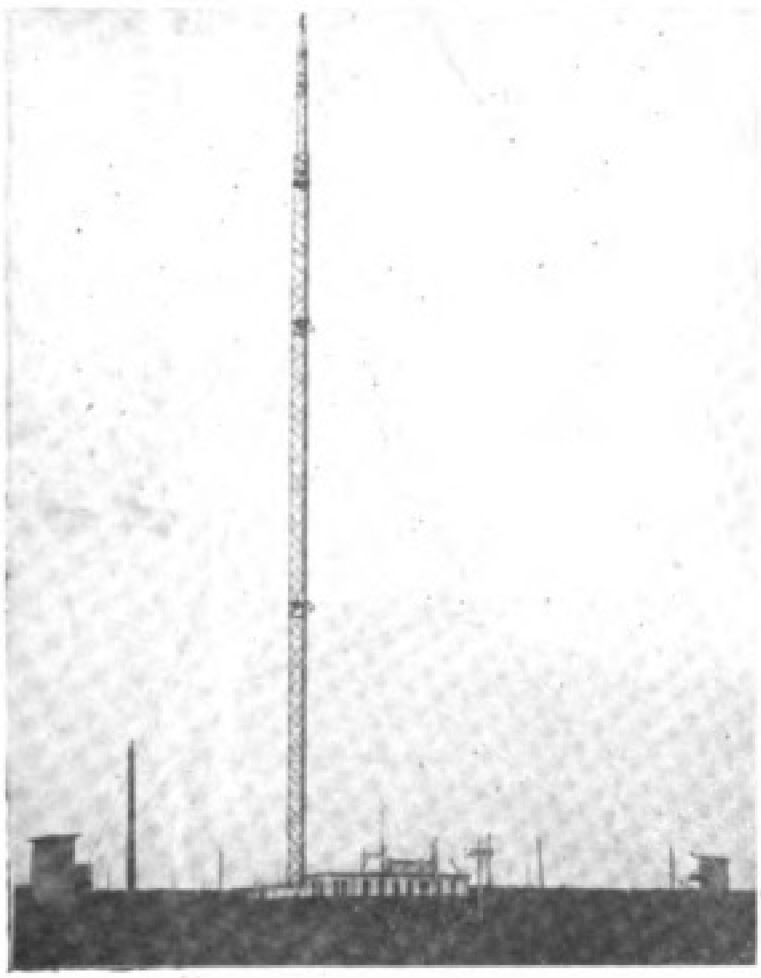
Nearly two years ago Mr. Apgar turned his attention to the development of a method of recording radio signals. He has been making phonograph records of messages since October, 1913. Though Westfield is only 100 feet above sea level, and though Mr. Apgar's aerials are well "treed in," he has taken messages from Government stations all over the United States; he has often caught San Francisco, and he has even heard German stations.

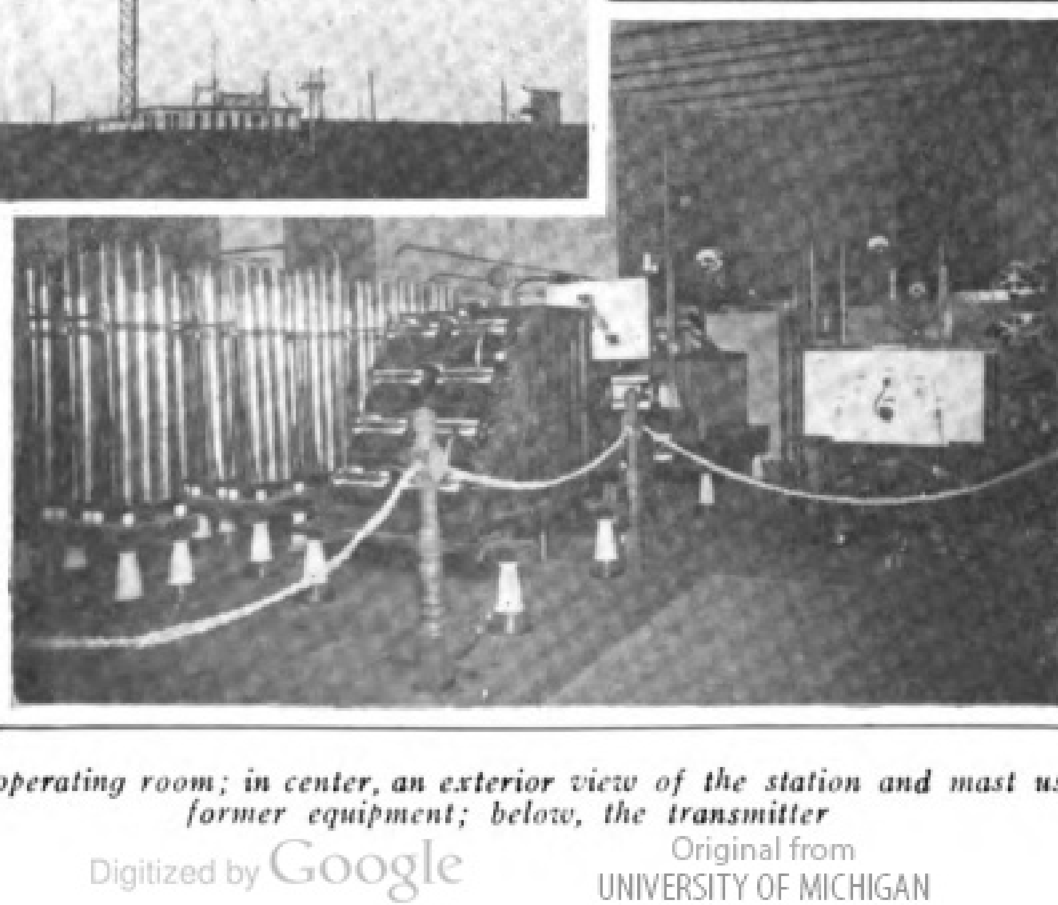
As he perfected his system, Mr. Apgar came into contact with many experts both in and out of the Government service, and what he has been doing has been pretty well known to Chief Inspector Krumm. Responding in person to the letter Mr. Apgar was introduced to Chief Flynn, and was forthwith commissioned to catch and record, until further orders, the messages that went out from Sayville.

Sayville starts transmission about 11 o'clock each night. It continues to send for two or three, sometimes four, hours, depending a great deal upon static conditions. At 11 o'clock on the night of June 7 Mr. Apgar began his vigil. He continued until the night of June 21, by which time he had filled nearly 175 cylinders, each big enough to take four minutes of conversation.

Chief Flynn at once turned these over to Secretary McAdoo of the Treasury Department, his superior. From the Treasury Department they went on to the departments directly concerned. Their contents by specific statute provision are inviolate. It has been alleged by the press, however, that some irregular things were brought to light by the records.

The Sayville Station





At top, the operating room; in center, an exterior view of the station and mast used with former equipment; below, the transmitter

In the Sayville messages it was found that custom was frequently varied. Sometimes a word would be repeated twice. Sometimes there would be still other variations in sending that became apparent in the faithful reproduction of the phonograph.

An operator taking down the message by ear could easily miss the possible significance of these variations. With his attention centered on getting the meaning he would regard the repetition as being intended merely to make the symbol clear. What Arlington and Fire Island did not note, therefore, the phonograph took down.

Numerous instances appeared where the messages were not always repeated in the order of their sending. Messages Nos. 73, 74, 75 and 76 would be sent, then Nos. 78, 79, 80, and so on. After a score or more of messages had been repeated, No. 77 would appear. Sometimes the missing message would come after only two or three others had been repeated. On one occasion forty-eight had been sent again before it appeared.

Another nightly custom that offered similar opportunities, apparently, was in the "message checks." These are reports back to the Nauen station of the messages, by number, "received complete" the night before. These reports would read, for example: "Received complete 191 till 196, 199 till 210," etc. What had happened to messages Nos. 197 and 198 would not appear.

Each night, also, after the transmission was at an end, there was always "talk" of how the signals had come in, of static conditions of the night, between what hours signals had been strongest, and matters of that sort.

Mr. Apgar took as many as thirty records in a night. Not all the "repeats" were taken when they were being made for the second time. The actual time of recording during the fourteen nights was a few minutes less than eleven hours. The number of words was in the neighborhood of 25,000.

One of the allegations regarding the messages sent out from Sayville has been that acrostic codes were used. In such a code one word in one message, another from the next, and so on, make up a distinct message. It was contended that the variations in sending that were recorded might have indicated the key to such a code. The skipping of messages in the "repeats" might have been intended to emphasize them.

None of those concerned in the investigation in New York knows of course, what was done in Washington after the records had been sent there. None of them knows what may have been brought to light when the recorded messages—the messages as they were sent—were compared with the messages as they were filed—the messages that were submitted to the censor for his O. K.

Chief Flynn would not enter into any discussion of the matter.

"I made, under instructions from my superiors," he said, "an investigation into the situation at Sayville. In the course of that investigation Mr. Apgar, at my direction, made a series of phonograph records of the messages sent out from Sayville. He did the work for the Government, and he was paid for it by the Government, through me. The records he made are now in the possession of the Government."

When Dr. Frank of the Atlantic Communication Company read the revelations published by the World he gave out an interview which quoted him as saying:

"That Mr. Apgar can record messages sent out by wireless on a phonograph cylinder is hardly worth discussing. That is physically impossible. I have never heard of its being done. If Mr. Apgar has accomplished it, he should get his idea patented and perhaps we will buy it."

On several occasions during the past year reference has been made in magazines and newspapers to the dictaphone receivers installed by the Marconi Company in its new trans-oceanic stations. Among wireless men the dictaphone, or phonographic wax cylinder, method of recording is known as a development that made possible the reception of signals at a speed greater than the most expert operator could achieve.

Dr. Frank's declaration was read with amused interest by Charles E. Apgar. By way of reply he produced a letter, written under date of February 5, 1914, on stationery of the Atlantic Communication Company, of which Dr. Frank was then, as now, secretary and treasurer.

The letter read:

"Mr. Charles E. Apgar, No. 549 Carleton Road, Westfield, N. J.:

"Dear Sir: Your letter of the 30th ult. addressed to Mr. A. F. Seelig has come to hand and we have noted its contents with interest. In answer we beg to say that we have no objection to your receiving our Sayville press in the way you have done so far. We can, however, not allow you to publish what you receive, neither private messages nor press. It would interest us to receive one or two of the phonographic records you have taken, and we would be much obliged if you would favor us with the same.

"Yours very truly,

"ATLANTIC COMMUNICATION COMPANY,

"Operating Department,

"H. Boehme."

On the letter Mr. Apgar had written this memorandum:

"Monday, Feb. 9, 1914."

"Delivered personally to Mr. Boehme two phonographic records of Sayville (W S L) sending, dated Nov. 3, '13, and Nov. 12, '13, for test of results."

"I think," said Mr. Apgar, "that ought to show Dr. Frank it is his own fault if he never heard of making phonographic records of wireless messages. This letter was written eighteen months ago. The records that were delivered at that time were made three months earlier, and, incidentally, in the course of the second month of my experiments in recording messages. You can see my experience with Sayville 'sending' began a long, long time before I did my work for the Government."

Making the Records from Sayville

A Description of My Set and How I Worked It

Written Specially for The Wireless Age

By Chas. E. Apgar.

THERE is comparatively little I can add to what has been so well set down by this magazine's editor. My part in the Secret Service work has been told and the circumstances which led to my employment faithfully related; what, then, will probably interest my fellow readers most are a few of the details connected with making the records and a description of my equipment.

First, let me deal with the attempts to discredit the use of the records:

It has been stated in several New York papers that as the phonographic records did not reach Washington till after the Sayville station had been taken over by the Government, they did not play any important part in securing certain desired information. Replying to this I will say that the records were made each night, between 11 P. M. and 2 A. M. The next morning I immediately transcribed the recorded messages and delivered them personally to Chief Flynn in New York, or sent them to him in Washington; hence they were filed with the Secret Service a very few hours after being sent out by Sayville, which enabled practically immediate comparison with the censored messages, as well as with those received by other wireless operators of the Government who were "listening in" presumably, at Arlington and elsewhere.

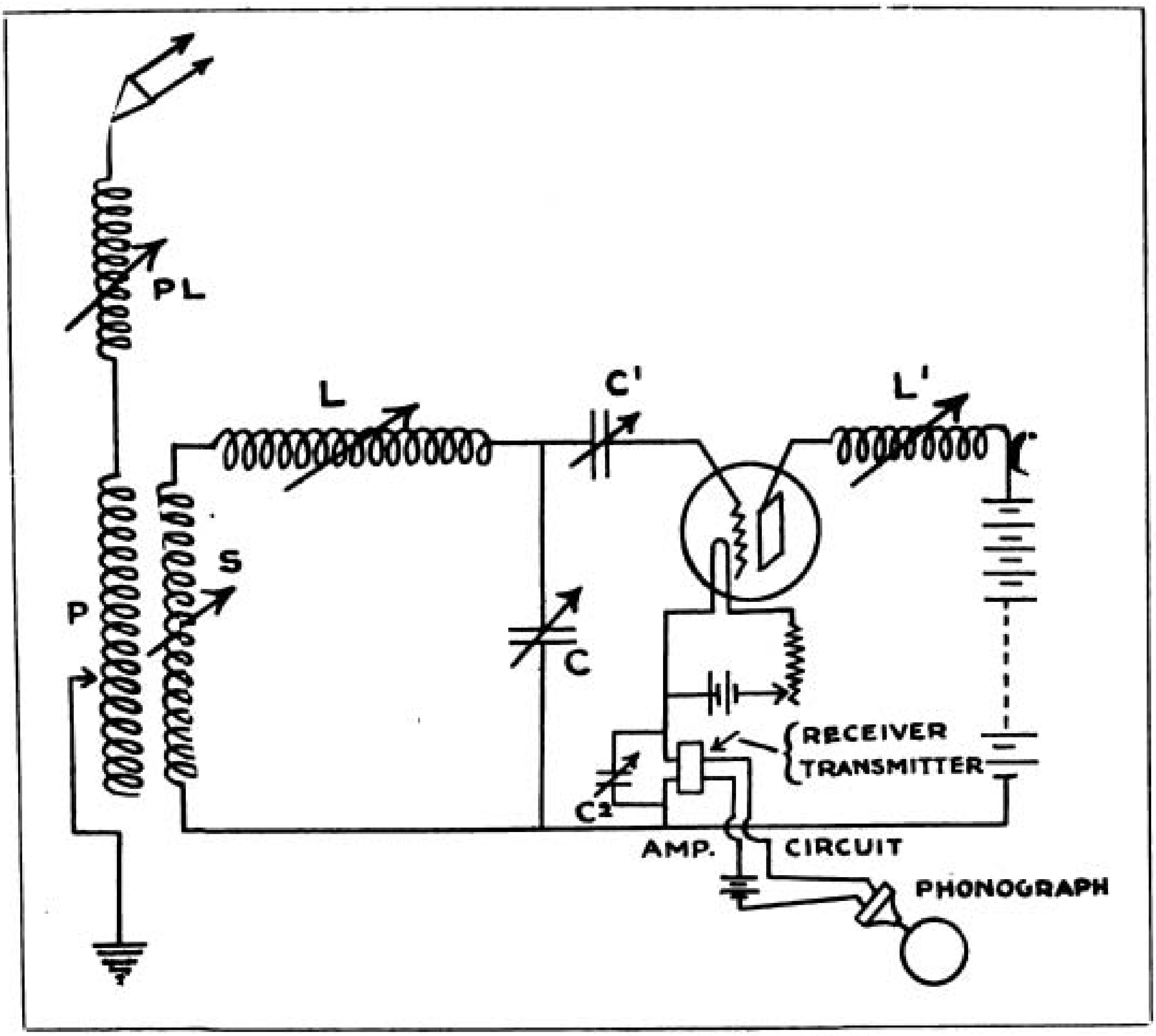
Just before this special work began L. R. Krumm, Chief Radio Inspector of the port of New York, visited my station and after many hours of actual experience with the receiving instrument pronounced the station of the highest efficiency. Many phonographic records were demonstrated to him, hence when Chief Flynn of the Secret Service consulted him concerning the best method to get Sayville undeniably on record, he requested me to call at his office "on an important matter."

I was immediately introduced to the head of the Secret Service in New York, who told me to "get busy." Needless to state, perhaps, it was some pleasure at least to aid in taking the 'Say' out of Sayville.

When I was asked to execute this commission, or whatever you want to call it, no time was allowed for extended preparation. The interview was held at eleven in the morning and I was instructed to begin work the same evening. Scouring New York for "blanks" meant some tall hustling, but before sundown I had secured a number sufficient for a night or two. Subsequently during the period of action it became necessary for me to go several times in person to the Edison Company at Orange to replenish my supply of wax cylinders.

In regard to the operation, Sayville was never very generous with her 11 P. M. test signal Vs and it meant working fast to utilize these in securing perfect tuning. There were several circuits to be looked after, their various condensers, inductances, batteries—everything, had to be practically in perfect harmony the instant Sayville began sending. That not a single message was missed and hundreds were recorded is evidence that every instrument and device of my home-made set did its duty fully and promptly; which is to me, of course, very gratifying.

The amateur station in which the Sayville records were made. A description of the equipment built by Mr. Apgar is given in the accompanying article



Circuit diagram of amateur station of Chas. E. Apgar

To avoic thc loss of a single word, which seemd likely in substituting a new blank for the record just filled, two phonographmachines were used. When the record in one machine was filled it was only necessary to switch the amplifone receivr from one machine to the other. Thc filled record was then replaced by afresh blank and everything put in readinss for the next switch-over. This methodmade practicable a continuous record without loss of a signal.

The cyliders were consecutively numbered ar when the work was finished a comete tabulation by message numbers wasmade. This was supplemented by a bulation which revealed instantly on wh cylinder any particular message coulde found.

Of course, uring the two weeks I recorded considerable static along with the message signa; other irregularities, too, were registered, particularly Sayville's many "breaks," due to poor spark. These breaks and the usual tuning-up signals all appear clearly on the cylinders. The phonographic record reveals some significant things; for example, when a break occurred in the middle of a long German word, three attempts were made to get through with this word before the message was continued. I was not a little interested to discover that "tape" sending could take care of such unusual interruptions.

Now as to my equipment:

There is nothing about it which might be termed remarkable; but unquestionably it is efficient for an amateur plant. The photograph of my station and diagram of connections tell the whole story, the hook-up being the simplest form of the Armstrong circuit. Referring to the photograph and using the explanatory diagram's identification letters the equipment is quickly described. The vertical and horizontal inductances to the left of the photograph are primary loading; vertical inductance in center on loose-coupler, secondary loading (L); vertical and horizontal inductances to right, boxed and open, are in the wing circuit (L'). The slide condenser in the foreground is connected to grid of audion valve detector (C'); the small variable rotary condenser across secondary and loading of loose-coupler (C); the other variable rotary condenser across receiving phones (C^2). The loud-speaking phone is in the amplifying circuit—on battery box to the right. When the records were made the amplifying circuit receiver, without the horn, was placed directly over the phonograph's recorder. The box containing the wireless receiver and amplifier, also transmitter, does not happen to show in the photograph.

Excepting the regular receiving phones and the valve detector, all my instruments are home-made. The set, without "loading" will easily tune to 4,000 meter wave lengths and over; with loading, 10,000 meter wave lengths are secured.

I have two aerials, a short one on the house, 55 feet long, 4 wires spaced 2 feet apart, and a long aerial in the trees measuring about 600 feet, 4 wires, fan shape starting 10 feet apart and graduating down to 18 inches, suspended at an average height of 50 feet; both of these aerials are well below the tree-tops.

THE USES OF THE CANAL ZONE STATION

It is pointed out in a dispatch from Washington that the opening of the new United States naval wireless station at Darien, on the Canal Zone, does not add to the facilities for the transmission of commercial messages. The new station will be used exclusively for government business. Primarily, it will be used as a means of directing operations of various kinds on the Canal Zone, and keeping in communication with ships at sea, but it will also be used freely by the Department of Commerce for the sending of its official messages.

Out of a total of forty-seven naval radio stations now in use in various parts of the United States or its possessions, twenty-one, it is declared, are open to commercial messages, the others being reserved strictly for official business. In the Canal Zone there are two stations—at Balboa and at Colon—which receive commercial messages, so that the new station need not enter that field in order to accommodate the public, as the facilities are already ample

Plans have been made for radio communication between San Francisco and Manila by way of Honolulu. The section to Honolulu will not be in operation until a year from this time

It has been announced that the Navy Department is planning to construct a new high power wireless station on Puget Sound, probably at Keyport, near Bremerton, Wash. The plant will have towers 400 feet high.

MYSTERY IN S O S CALL

An S O S call which was picked up by several land and ship stations on the night of July 25, has caused considerable speculation as to its source The appeal was received by the United States naval wireless station on Fire Island at ten minutes to ten o'clock, but before the name or the position of the ship could be ascertained, the message was broken off. Fire Island called back in the hope of getting a response, but none came. The appeal was also picked up by the Marconi station at Sea Gate. Investigation failed to show that a sea disaster had occurred, and the source of the call still remains a mystery.

ERRATA

In the article "The Rapid and Simple Calculation of the Inductance of a Cylindrical Single Layered Coil," which appeared in the August issue, a compositor's error appeared at the foot of the first column on page 844. The equation which made complete the footnote appeared in the opposite column.

The foot note should read

* Since there are 10^9 cms. of inductance in a henry, therefore

$$L = 4\pi^2 \frac{a^2 n^2}{b} K. \text{ cms. of inductance.}$$

WIRELESS

BY A. F. GANNON.

Into the heart of Abysmal Night
I uttered the Ultimate Word,
The Master Fiat: "Let there be light!"
And the seething Chaos heard.

Right proud was I! When the law construed,
I leaped at its least intent
From star to star, where the thick seas brood,
Each big with a continent.

I hurled the Lightning's defiant flare!
I muttered the Thunder's scorn!
And had no fear of the Furies there
That cluttered Creation's Morn.

But One, betimes, (when the great green sea
Gave birth to the rock-ribbed shore)
There came, who bade that I bend the knee,
And shoulder the task he bore.

I flouted him, and his foolish task,—
To carry a puny crash—
But he curbed my pride with an earthen flask,
And drove with a fiery lash.

He taught me speech, (in a sputtering tongue)
Who bellowed the Comet's roar,
And the mighty note of a new star swung
Aloft in the Cosmic corps!

Now hither and yon I scurry quick
With tidings of ill or good,
And whisper them, with a "tick, click-click!"
To one of his myriad brood.

Let them but brew me a draught of Force,
And fling in my teeth a phrase:
I'll speak each sun on its circled course,
Or question the Pleiades!

How to Conduct a Radio Club

By E. E. Bucher

Article XVI (Continued)

A COMPLETE portable wireless telegraph equipment for amateurs which can be employed at the summer camp to communicate between points several miles apart will now be described. The apparatus is conveniently mounted in portable cabinets so that the component units can be divided among a number of persons while it is being transported. The transmitting set comprises, mainly, a 3-inch spark induction coil with necessary vibrator and condenser, a simple aerial change-over switch, a spark gap with cooling fins, a transmitting key and aerial tuning inductance. The complete assembly for this equipment is shown in Fig. 1, wherein all of the parts are mounted in an oak cabinet fitted with a leather carrying handle. A fundamental diagram of connections for the entire equipment is shown in Fig. 15, the assembly of the corresponding receiving apparatus, comprising an inductively-coupled receiving tuner, detector, variable and fixed condensers, in Fig. 5, and the diagram of connections in Fig. 15.

The Transmitting Apparatus

It should be noted in the case of the transmitting apparatus that no provision is made for the use of an oscillation transformer, as it has been the experience of the writer that more consistent and efficient results are obtained with small spark coils by connecting the spark gap directly in series with the antenna system. This connection, however, is not in accordance with the United States regulations when it is planned to operate the apparatus within the zone of commercial or naval stations; but inasmuch as the average boys' camp is located outside of that zone a license for experimental operation will undoubtedly be allowed.

The construction of the transmitting apparatus (see Fig. 1), beginning with the induction coil, comes next in the order of description. The core for the primary winding consists of a bundle of fine wires, 8 inches in length by ¾ of an inch in diameter, neatly taped in circular form. It is then covered with two layers of Empire cloth of moderate thickness. The primary winding has 200 turns of No. 16 D. C. C. wire, which is preferably soaked in melted paraffine just previous to the winding. When completed it is covered with from six to eight layers of Empire cloth.

It will be observed that the secondary winding is split in two sections, each of which has approximate overall dimensions of about 3 by 3 inches. For this winding about 1½ pounds of No. 36 enameled wire are required.

Mechanical details and dimensions for the vibrator are not given because many amateurs prefer to purchase rather than construct the necessary parts. But if made to the scale of the drawing (Fig. 1) a satisfactory interruptor will be produced. A piece of phosphor bronze, E, having a width of, say, ½ inch, and thickness of 1-16 of an inch, has mounted upon it a circular piece of soft iron, D, ⅜ of an inch in diameter. It also carries the platinum point, F, ⅛ of an inch in diameter. The vibrator spring is fastened in place to the L shaped piece of brass by the aid of two machine screws.

The stationary portion of the interruptor has the holding screw, C, the adjustment rod, H, carrying another platinum point, and the tension adjustment screw, B. The latter has a small shoulder at one end which engages the spring, E, so that when B is turned to the left, the rigidity of E is increased and also in consequence the rate of interruption of the current in the primary winding.

The spark gap electrodes, GG, are mounted on the inside of the top of the case, and are fitted with cooling fins

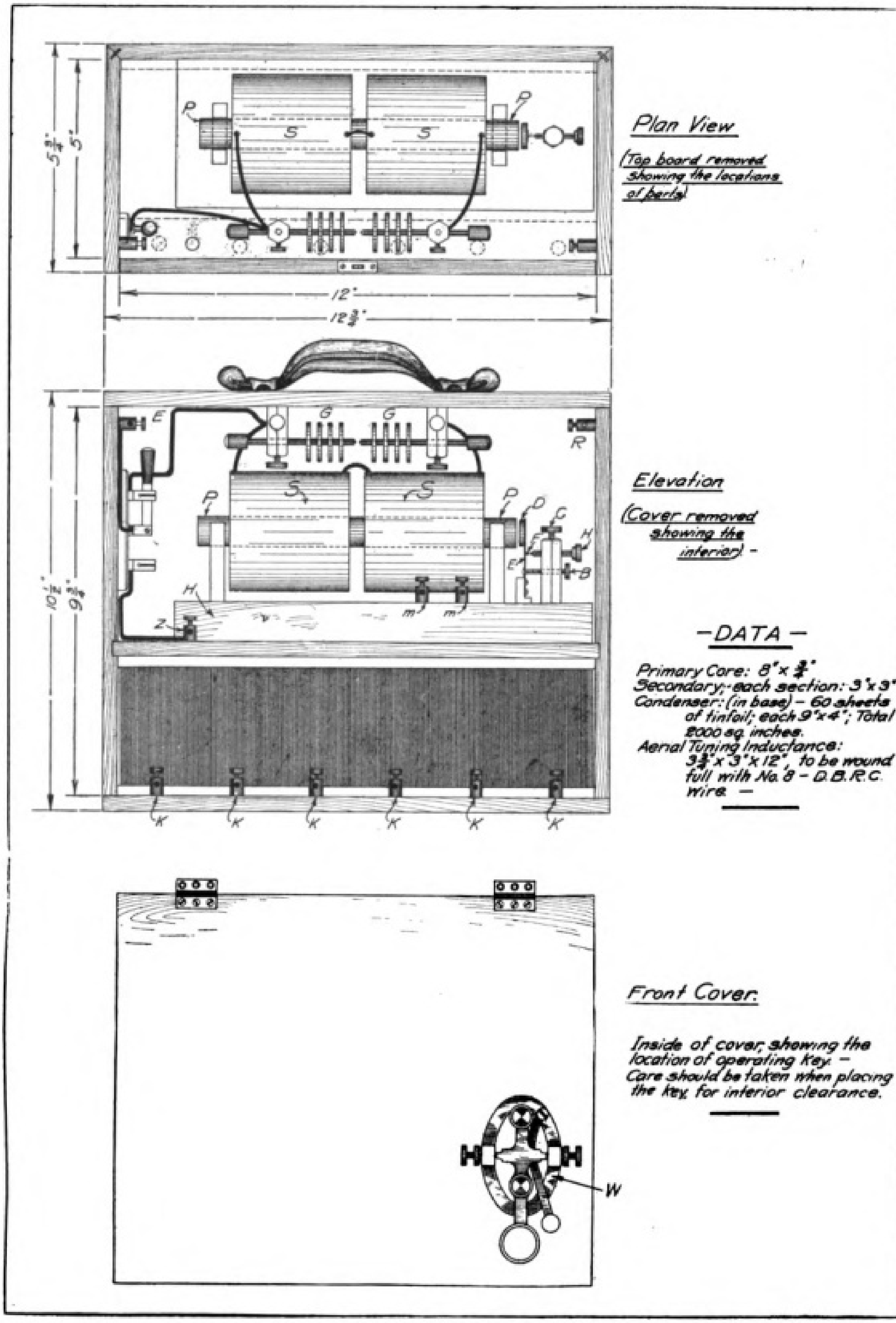

Plan View
(Top board removed showing the locations of parts)
Elevation
(Cover removed showing the interior) -
-DATA-
Primary Core: 8" x 3/4"
Secondary;-each section: 3"x 3"
Condenser: (in base) – 60 sheets of tinfoil; each 9"x4"; Total 2000 sq. inches.
Aerial Tuning Inductance: 3 1/2"x 3"x 12", to be wound full with No. 8 – D.B.R.C. wire. –
Front Cover.
Inside of cover, showing the location of operating key. – Care should be taken when placing the key for interior clearance.
12"
12 3/4"
5 3/4"
5"
10 1/2"
9 3/4"

Fig. 1

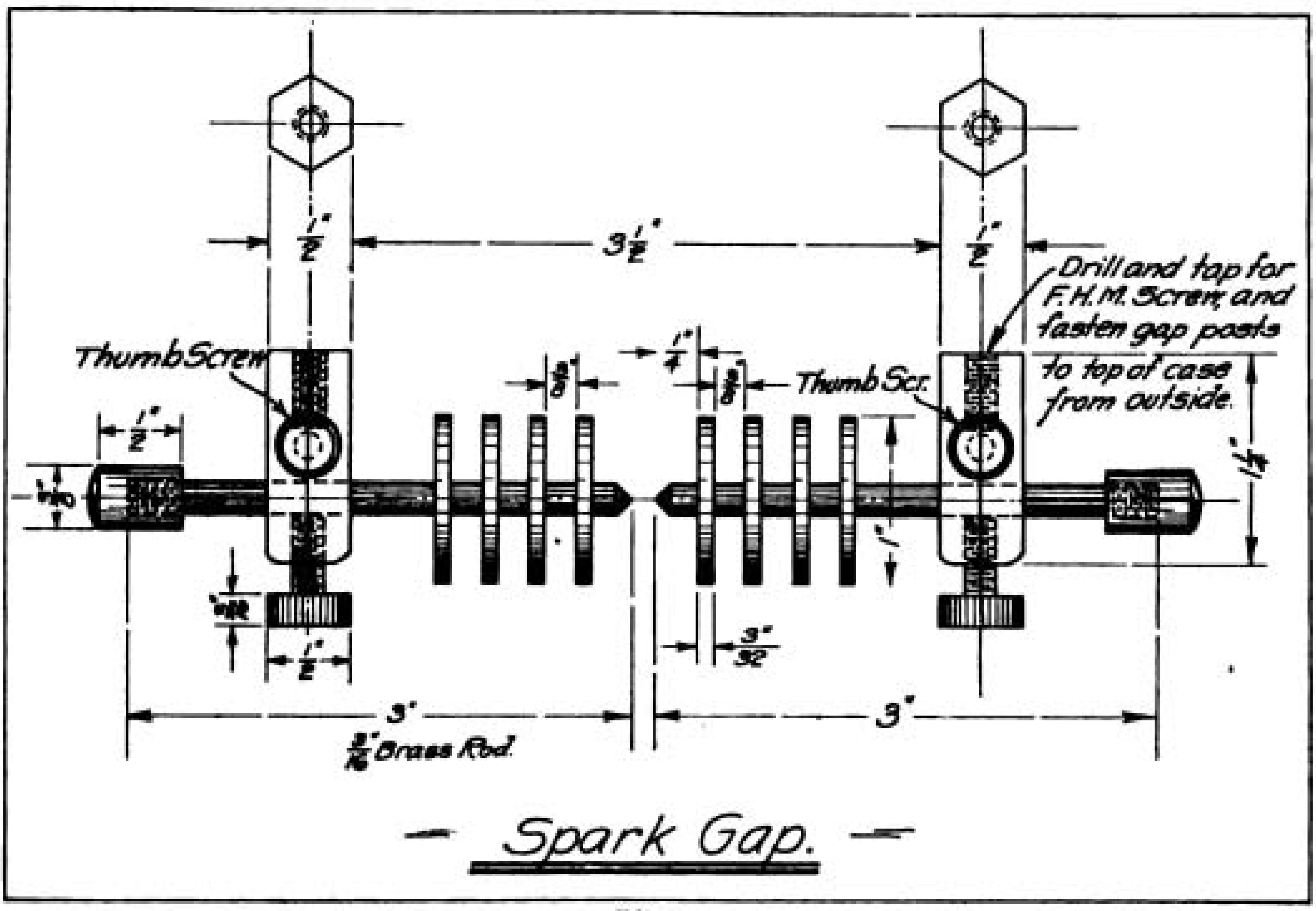


Fig. 2

which may be cast integral with the rod or mounted later. A detailed drawing and the necessary dimensions for this gap are presented in Fig. 2. The hard rubber standards for support of the primary core are represented in detail in Fig. 3. Two are required.

The condenser for the vibrator contains approximately 2,000 square inches of tin-foil which may consist of 65 sheets of tin-foil, 4 by 9 inches, separated by thin paraffine paper, the entire arrangement being closely pressed together and mounted in the space provided for it at the base of the coil.

An aerial tuning inductance is included in the antenna circuit to allow for adjustments of the radiated wave and to decrease the decrement of damping, thus producing a "sharper" wave. This inductance is wound on a rectangular form, 3¾ by 3 by 12 inches, and is covered with No. 8 D. B. R. C. stranded wire. The fixed binding posts represented at K allow a variable connection to be made to this inductance.

The transmitting key, W, is mounted on the inside of the lid of the cabinet. It may be of the ordinary type as used in land line telegraphy, but must be fitted with extra heavy contacts to carry the current. An S. P. D. T. switch is mounted to the left of the box for changing the aerial from a transmitting to a receiving position. It may be of any dimensions consistent with the size of the cabinet, but it should have a well insulated base. There should be a distance between the contacts on the base of at least 1½ inches. The binding post, E, is con-

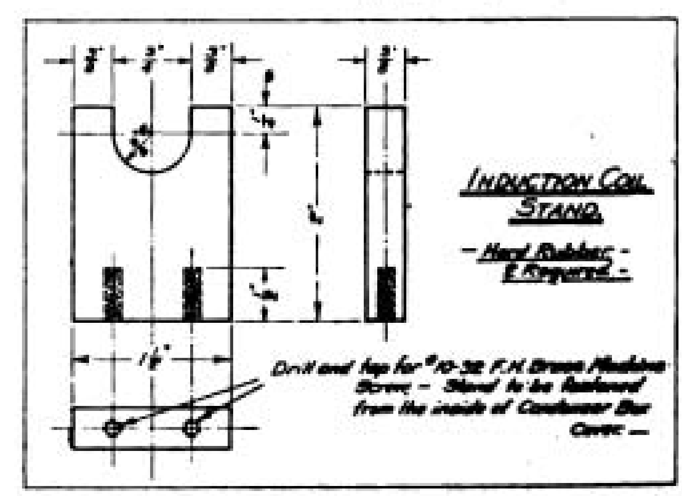


Fig. 3

nected to the portable aerial, while the post, Z, is connected to the antenna post of the receiving apparatus.

A drawing for the over-all dimensions of the cabinet is shown in Fig. 4. The ends of the cabinet are preferably dove-tailed, but if desired they can be glued together or held with small wood screws.

An equipment which can be employed at the camp to communicate between various points

Attention is now directed to the battery containing cases for the transmitting coil, as depicted in Fig. 16. Herein six dry cells are mounted in each box, each cell having its own compartment. Two boxes are required, giving a potential when connected in series of from 15 to 18 volts. The life of the battery, however, is prolonged by connecting the two boxes in parallel, thus supplying the necessary amperage for operation of the coil. These boxes should have over-all dimensions of 6¾ by 7¾ by 9⅞ inches. The detailed dimensions are given in full in Fig. 16.

Receiving Apparatus

A complete portable receiving set assembled and mounted in a cabinet is shown in Fig. 5. The over-all dimensions of the cabinet are 5 by 5 by 9½ inches. The receiving tuner about to be described is specifically designed to give the maximum degree of efficiency on amateur wave-lengths only, namely, from 160 to 450 meters. By the use of a variable condenser in shunt to the secondary winding having capacity beyond that described this tuner can be made adjustable to wave-lengths of 600 meters. The design is such that inductance predominates in the secondary winding over the range of wave-lengths desired, making the tuner particularly effective with detectors requiring a high potential, like the vacuum valve or certain detectors of the crystalline type.

It will be observed that the primary turns are wound on a hard rubber tube 3¼ inches in diameter by 2 inches in length. This tube is covered with 80 turns of No. 28 D. S. C. wire. The secondary winding, S, is 2¾ inches in diameter by 1½ inches in length and has sixty turns of No. 30 D. S. C. wire.

The turns of the secondary winding are equally divided between the taps of a 3-point switch, S-3, while the turns of the primary winding are progressively cut in the circuit by two switches, S-1 and S-2. S-2 is connected to the first ten single turns of the primary winding, and S-1 is connected to every successive tenth turn of the remainder of that winding. These two switches are mounted on a hard rubber upright, the dimensions in detail for which are given in Fig. 6.

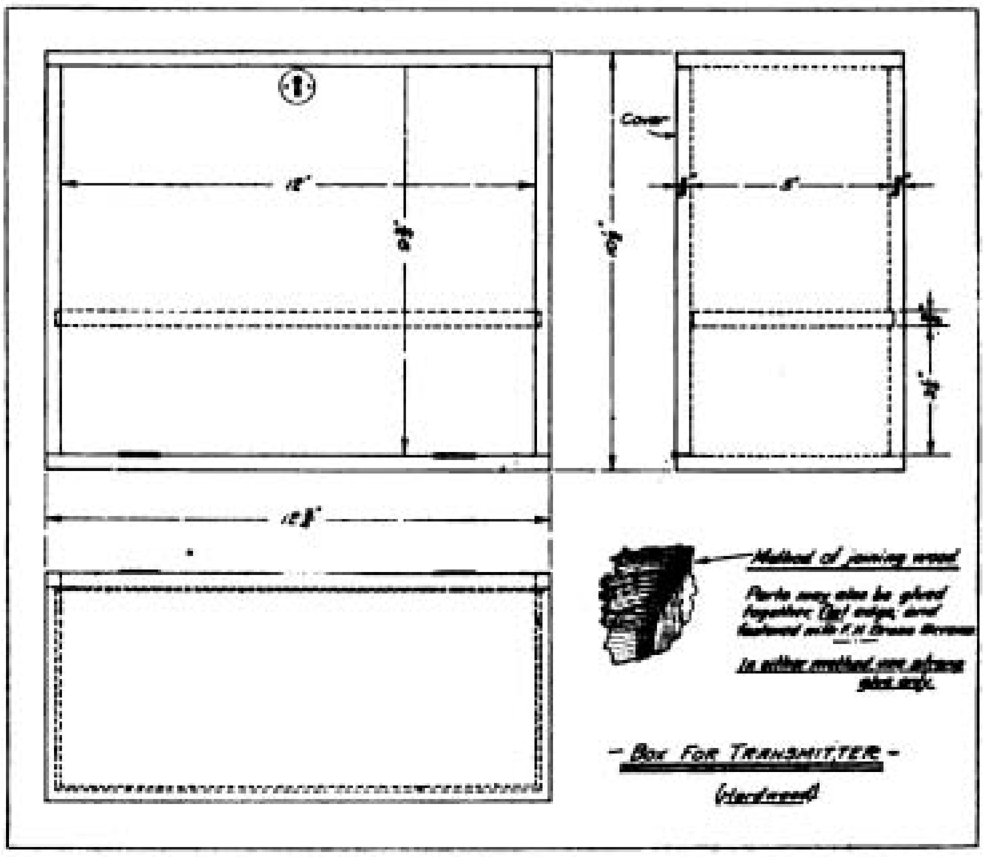


Fig. 4

The primary and secondary windings are supported by two brass rods shown in detail in Fig. 10. These rods are held in position by the hard rubber uprights, K-1 and K-2, shown in detail in Fig. 9. Two are required. De-

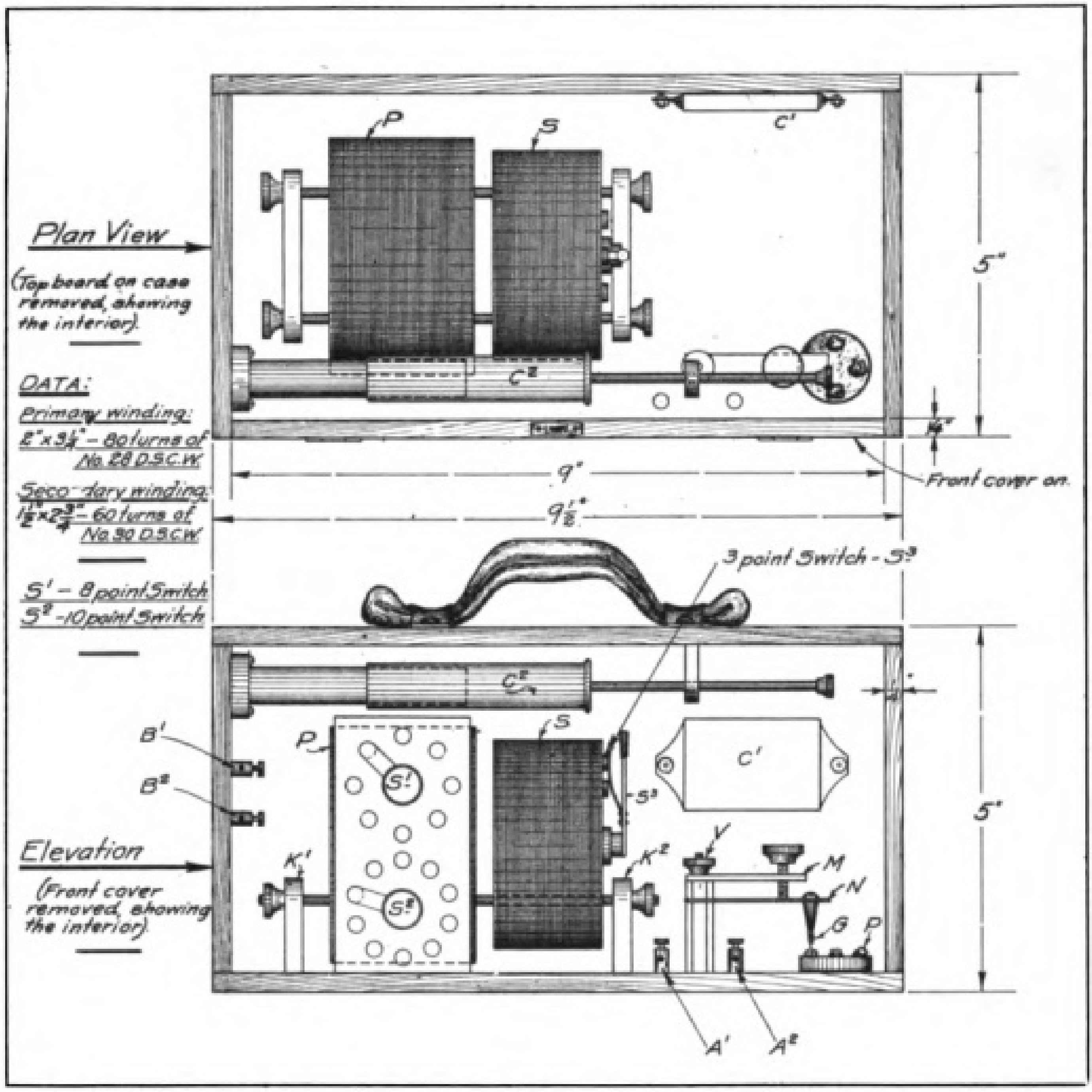


Fig. 5

tails of the supports for the primary and secondary windings are given in Figs. 7 and 8.

A variable condenser for the secondary winding is mounted immediately above the oscillation transformer. It consists of two concentric brass tubes, one of which is movable and the other stationary.

The complete details for this condenser are shown in Fig. 11; the inner tube is ½ inch in diameter by 3 inches in length; the outer tube is ⅝ of an inch in diameter by 3 inches in length. The inner tube is covered with a very thin sheet of hard rubber for purposes of insulation.

The fixed stopping condenser is mounted to the rear of the cabinet at the right and contains approximately 70 square inches of tin-foil. It may consist of two strips of tin-foil, 17 inches in length by 1 inch in width, separated by a thin sheet of paraffine paper. The entire unit may then be rolled up in circular form or folded back and forth to have a rectangular shape as shown in Fig. 5.

The complete receiving detector is represented by the cup with crystals, P, the hair spring, G, and the flexible strip, N; also the rigid strip, M, with an adjustment screw. The crystal cup is mounted in a socket so it can be revolved, allowing contact to be made with any of the minerals; or if desired it can be held in position by a small wooden screw as shown in the accom-

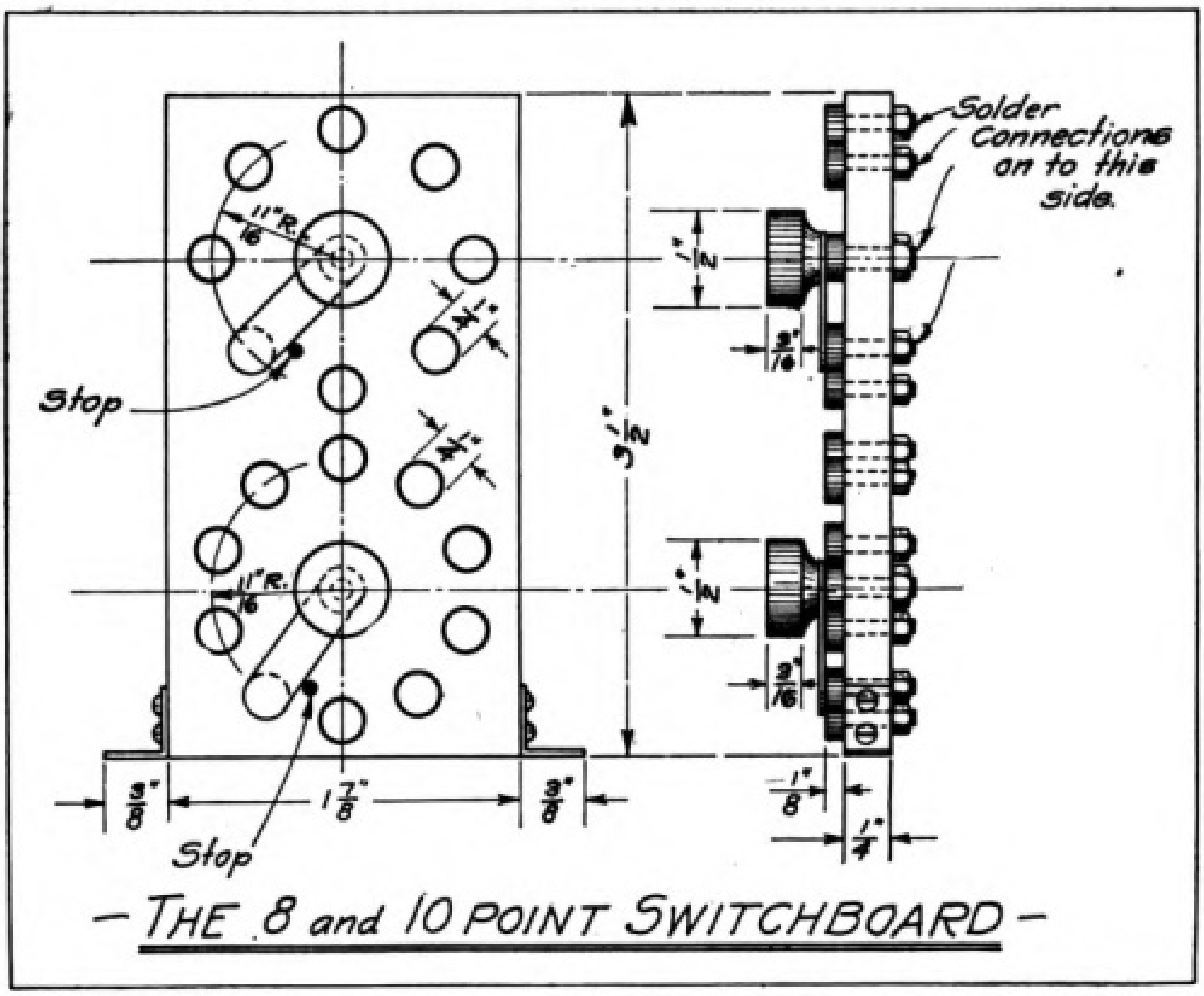

Solder connections on to this side.
Stop
Stop
11" R. 16
3"/16
3 1"/2
1"/2
3"/8
1 7"/8
1"/8
1"/4
— THE 8 and 10 POINT SWITCHBOARD —

Fig. 6

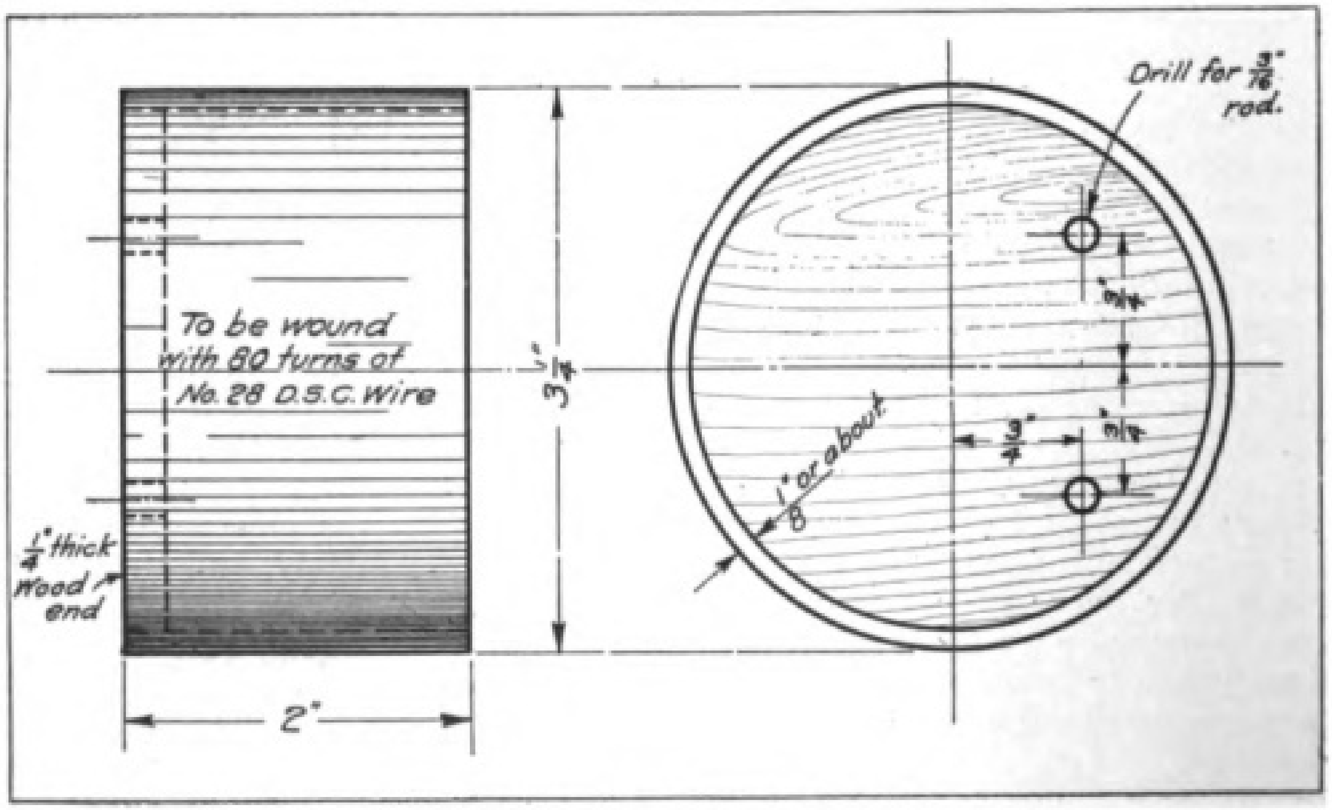

To be wound with 80 turns of No. 28 D.S.C. Wire
3 1"/4
1"/4 thick Wood end
2"
Drill for 3"/16 rod.
1"/8 or about
3"/4

Fig. 7

panying drawing. Complete details of dimensions for this detector are given in Figs. 12 and 13. The strip, M, should be a light piece of phosphor bronze.

In order that no confusion may arise in the mind of the builder it should be understood that in Fig. 15 a potentiometer and battery for the crystalline detector are shown, but, as will be observed, they have not been included in the portable set. This was done to simplify matters of construction and operation, but they can be mounted if desired, on the right hand side of the cabinet.

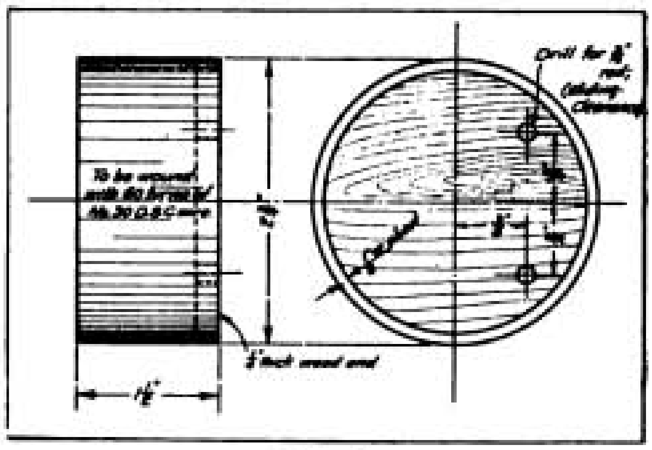


Fig. 8

Whether at the summer camp or at home, it is well for amateurs working in the restricted wave-length of 200 meters in the majority of their experiments, to build a receiving tuner of the dimensions given. The reason for this is found in the fact that owing to the absence of dead-ends and that the windings were specifically designed for the lower range of wave-lengths the maximum strength of signals will be secured. The secondary winding of this tuner is particularly suitable for use with the vacuum valve detector at a wave-length of 200 meters.

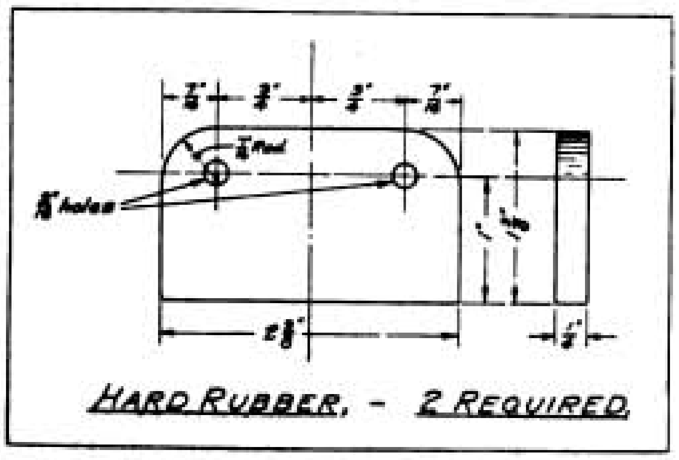


Fig. 9

The apparatus described having been constructed and wired in accordance with the diagram of connections shown in Fig. 15, it can be used as a stationary equipment at the summer camp or installed in a launch or small sailing vessel. It can also be used as a portable equipment for a Boy Scout exploration party.

Since the spark gap of the transmitter is connected in series with the antenna, the wave-length is governed by the dimensions of the aerial alone. Consequently a hot-wire ammeter is not necessary to determine the maximum value of current in the antenna circuit. However, a wave-meter is of considerable value in determining whether the emitted wave complies with the United States restrictions.

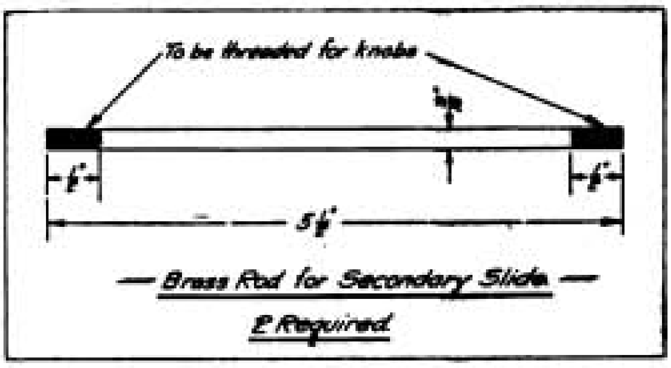


Fig. 10

A wave-meter suited strictly to amateur wave-lengths and having a range of from 120 to 600 meters, is fully described in an article of the series "How To Conduct a Radio Club," which appeared in the February, 1915, issue of The Wireless Age. The wave-meter under consideration comprises a fixed coil of inductance 5½ inches in diameter wound with 26 turns of No. 18 D. C. C. wire; two extended terminals of 10 inches each connected to the binding posts of a Clapp-Eastham variable condenser having a capacity of .0008 microfarad; also to a Murdock condenser having a capacity of .001 microfarad.

A complete chart of wave-lengths covering the scale for the two condensers appears on pages 380 and 381 of the February issue. Resonance between the wave-meter and the antenna system is indicated by a receiving de-

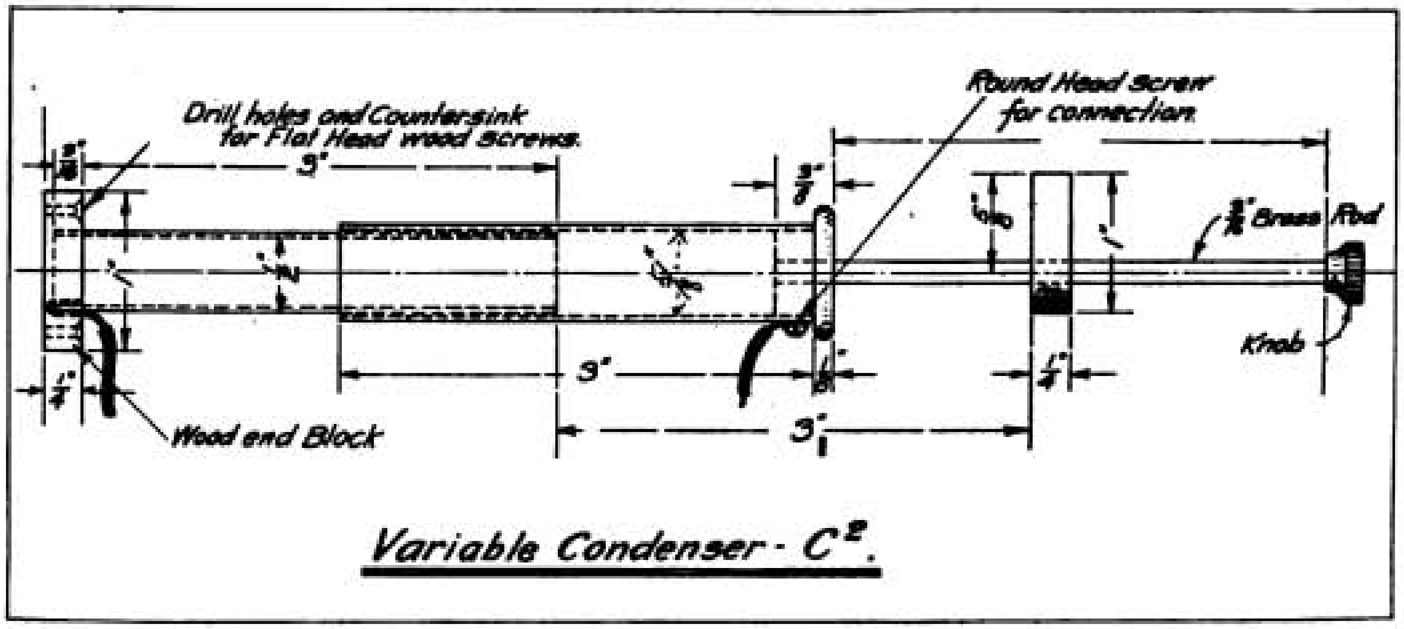


Fig. 11

tector connected unilaterally to the wave-meter system. The construction of these condensers is sufficiently accurate so that the tables given on the pages named can be applied for practical purposes.

As recommended in a previous article of this series, the aerial for the portable set consists of two aluminum wires, each 100 to 150 feet in length, which can be insulated by several porcelain cleats connected in series. The ground connection can consist of a number of copper or galvanized iron wires spread radially over the surface of the earth, or placed in a creek or moist ground.

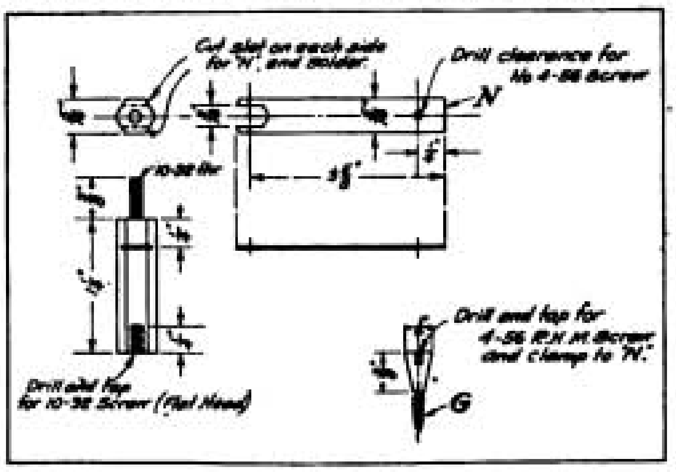


Fig. 12

For preliminary tests and adjustments two of these equipments should be set up at a distance of, say, a mile in order that the apparatus may be brought to the highest degree of efficiency.

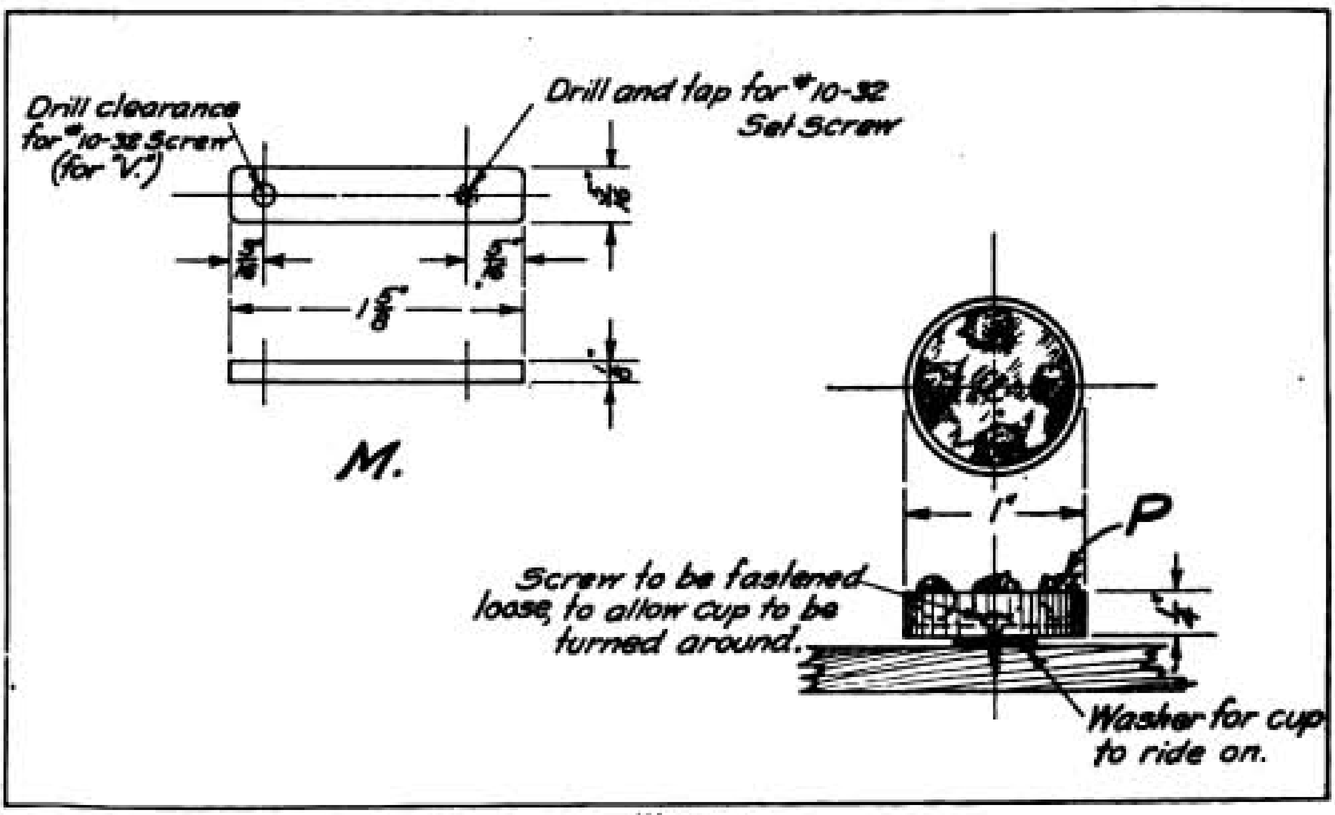


Fig. 13

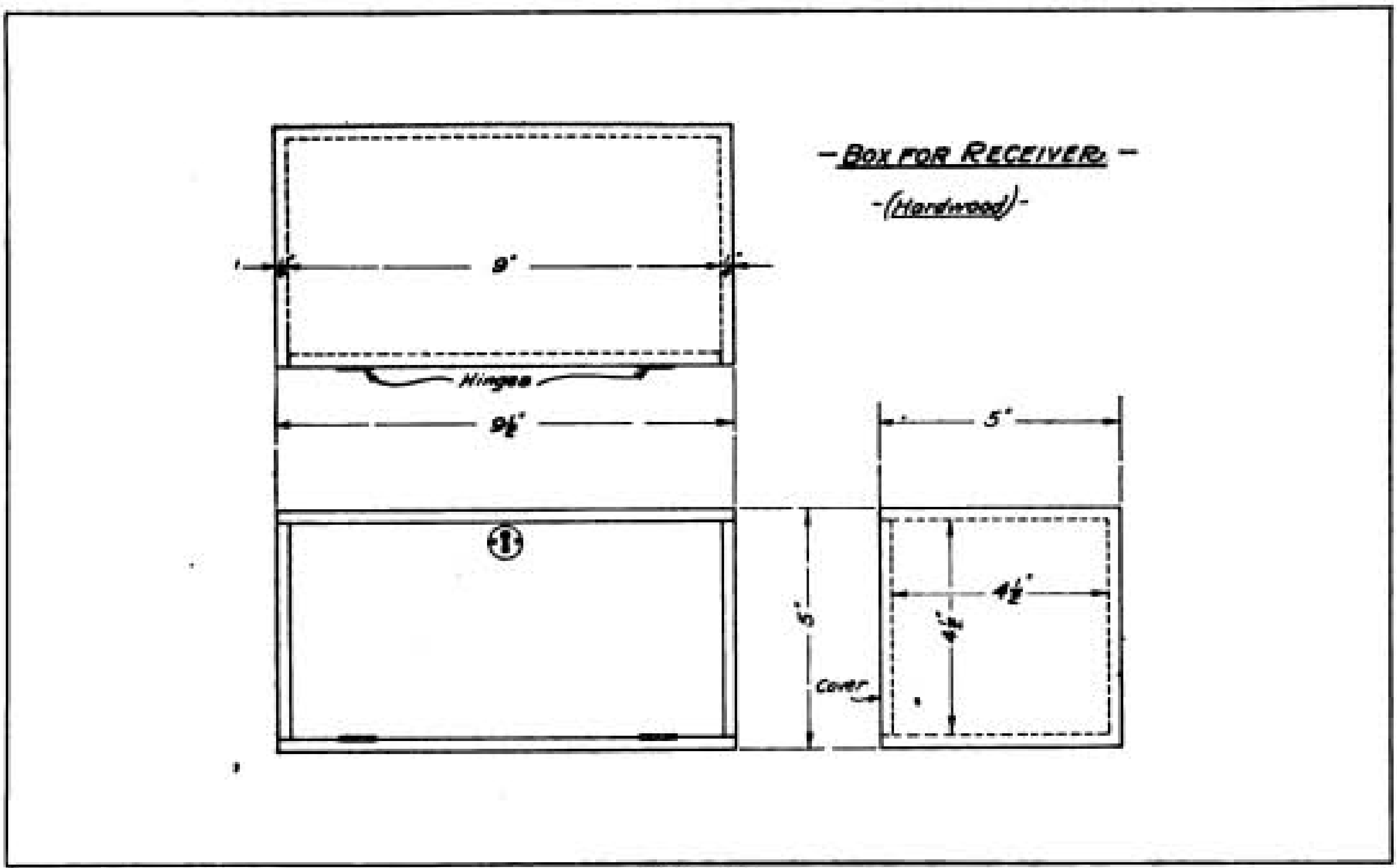


Fig. 14

If it is desired to employ a detector of the vacuum valve type, it is recommended that a third cabinet be constructed to hold the lamp socket, the battery rheostat and the necessary high potential batteries.

No provision has been made in the receiving set for carrying the head telephones, but the dimensions of the case can be enlarged and a small compartment furnished in one end to hold them, if desired.

Provided the transmitting aerial is erected in a clear space and the receiv-

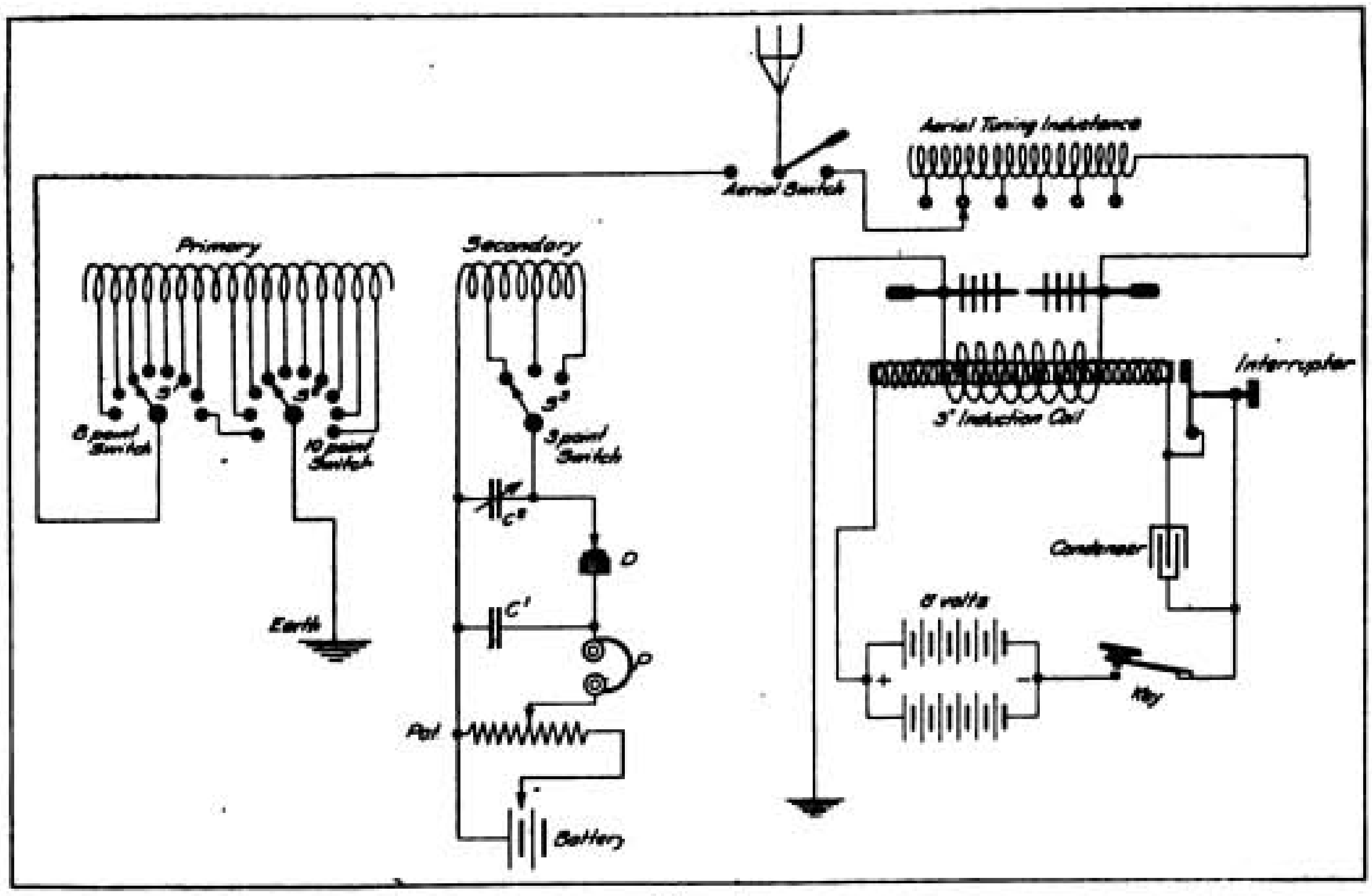


Fig. 15

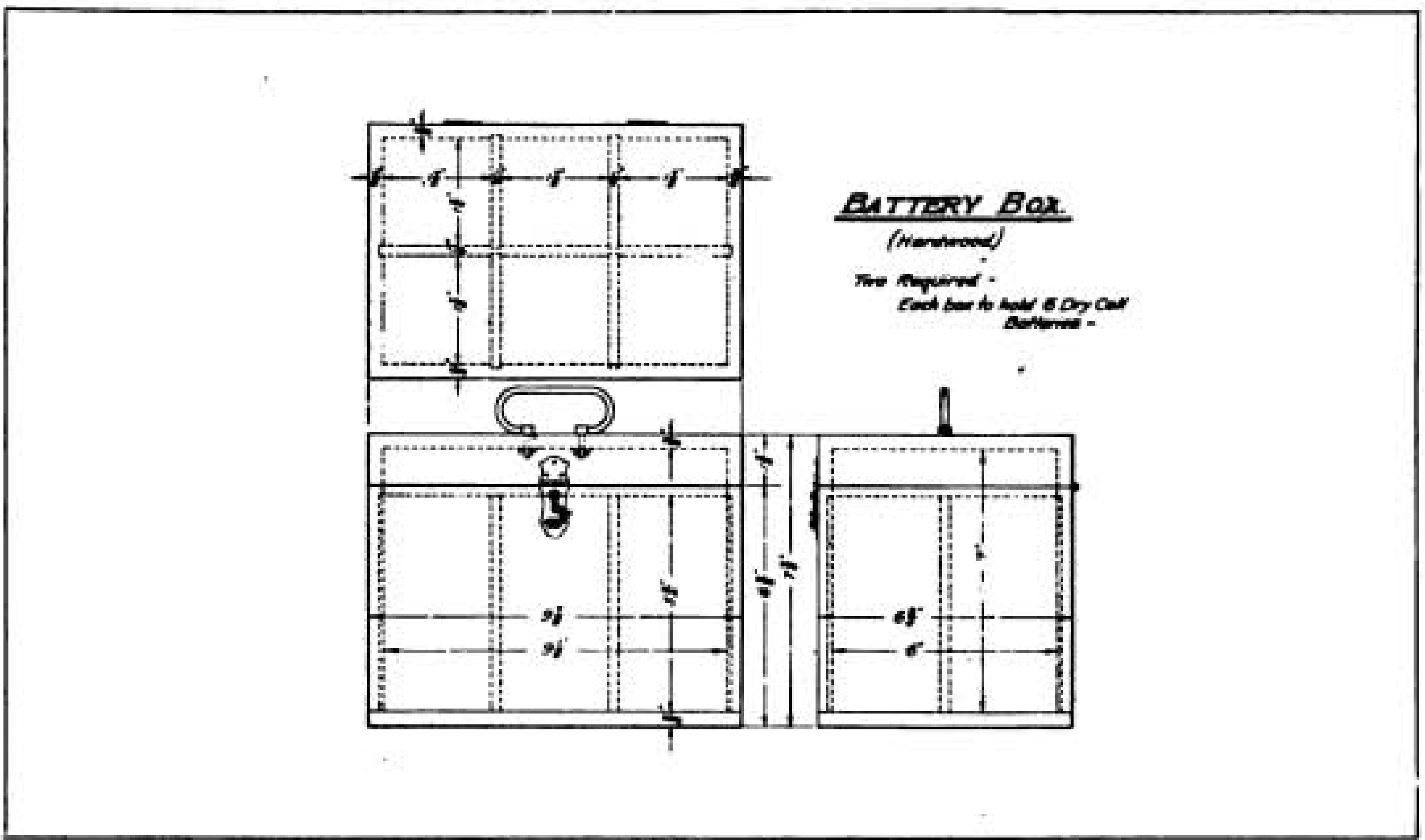


Fig. 16

ing apparatus at both stations fitted with sensitive vacuum valve detectors properly adjusted, a range of 10 miles should be obtained. With the crystal-line detectors a distance of from 3 to 5 miles should be covered under favorable conditions.

(To be continued)

AN AMATEURS' OBITUARY

An unusual obituary notice, forwarded by the Rochester, N. Y., Democrat and Chronicle, appeared in that newspaper on July 7. It follows:

"The web of wires on the roof of No. 206 Frank street last night might have told the secret of navies, as it had often done, if there had been anyone to translate their murmurings, but Charles L. Van Hoesen, who by lamplight each evening used to sit and pick words out of the air, was dead. His funeral will take place this afternoon.

"Some years ago when the amateur radio operators in Rochester organized the Rochester Wireless Association they elected Mr. Van Hoesen president. His wires were high-powered and sensitive enough to receive messages from as far away as Cape Cod, but yesterday, if there were dots and dashes flying from the coast of New England, they were not noted at No. 206 Frank street. Mr. Van Hoesen's 12-year-old son, Edmund, some day may take his father's place at the instruments, though he has yet to master their technic. His mother says she will preserve the instruments for him.

" 'Have any of the operators in Rochester wirelessed their sympathies?' " Mrs. Van Hoesen was asked

" 'I don't know. This is so much Greek to me,'—with a wave at the rheostat and queer contrivances—'they may have, but I don't know. Some day Edmund will know.'

"Piled at one side of the receiving station were books filled with messages, set down by Mr. Van Hoesen as he caught them on the wing. Most of them have to do with weather observations, but there are others in code, and still others bristling with war terms. Mr. Van Hoesen, up until he was taken ill on April 19th, never missed opening the station for an hour a day."

Marconi Decremeter No. 24

(Special Instructions to Marconi Inspectors)

Part I

THE amount of interference to be expected from a given wireless telegraph transmitter may be accurately predetermined if the rate at which the energy decays per wave train is definitely known. It is customary to express this loss of energy in terms of the "logarithmic decrement," which is the Naperian logarithm of the ratio of one oscillation in a wave train to that preceding it in the same direction. Measurements of this character are obtained by an instrument known as a decremeter.

Since the operation of the decremeter is based on the phenomena of electrical resonance and corresponding current readings in a given circuit at certain wavelengths, both at and off resonance, apparatus of precision is required. Decremeter No. 24 has been especially designed to meet the urgent demand for a semi-direct reading portable instrument having a range suitable for the requirements of the marine service, namely, 300 to 600 meters. For convenience in operation the complete range of the decremeter scale extends from 200 meters to 850 meters.

This instrument is not only useful for accurate measurement of the decrement (or decay) of the oscillations in a wireless telegraph circuit, but may also be employed for the determination of the frequency and wave-length of such circuits. Variation in wave-lengths of the decremeter is secured by means of an accurately constructed variable condenser fitted with a scale calibrated directly in values of condenser capacity, wave-lengths (200 to 850 meters), decrement of the instrument.

In Fig. 1 the capacity value of the condenser at various positions is engraved on the scale marked K, the decrement of the instrument on the scale marked δ and the wave-length on the scale marked λ. The position of the movable plates of the condenser in respect to the stationary plates may likewise be accurately determined by means of a 180° scale.

The complete decremeter comprises the following apparatus:

1. A variable condenser having a range of .0025 microfarad to .003 microfarad.

Fig. 1

2. A fixed coil of inductance.
3. A hot wire galvanometer having a current carrying capacity of .5 amps.; the instrument being calibrated in current ratios; that is to say, the scale readings are proportional to the current flowing through the instrument. The range of the scale is from 0 to 100.
4. A buzzer excitation set, enabling the wave-meter to be employed as a miniature transmitter of electromagnetic waves of definite lengths.
5. A crystalline detector and head telephones for the determination of the point of resonance when making simple wave-length readings.

A top view of the complete decremeter is shown in Fig. 2 and a side view in Fig. 2a.

The use of the binding posts on the

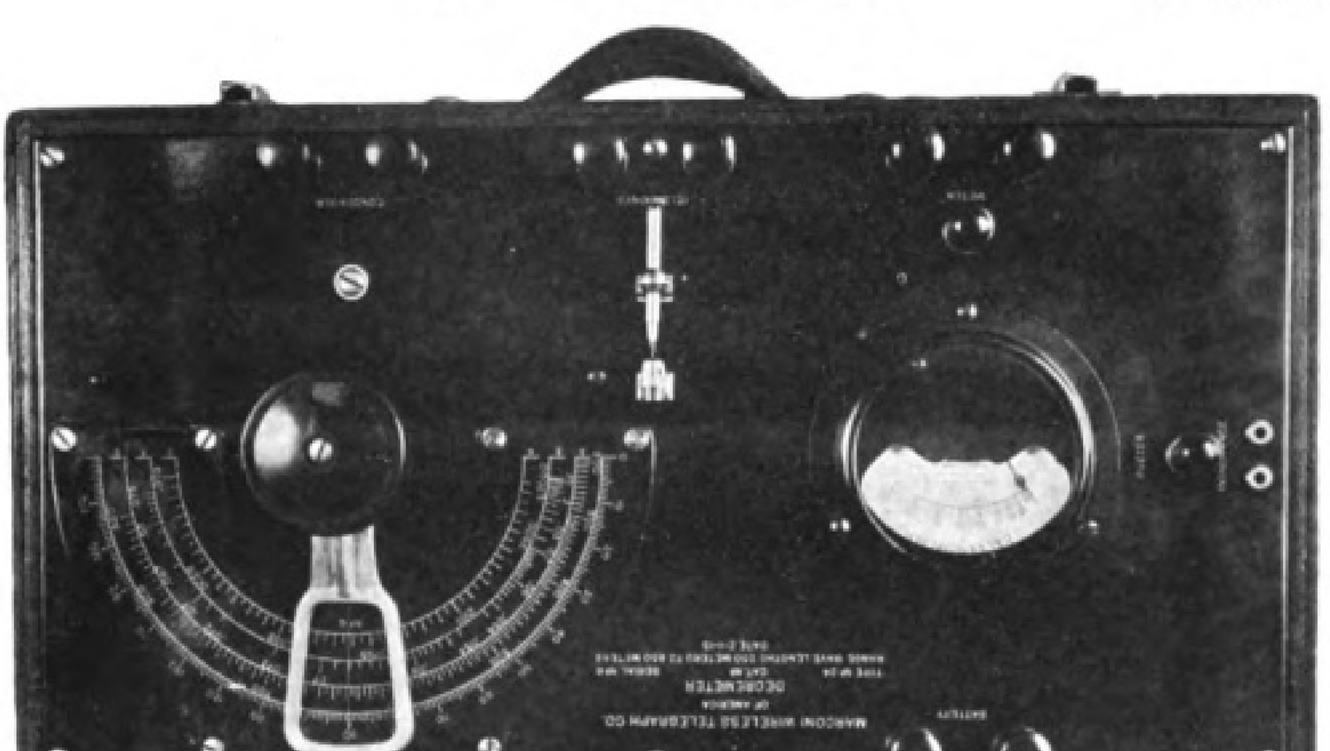


Fig. 2

instrument as shown in Fig. 2, is explained as follows:

The posts marked "battery" allow connection to an external source of one or two cells for operation of the buzzer. The switch marked "buzzer" connects the external battery to the buzzer. If the buzzer is to be held in a continuous state of operation the switch is depressed and simultaneously given a slight turn to lock it in position.

The plug connection marked "inductance" takes the terminals of a flexible cord connected to the inductance coil of the wave-meter proper. The binding posts marked "meter" allow connections to be made to an external galvanometer should the one supplied with the instrument become inoperative. A small push switch mounted near to these posts permits either the external or the supplied galvanometer to be short-circuited if desired. The head telephones are connected to the binding posts marked "telephone."

A schematic diagram of the complete connections is given in Fig. 3.

The point of resonance between the decremeter and the circuit under measurement may be obtained either by use of the crystalline detector and head telephones or by means of a hot wire galvan-

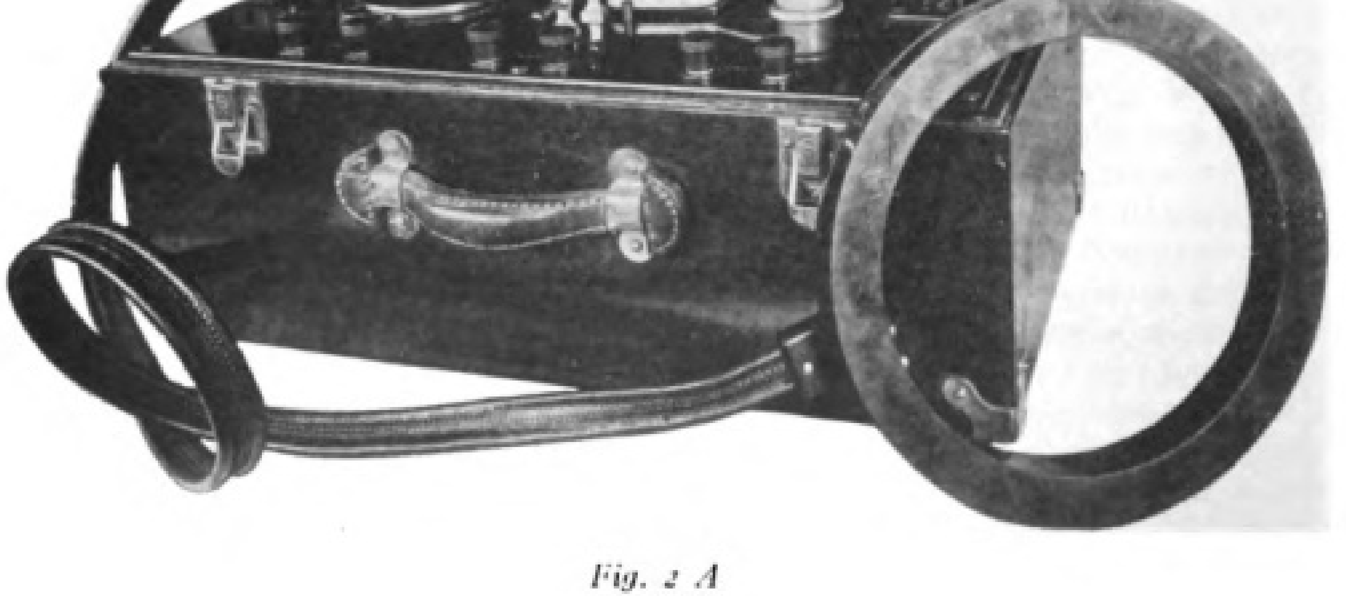


Fig. 2 A

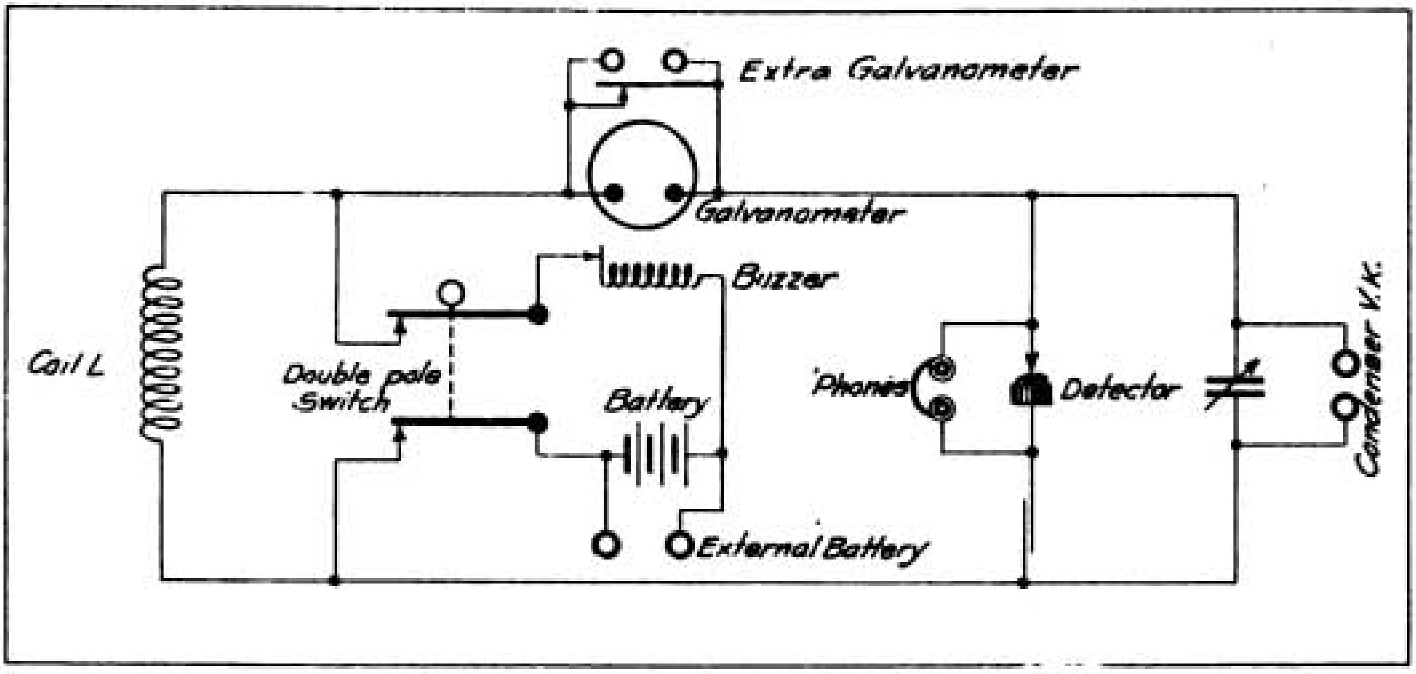


Fig. 3

ometer. When the crystalline detector and head telephones are employed, the maximum potential at the terminals of the condenser is indicated at resonance, but when the galvanometer is used conditions of maximum current flow at reasonance are given.

If the crystalline detector is thus employed, the hot wire galvanometer is short circuited by means of a push switch, but if the galvanometer is used the head telephones are to be disconnected from their binding posts and the detector itself cut out of the circuit by removal of the adjustable contact from the crystal.

When the galvanometer is employed for determination of resonance, care should be taken not to bring the inductance coil of the wave-meter too close to the circuit under measurement; otherwise a burn-out may result.

The second and concluding installment of this article will appear in an early issue.

MUSIC BY WIRELESS

One of the wireless operators on the steamship Port Kembla was recently entertained by music rendered by a gramophone on shore, while the steamship was making her way from New York to foreign ports, according to an article published in a newspaper. Soon after the vessel left New York the operator, who was listening in, was surprised to hear a human voice coming from the apparatus. Then he distinguished the words. "Hello, Philadelphia," followed by "Hello, Boston." Shortly afterwards, the following come from the first station: "Stand by for a little music."

The discordant sound of the musical instrument next reached the ears of the wireless man. This was succeeded by the notes of a song, which were as plain as if the gramophone were in the wireless cabin. When the Port Kembla arrived at Bermuda it was learned that other operators had been given the privilege of hearing the music. It was afterwards learned that experiments conducted in wireless telephony in Boston enabled them to enjoy the concert.

TIME SIGNALS IN SOUTH AFRICA

It has been announced that arrangements have been completed for the daily transmission of a wireless time signal for the convenience of mariners in the waters of South Africa by means of the Union Government wireless station at Slangkop. The stations at Cape Town and Durban, which are open night and day, work on a 600-meter normal wave. At Cape Town a clock gives automatically a series of signals extending over an interval of thirty seconds. The signals are flashed at eleven o'clock at night, Union time, which is nine o'clock at night, Greenwich time. The usual signal of warning is given.

JOINT MEETING AT EXPOSITION

On Thursday and Friday afternoons, September 16 and 17, joint meetings of the Institute of Radio Engineers and the American Institute of Electrical Engineers will be held at the Native Sons at the Golden West Hall, Panama-Pacific Exposition Grounds, San Francisco.

Two papers for the Radio Engineers will be presented, one each day. Thursday afternoon Prof. Harris J. Ryan will read the results of investigations on the "Sustained Radio Frequency High Voltage Discharge," by Mr. Roland G. Marx and himself, taking up the flame and brush types of discharge obtained from conductors when a powerful arc generator is used to apply voltages up to 50,000 at frequencies as high as 200,000 cycles per second. On Friday, Mr. Robert H. Marriott will read a paper on, "Radio Development in the United States," giving especial attention to Pacific Coast conditions.

A meeting of the Institute of Radio Engineers was held Wednesday evening, September 1, in Fayerweather Hall, Columbia University, New York. Professor J. Zenneck presented a paper on "The Operating Theory of Frequency Changers." The fundamental equations of the theory of the frequency changer were derived (with certain assumptions) and the application of the solution to unloaded and loaded frequency changers was discussed.

WITH THE AMATEURS

A meeting called for September 1 and 2 at Ames, Ia., marked the close of the first year of the Hawkeye Radio Association. Exhibitions and tests of modern wireless instruments were made possible through permission granted by the Iowa State College to use its wireless station.

This association reports that nearly every part of the state can be reached by relaying among its twenty-five members. The membership is expected to reach a total of thirty-five or forty members befor the end of the year.

The Norfolk Radio Society fears that an erroneous impression may have been given by the item in our July issue which mentioned in the amateur field nine juvenile Virginians of that city, four having licenses and five remaining unlicensed. It appears that the licensed ones possess only second grade certificates and the young man alleged to have received messages from Florida has heard but one station, N A M, the Norfolk Navy Yard.

The point is, according to C. Bruce Flick and W. W. Barrett, this item may have given the impression that Norfolk is not wideawake in amateur work, whereas the Norfolk Radio Society, comprising eighteen members and in every sense a vigorous and progressive organization, is more representative of the city's activities. Five of this society's members have first grade commercial licenses, and five others first grade amateur certificates, all of which were secured by passing the regular examination at the Norfolk Navy Yard.

PAINT PROTECTOR FOR MASTS

Protection for aerial masts is a question which comes up for discussion every so often. The Marconi Wireless Telegraph Company's steel masts at New Brunswick, N. J., are painted with silica-graphite paint. Exposed steel construction often requires more than ordinary care in the selection of a protective covering. Architects, engineers and contractors specify, where economy and durability is desired, a paint whose pigment is a natural mixture of silica-graphite, rather than one containing the free silica mechanically mixed with graphite. Chief among the reasons for this preference of paint pigment is that the natural mixture, *i. e.*, the silica mined with and intimately attached to the graphite, spreads more evenly than the other. Also in a natural mixture the silica will not settle into a hard mass which later makes it difficult to stir the contents. The graphite in a silica-graphite paint should be of flake formation. The flakes spread flat upon the painted surface, and overlapping one another, form with the linseed oil vehicle, a film impervious to moisture, gases and even acids and alkalies.—S. B. P.

From and For those who help themselves

Experimenters' Experiences.

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

FIRST PRIZE TEN DOLLARS

Design for an Efficient Transmitting Set

An efficient and well-appearing transmitting set is a source of great pride to the average amateur experimenter. The design presented in this article combines both of these desirable features and, in addition, allows very short connecting leads to the elements of the oscillatory circuits.

By a slight change of the dimensions the general plan suggested may be adapted to any size of amateur set, but those given are intended for a ¼ or ½ k. w. transmitter employing an unmounted transformer.

In the accompanying drawings (Figs. 1 and 2), compartment A contains a transformer imbedded in paraffine or any other good insulating compound. Compartment B contains a high potential condenser which, if home made, may be immersed in light lubricating oil, thus eliminating brush discharge and leakage through moisture. Considerable care should be taken to make the joints of the containing case oil-tight. The oscillation transformer is mounted on the top of the cabinet; the coils may be placed in a vertical or horizontal position. The latter position is used in my set, particularly because it does not require the length of leads necessary with the former. The primary winding of the oscillation transformer is supported by small porcelain knobs and the secondary winding is kept in position by a set screw through a fibre block, F.

Two heavy insulating bushings, such as are found on transformer cases, are mounted on the front of the cabinet. These carry the leads from the transformer, the condenser being connected across the transformer inside the cabinet by means of heavy D. B. R. C. wire passing through partition C. One outside connection, D, is connected to one side of the rotary spark gap, while the other terminal of the gap is connected to the primary winding of the oscillation transformer. A lead is then extended from the oscillation transformer to the bushing, E.

In order to conform to the Fire Underwriters' regulations, one end of the cabinet is of slate, about ¼ of an inch in thickness. The 110-volt binding posts and a multi-point switch to vary the input to the transformer are mounted on this end.

The cabinet, outside of the slate end, is best built of birch or some other wood that will take a good finish. The complete cabinet is mounted on porcelain knobs, which are used as feet, similar supports being used for the rotary gap. If the gap is of the ordinary type, consisting simply of two electrodes, it can be mounted on the front of the cabinet.

As stated previously, the plan given may be varied to suit the individual ideas and the apparatus obtainable. The general scheme, if adhered to, however, will give a greater degree of efficiency than the usual arrangement of amateur transmitting sets.

Roger G. Wolcott, *Virginia.*

SECOND PRIZE, FIVE DOLLARS

Design for a Transmitting Set

Unit design for amateur wireless telegraph apparatus seems to be the order of the day. I have recently constructed a complete set which is divided into three component parts, the particular one under discussion being called the power and transformer set. It comprises the transformer, magnetic key, protective condenser, wattmeter and necessary resistance coils, all compactly and neatly mounted, as per Fig. 1. A detail of the connections for the protective condenser is indicated in Fig. 2 followed by a sketch for a special electro-magnetic key, as per Fig. 3. In Fig. 4, complete connections for the set are shown.

The construction is as follows:

First secure two uprights, 2" x 2" x 3', which are separated by a 1-foot brace at the top and bottom. The front of this frame is then covered with a piece of hard wood forming a panel board for the mounting of instrument and control switches. A lamp bracket is mounted at the top of the panel and directly underneath, a wattmeter. Three control switches are placed side by side at the center of the panel board. These switches should be properly fused.

Next construct a base for the panel (as in Fig. 1), of sufficient dimensions to hold the transformer and the wattmeter resistance coil.

The protective condenser and magnetic key are mounted on the transformer case. These condensers should have a capacity value of 1 or 2 microfarads and be connected as shown in Figs. 2 and 4

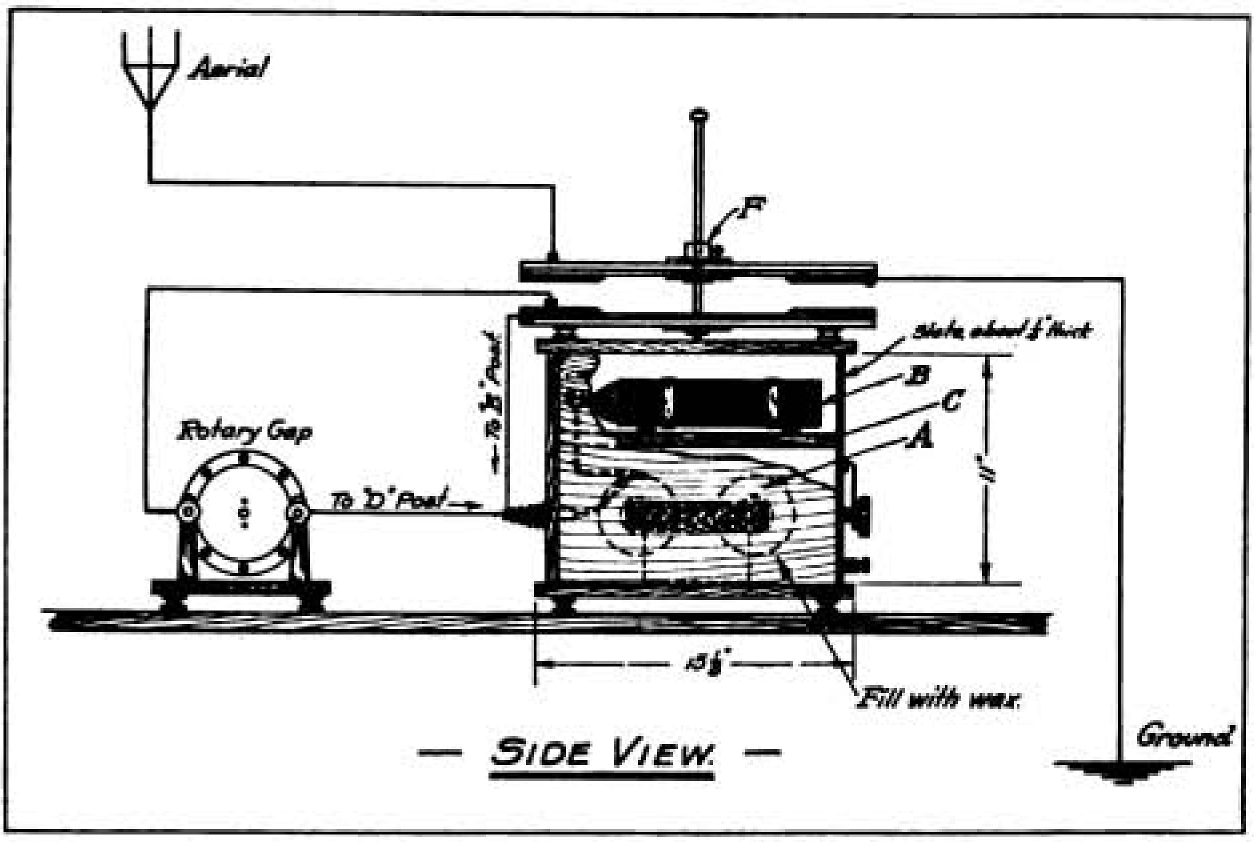


Fig. 1, First Prize Article

The electro-magnetic key is controlled by a small Western Union or other type of telegraph key, being energized by a small dry cell unit. The construction of the magnetic key is as follows:

An ordinary telegraph sounder is taken apart and reconstructed, as in Fig 3. A small metallic cup, A, is fastened underneath the lid of the key as indicated. A small lever is extended from the armature of the sounder through the opening in the top of the case. This lever makes contact with the stationary electrode mounted at the bottom of the container. A flexible contact is extended from the rod to a binding post for outside connection. Connection to the

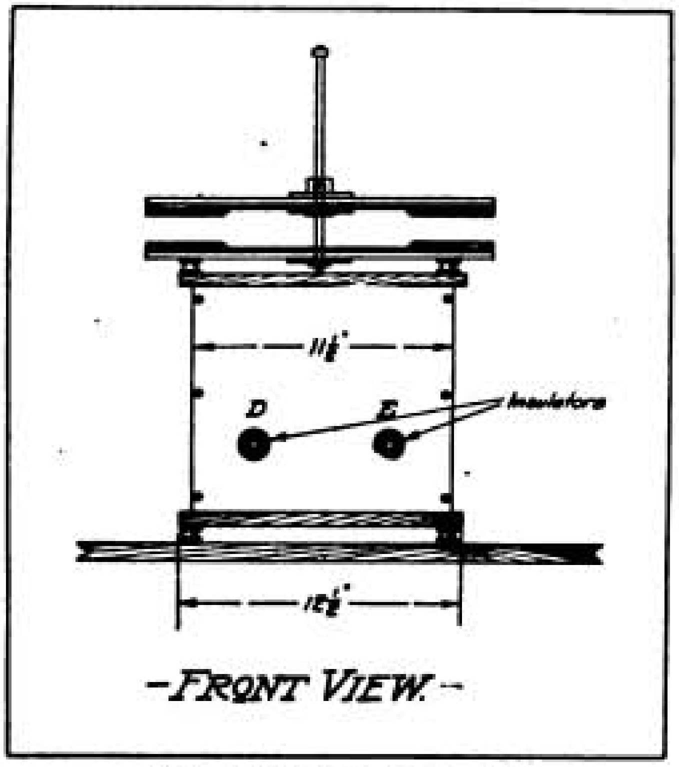


Fig. 2, First Prize Article

magnet of the telegraph sounder is made at the binding posts B and B′. The circuit to the power transformer is closed through the contacts, M and M′. The complete apparatus should be connected up as per Fig. 4.

At a later date I may supply to the readers of THE WIRELESS AGE a description of the additional apparatus comprising my set.

HARRY PATTON, *California.*

THIRD PRIZE, THREE DOLLARS
Screeching Rotary Spark Gap

The rotary spark gap I am about to

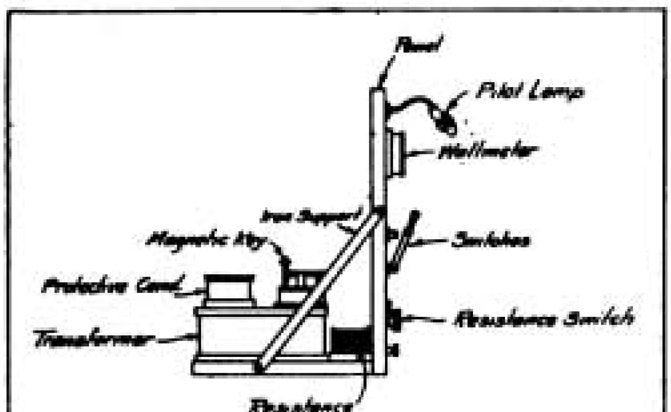


Fig. 1, Second Prize Article

describe is not entirely of my own design, but on account of the obvious advantages it possesses, I have decided to present it to the readers of THE WIRELESS AGE with apologies to A. R. Macreary, a local enthusiast.

The desirable features of this gap are: large sparking surfaces; a clear high tone, and close adjustment to the stationary electrodes.

In Figs. 1 and 2 the rotary element, A, is a standard brass gear wheel having 80 teeth. Every other tooth must be

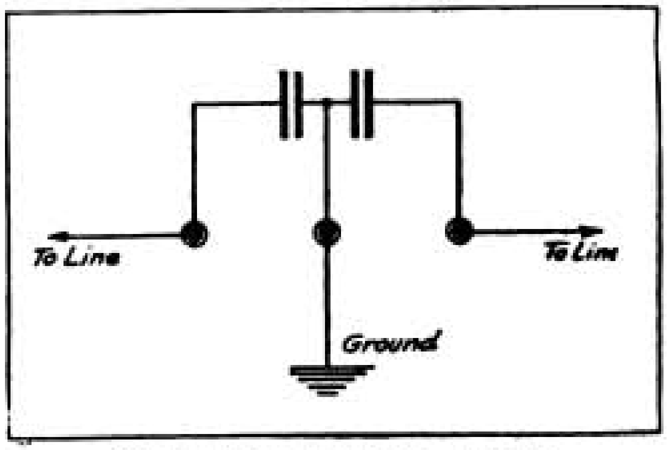


Fig. 2, Second Prize Article

sawed out with a sharp file in order to produce a desirable tone. A wheel of this description may be purchased at a hardware store for about $1.25. The wheel is then mounted on a polishing head stand, B, which also may be pur-

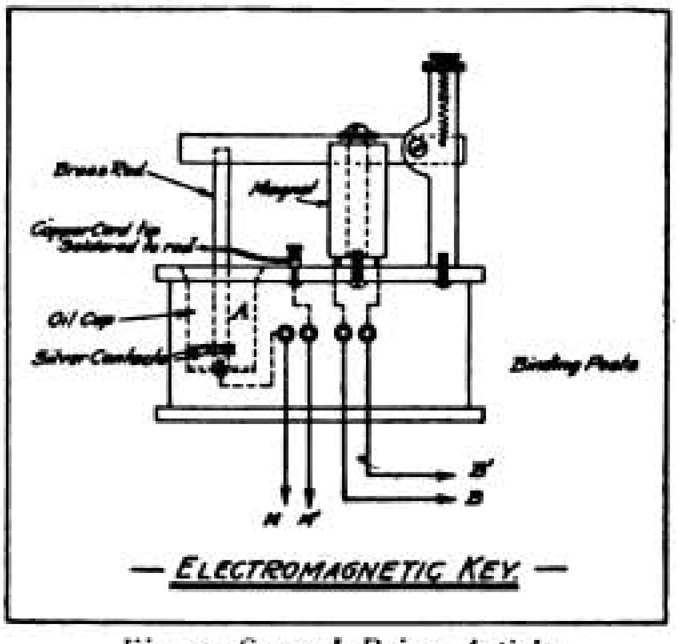


Fig. 3, Second Prize Article

chased at the average hardware store for $1.25. The gear wheel is then clamped tight by the two nuts, E.

The details of the standards for the stationary electrodes are shown in Fig. 3. From ½-inch fibre stock a piece, G, is cut to the required size. Then drill

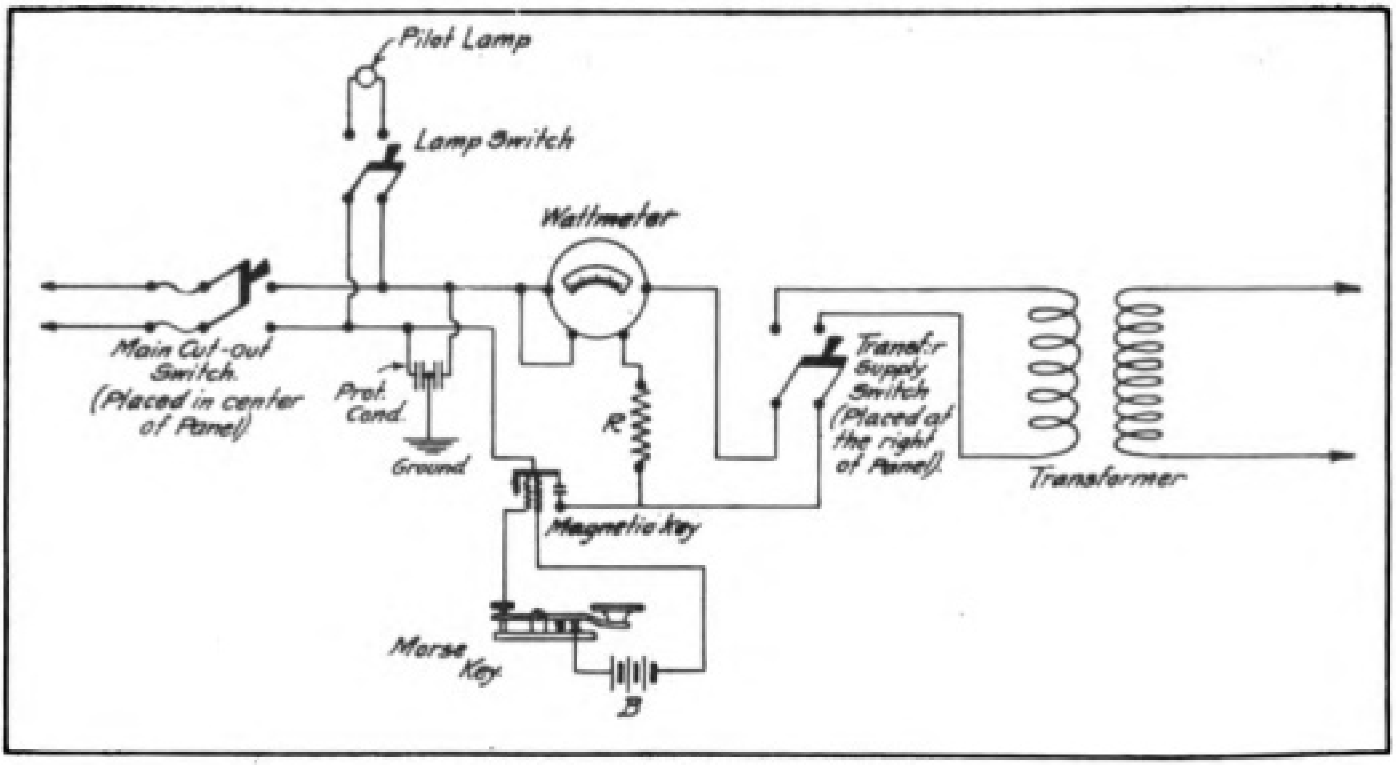


Fig. 4, Second Prize Article

holes as shown in Fig. 3. The standards, H, are made from a ¾-inch hexagon brass rod, being drilled and tapped at each end for a depth of 1½ inches. The parts should then be assembled as shown in Fig. 3.

Demount the standards on the polishing head stand, place the stand on a table and measure upwards 2⅜ inches from the table on the stand, then mark off a place ⅝ of an inch higher up. Drill two ⅛-inch holes at these points and tap for an 8/32 machine screw thread. With two 8/32 machine screw thread bolts, ⅝ of an inch in length, fasten the standards firmly to the stand.

The stationary electrodes themselves are made of copper, being shown in detail in Fig. 4. The rod that holds the electrodes in place is of 3/16-inch brass, 2½ inches in length. Two of these are required. These rods are pressed firmly into the copper electrodes and then fitted into the adjustment standards, H. Now by moving the electrodes, FF, back and forth also up and down, a very accurate spacing is secured. If this gap is driven by a fan motor having a speed of 1,800 R. P. M., a high screeching note, similar to that given by the 500 cycle quenched spark transmitter is obtained.

An amateur who desires the last degree of efficiency will, I believe, appreciate the design which I have described.

PARKER E. WIGGIN, *Kansas.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A Sensitive Receiving Detector

A well constructed receiving detector is an essential part of any amateur's equipment; in fact, more so than many believe. The design I am about to describe is particularly suitable for galena, silicon or other detectors which require accurate adjustment.

The base is made of hard wood or rubber, 2½ by 3½ inches. The upright, A, is made of ⅛ by ½-inch brass and bent as shown in Fig. 4. It is tapped with an 8/32 thread to take the adjusting screw B. It should also be drilled, in order that it may be fastened to the base. The arm, C, is made as shown in Fig. 1. It may be soldered to A or screwed on to the upright, A. The piece of fibre F, is ½ inch in length by ¼ of an inch in diameter at one end, tapering to ⅛ of an inch in diameter at the other end. It is drilled with a ⅛-inch hole to a depth of ⅜ of an inch, or to suit the spring, E. It is then drilled the remainder of the distance to take the spring wire. The spring, E, is made of No. 36 copper wire. The point of the spring should project through the fibre about 1/16 of an inch.

The arm for holding the mineral is made as shown in Fig. 2. The piece, H, is soldered to the bottom of J. The other joints are made as shown. The adjust-

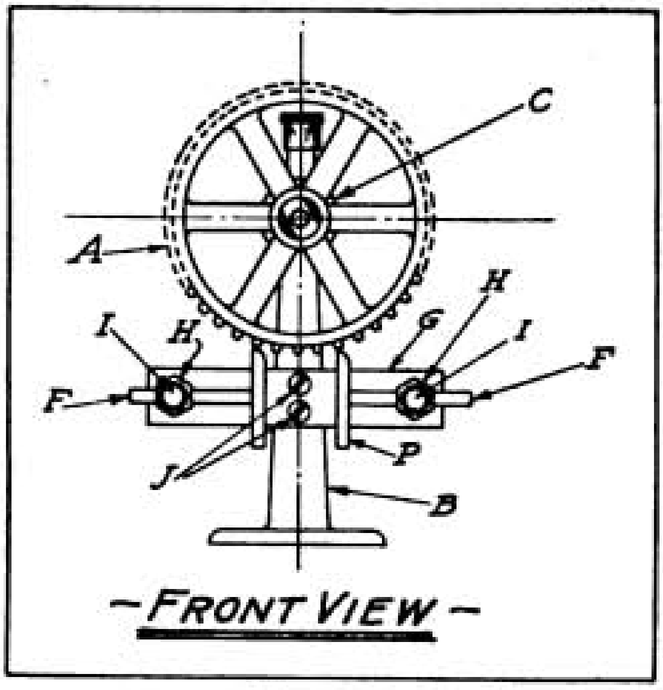


Fig. 1, Third Prize Article

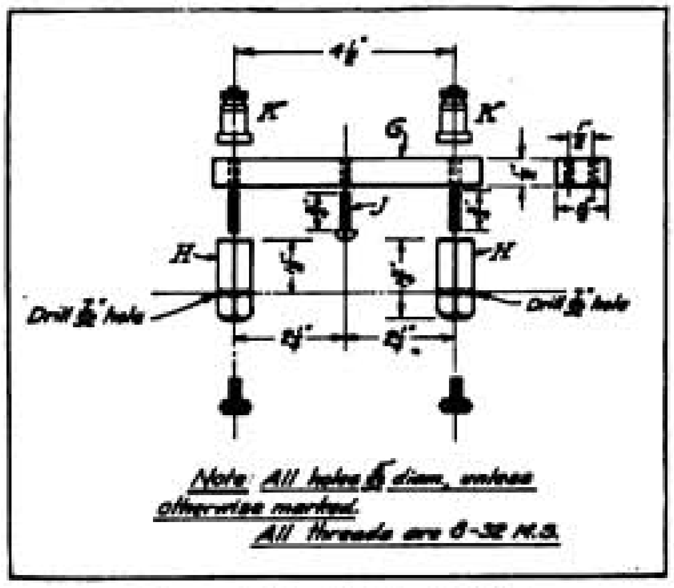


Fig. 2, Third Prize Article

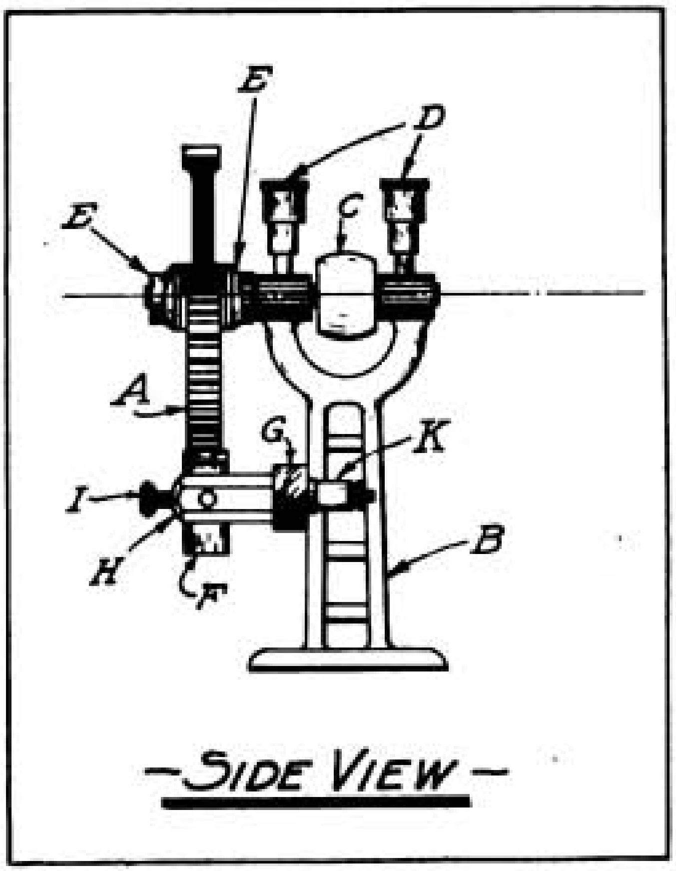


Fig. 3, Third Prize Article

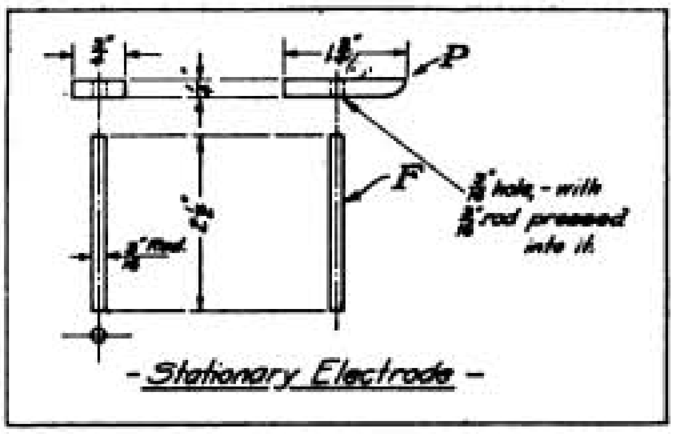


Fig. 4, Third Prize Article

ing screw is intended to hold the mineral.

To adjust the detector, the point of the spring, E, is placed over a sensitive spot. The fibre is then screwed down tight on the mineral, followed by corresponding necessary adjustment of the spring. The complete details are shown in Figs. 1, 2, 3, and 4.

PETER VENEMAN, *New Jersey.*

HONORARY MENTION
"Station 3EJ"

The accompanying photographs will show how I solved the problem of maintaining a wireless set in my apartment. The space being limited, I could not erect a permanent outfit on the usual amateur lines, therefore I constructed a folding cabinet set, which has given perfect satisfaction in operation as well as economy of space.

The cabinet when closed appears to be the usual box window seat and in no respect suggests a wireless telegraph equipment. The necessary leads for connection extend through the rear of the cabinet direct to my antenna and ground connection. When the cabinet is open the wireless instruments are readily accessible for quick and accurate adjustment.

A general idea of the construction is given in the accompanying photograph. An oak table top, which also forms the table, is fastened at right angles to the lid of the cabinet. To this I have securely attached a loose coupler, variable condenser, detector, fixed condenser and connectors for the head telephones. The transformer, sending condensers and key of the transmitting apparatus, also the antenna switch and buzzing tester apparatus, are mounted between. On the inside of the lid is placed a holder for the telephones, loading coil, transmitting oscillation transformer, spark gap and necessary code abbreviation card.

All my instruments are of old design, having been constructed four years ago. Since they give perfect satisfaction under steady operation, I have not replaced them with more modern instruments.

I believe that to secure maximum efficiency from any wireless telegraph outfit, it is necessary to have large surface connectors with tight and short connections; a set of this type has a great advantage over the usual amateur apparatus.

This cabinet, practically dustproof and locked when I am away and yet ready for use upon raising the lid, is a source of great satisfaction to me and one which a good many amateurs, I am sure, would enjoy.

An outfit assembled in this manner need not prevent the use of other instruments for experimenting, because I often use auxiliary apparatus for testing, such as rotary, quenched spark gap, hot wire ammeter and numerous other appliances.

D. L. PRIMROSE, *Maryland.*

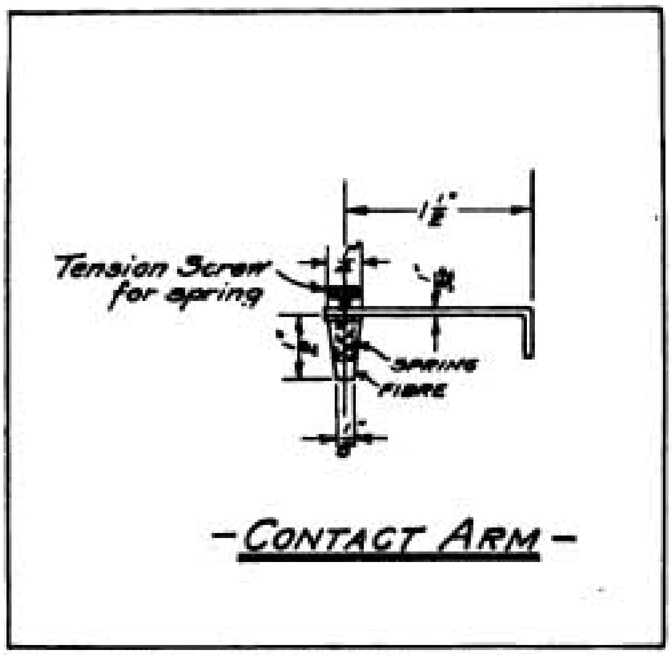


Fig. 1, Fourth Prize Article

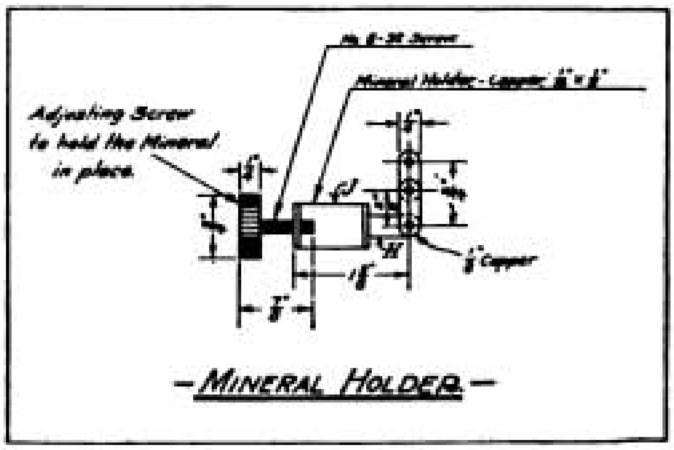


Fig. 2, Fourth Prize Article

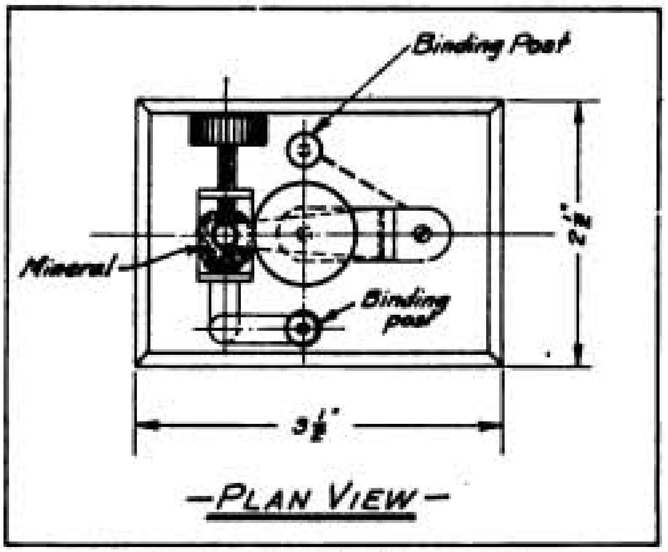


Fig. 3, Fourth Prize Article

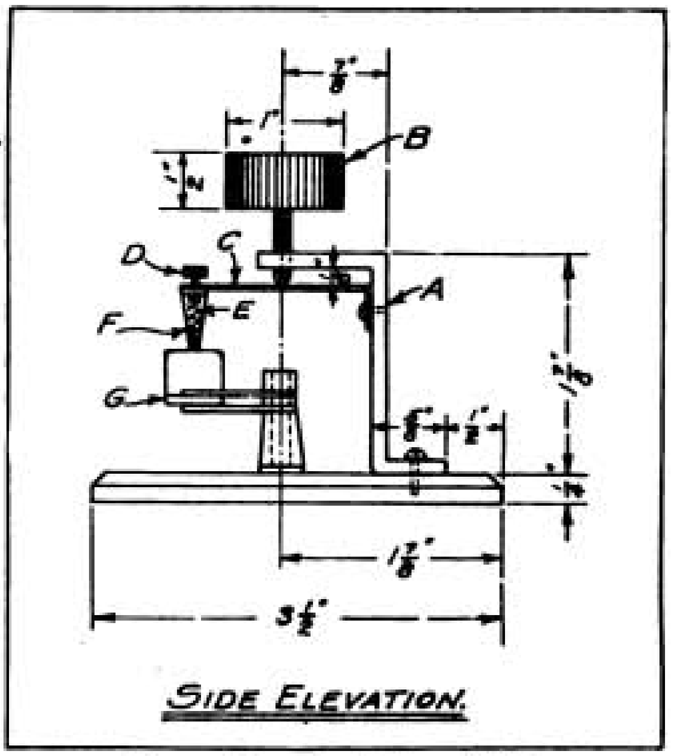
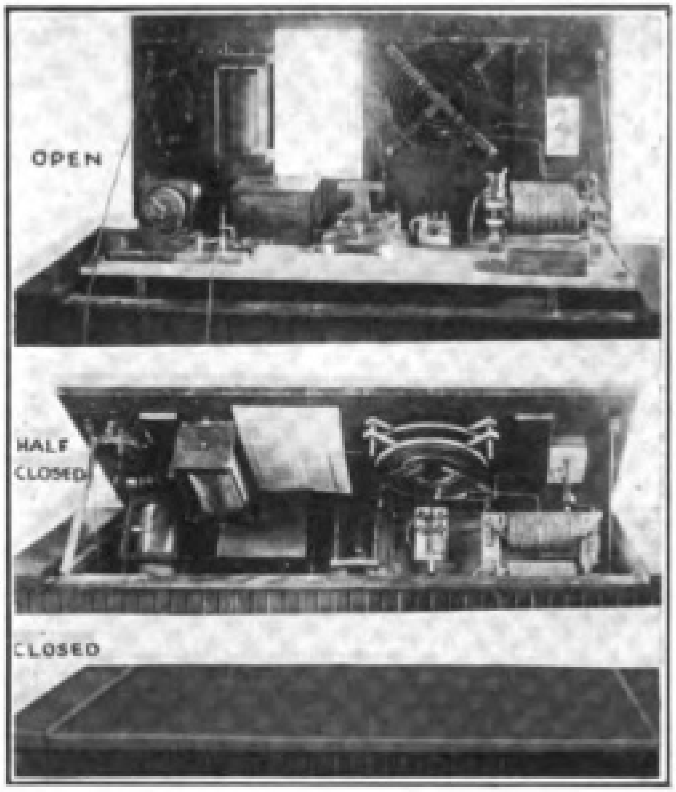


Fig. 4, Fourth Prize Article

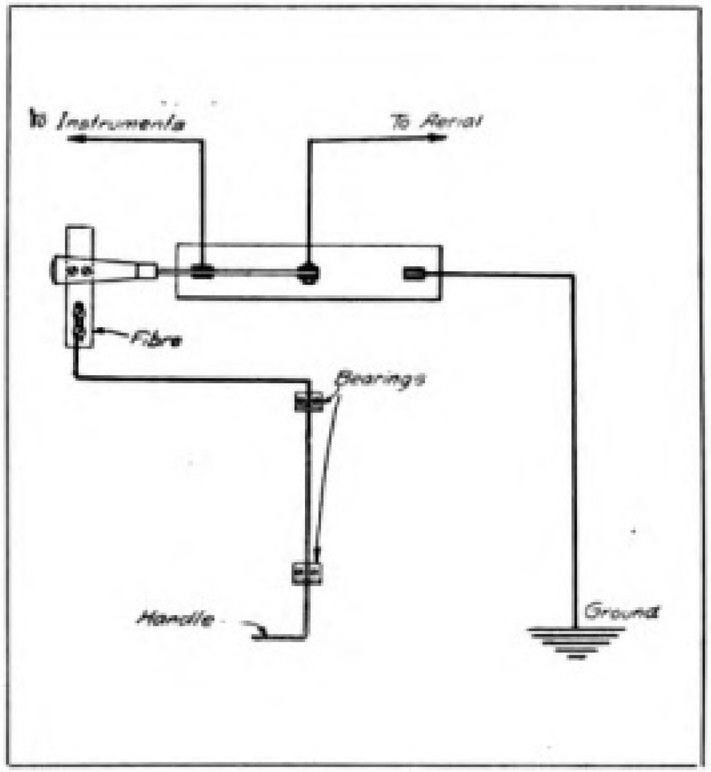
HONORARY MENTION

An Attachment for an Aerial Switch

Many amateurs prefer to have a combined aerial and lightning switch and, therefore, in order to comply with the underwriters' regulations they are required to place this switch on the outside of the building. Even though they are allowed to mount it on the inside of the building, it is often inconvenient to have to rise from the operating chair to



Photographs, Honorary Mention Article, D. L. Primrose



Drawing, Honorary Mention Article, Frank Marstell

change from sending to receiving or to ground the aerial, as may be desired. The following simple attachment will be found useful in cases of this kind:

An iron rod 5/16 or ⅜ of an inch in diameter having one end bent into the shape of a crank, as shown in Fig. 1, is required. To the end of the crank a piece of fibre is fastened by two bolts. A hole is drilled in one end of the fibre large enough to fit over the switch handle. The bearings which secure the rod to the building can easily be made from a flat piece of iron about ¼ of an inch thick and 1½ inches wide, the length depending upon the special requirements of the building. A hole is drilled in one of the pieces, large enough for the rod to pass through and turn easily. The other end of the bearing is bent into an "L" shape and fastened to the building by screws.

The general construction will be readily understood from the accompanying drawing. The rod may be obtained from any hardware store in 8 or 10-foot lengths and, if one section is not long enough, two or three may be put together by bending a hook in each end or using a bushing with set screws. The end near the ground should be bent into the shape of a short handle for turning the switch.

FRANK MARSTELL, *Kentucky.*

HONORARY MENTION

Wire Protection

When an amateur desires an aerial of lasting quality he usually employs copper wire. As this wire is somewhat expensive, particularly in the "prairie" states, he must depend upon aluminum wire, which usually breaks from corrosion, even during a mild windstorm.

A coating of copper which resists corrosion can be put on aluminum wire by a simple process. The electrolytic method of plating is exasperating as well as expensive and it has been found possible to resort to another method.

An inexpensive solution for plating can be made at a cost of 5 cents a hundred feet. The solution is made up in the following manner: Three parts of copper sulphate; four parts of pumice stone and one pint of sulphuric acid are thoroughly mixed. To plate the wire some of the solution is placed on a piece of muslin and rubbed over the aluminum. A hundred feet may be plated in this manner in four or five minutes. The solution when properly applied produces a fairly thick coating, which does not crack, peel or corrode.

JOSEPH L. ARMAK, *New York*

THE TESLA SUIT AGAINST THE AMERICAN MARCONI COMPANY

IN a suit brought in the United States District Court in New York City by the Nikola Tesla Company against the Marconi Wireless Telegraph Company of America to have the Marconi tuning patent adjudged void, as interfering with two of the Tesla patents, Judge Hand on August 10 rendered a decision on a motion made by the Tesla Company to strike out certain allegations in the answer of the Marconi Company. He refused to strike out the allegations in the Marconi answer alleging the invalidity of the Tesla patents. He decided that these allegations are good defenses of the suit, and should, therefore, remain in the answer.

Judge Hand, however, decided that as the allegations in the answer relating to Judge Veeder's decision sustaining the validity of the Marconi tuning patent over the Tesla patents in the suit against the National Electric Signaling Company is a legal precedent and can be presented on the argument in relation to the issues, and as it was not alleged that the Tesla Company was in privity with the National Company, or had control over that suit, that allegation should not be set up in the answer.

The suit of the Tesla Company against the Marconi Company is a new development in the latter's claim to ownership of all basic patent rights in the transmission of wireless messages. In a number of other wireless patent suits against companies and individuals the Marconi Company is the plaintiff, and, though a defendant in this latest litigation, Edward J. Nally, vice-president and general manager of the Marconi Company, believes that the suit will serve as one of the mediums through which the Marconi Company hopes to establish the broad claim of its right to all basic wireless patents.

The dispute over patent rights between the Marconi Company and Mr. Tesla began in August, 1914, when the Marconi Company sued Fritz Lowenstein, a German engineer, alleging that certain wireless apparatus sold by him to the United States Navy was made in violation of Marconi patent 763,772. It was announced then that Tesla would testify for Mr. Lowenstein, alleging that the Lowenstein devices were developed from Tesla patents 645,576 and 649,621, which were granted prior to the Marconi patent.

In the present suit, Mr. Tesla bases his action on the allegation that his two patents were granted in 1900, and that the Marconi patent was not granted until 1904. The bill of complaint asks for a decree adjudging the Marconi patent null and void, and asserts that the Marconi patent covers the inventions and combinations of apparatus described and claimed in the Tesla patents.

The answer of the Marconi Company denies that the Marconi patent covers the inventions or combination of apparatus described in the Tesla patents, and also denies that it is guilty of any infringement. The company asserts that its patent was granted to Guglielmo Marconi on the proof of independent invention by Mr. Marconi, not in any way due to or based on any invention of Mr. Tesla.

Mr. Nally said that he had no reason to fear the Tesla suit.

"The Marconi Company has a right to its patent," he said, "and can establish that right in the courts. Many individuals and companies have infringed the Marconi patents, and others have attempted to disprove the originality of our inventions, but when our present litigation shall have gone through the courts, I am confident that the leadership of the Marconi Company in the invention and development of wireless communication will be established."

Radio Tractor at Plattsburg Camp

A feature of the Camp of Instruction for business and professional men in Plattsburg, N. Y., was United States radio tractor No. 3, in charge of Sergeant W. T. Payson, U. S. A. The tractor is a big gray automobile with accommodations for the men who operate the wireless, which has a radius of three hundred miles.

The Eastland Catastrophe

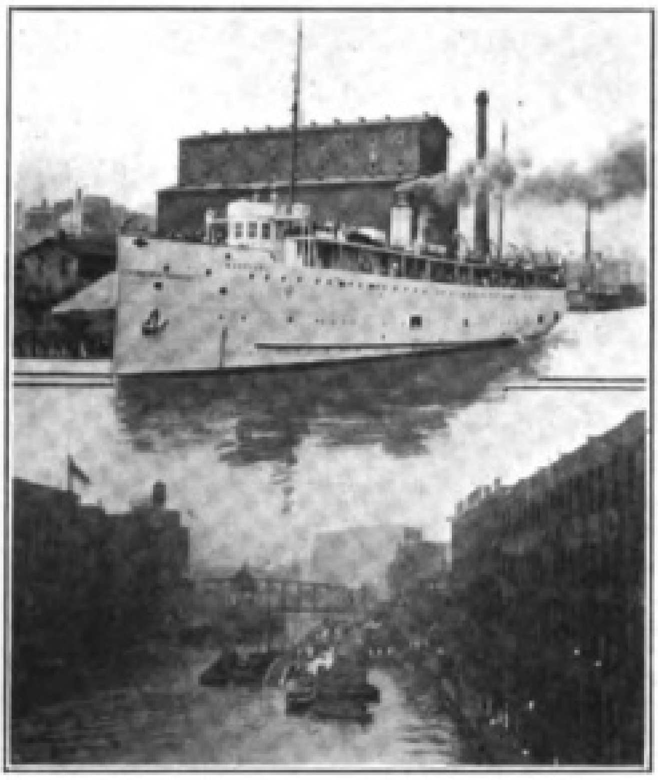
Marconi Operator Dibbell Who Aided in Rescue Work.

STANDING out prominently amid the awful scenes which marked the loss of lives following the capsizing ot the steamship Eastland at her dock in Chicago on July 24th, are the deeds of several men who unselfishly put thoughts of their own safety behind them and aided others to escape death. Among these is Marconi Operator C. M. Dibbell. From the minute the ill-starred craft began to list until she had careened over on her side, he was active in striving to avert the disaster and save lives, remaining on the vessel up to the time the Chicago authorities took charge of the rescue work and ordered him to go ashore.

The number of known dead is estimated at 839. One hundred and forty-two persons are missing.

The Eastland, which had been chartered to carry employees of the Western Electric Company on a picnic to Michigan City, Indiana, was crowded with passengers said to number approximately 2,000 persons as she lay in the Chicago River ready to steam away. Twenty minutes before she turned over she had a considerable list to port and Dibbell walked to the starboard side of the vessel and looked over the rail on to the dock. A watchman there shoutd that it would be advisable to gather the passengers on the starboard side. Dibbell then attempted to move the members of the crowd to port. Few seemed to realize the danger they were in, however, and showed no inclination to follow his directions.

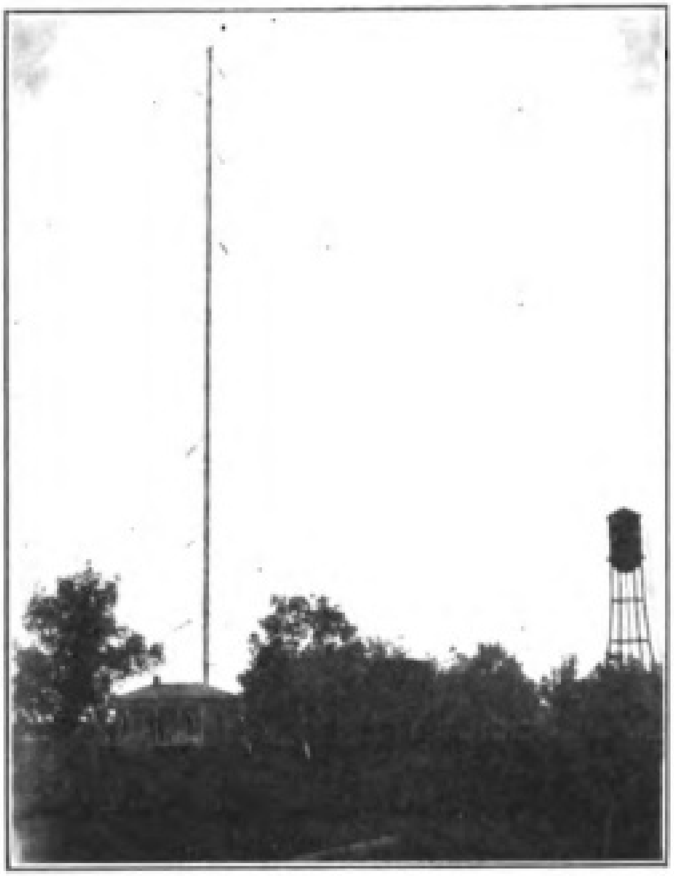
In the meantime the Eastland kept listing. Gradually her deck took on a sharp angle and the more cautious among the passengers took up positions near the starboard rail. They did not equal in numbers those who were on the port side, however, and suddenly the vessel careened sharply and turned over. Dibbel clung to the starboard rail and helped those who were not able to aid themselves to clamber on to the side of the vessel. Thus many of the survivors made their way with little difficulty to the tugs and launches which had come alongside the overturned craft.



Above, the Eastland as she appeared while engaged in passenger carrying service. Below, at her last resting place in the Chicago River

WIRELESS TO RESCUE IN GALVESTON TORNADO

IN a tornado which blew continuously for eighteen hours in southeastern Texas, leaving death and destruction in its path, Marconi wireless telegraphy and Marconi men showed their worth by keeping the residents of Galveston in touch with the rest of the world when all other means of communication had failed. This was accomplished in spite of the widespread havoc, including the destruction of the aerial mast at the Marconi station at Galveston.



The station at Port Arthur which opened up communication between Galveston and the outside world

The storm, according to newspaper reports, spent the greater part of its fury on Galveston, beginning on August 16. A great hole in the sea wall in that city was broken, and the water backed up from the bay, filling the streets to a depth of several feet and putting the power plants and the telephone and telegraph service out of commission. The Marconi station house was undamaged, but the water reached the apparatus and the mast was entirely swept away. Some of the mast anchors were also carried away and some of the ground plates were displaced.

E. C. Newton, superintendent of the Gulf Division of the Marconi Company, came from New Orleans to Galveston to take charge of the situation, arriving in the latter city on August 19. The army transport Buford was at that time communicating with Fort Sam Houston, which is about 250 miles away, with only indifferent success. No messages were handled at night. The steamship Concho being in port, the Marconi operators from the Galveston station reported for duty on board that vessel and communication was established on August 20 with the Marconi station at Port Arthur, Texas. Messages were handled for the steamship companies, the military authorities and the general public, this service being the only means of communication between Galveston and other places.

The mast and the guy anchors at the Marconi station at Port Arthur also gave way during the storm, messages being sent and received from the steamship Wild Duck.

MARCONI EXHIBIT AT GALVESTON

One of the most interesting among the educational exhibits at the Seventh Annual Cotton Carnival and Exposition, held at Galveston from July 22 to August 1, was the Marconi Wireless Telegraph Company of America's wireless exhibit. This consisted of a modern Marconi set, also an auxiliary set which was worked from batteries identical with those installed on ocean liners.

The exhibit was in charge of C. D. Campbell, local manager for the Marconi Company at Galveston and an expert operator was constantly on duty to explain how wireless messages are sent to ships at sea. Adjoining the Marconi exhibit the Southwestern Tel. and Tel. Co. demonstrated a modern switchboard and telephones, the Postal Telegraph Co. showed a telegraph set and a messenger call system, the three exhibits explaining to the public how communication is carried over land and out to sea.

Disptaches telling of the revolutionary troubles in Cap Haiten, Hayti, contain information to the effect that a wireless station has been erected on the roof of the American Legation in that city.

NEW SERVICE TO ALASKA

With the announced date of opening still several weeks off the new wireless telegraph circuit connecting the United States with Alaska was opened August 7, following the report that the Government cable had broken down and cut off the only means of communication between Pacific Coast cities and various Alaskan ports.

Over a span of 826 miles covered by the Marconi stations at Astoria, Ore., and Ketchikan and Juneau, in Alaska, commercial operation has been officially inaugurated and public business is being handled for Ketchikan, Juneau, Wrangle, Petersburg, Cordova, Sitka, Douglas and Treadwell.

A reduction in rates of 30 per cent. to 50 per cent. less than the government cable charges is announced. Wireless messages from New York to Ketchikan and Juneau will be accepted at 19 cents per word, as against 26 cents charged by the Government cable. The wireless rate from Seattle is to be 12 cents, whereas the cable charge is 19 cents a word. Similar reductions have been effected to all points.

The present wireless service is operating over what is understood to be but the first link in a chain of stations which will eventually cover all Alaska. With the ports of the southwest section provided for, the next Marconi station is to be erected on Prince William Sound. When it is determined where the terminus of the new Alaskan railroad is to be four 300-foot towers will rise at that point and a 25-kilowatt station will be established. Later plans cover an additional relay station at some point along the peninsula and, if business justifies it, various other stations in districts not yet connected with outside communication.

THE SHARE MARKET

NEW YORK, August 27.

At the close of yesterday's trading the outside market showed transactions amounting to 257,546 shares. Among the forty-four active industrials, American Marconi stood fifteenth in volume of trading and at the close today showed a fair advance over the prices quoted in the August issue. The high level since the war began was reached on August 9, several sales being reported at 5¼.

Trading in Canadians has been light and English issues have been practically at a standstill today. One broker reported no sales whatsoever and attributed the stagnation to the lowered exchange rate on the English pound sterling. Another broker could not account for the public's unresponsiveness to the excellent showing made in the parent Marconi Company's annual report, other than to attribute it to the natural unwillingness of investors to touch the industrial securities of countries engaged in war. Canadian Marconi's fractional advance is pointed to as a hopeful sign, however, and in combination with the American Company's renewed activity in a rising market, is expected to strengthen the English issues.

Bid and asked quotations today:

American, 4¼—4⅜; Canadian, 1⅜—1¾; English, common, 9½—14; English, preferred, 8½—13.

AID FOR STORM-BATTERED SCHOONER

The schooner Emma F. Angell was caught in a storm off Fire Island on August 4 and battered by the seas and gale until she was compelled to fly distress signals. The Seneca of the United States Coast Guard Service set out in search of the distressed craft, when word of her plight reached land, but could not locate her. In the meantime the steamship Bermudian, bound up the Atlantic coast, took a course near enough to the Angell to enable the captain of the former vessel to see the distress signals of the storm-racked craft.

A wireless message from the Bermudian flashed and the Seneca picked up the message. The revenue craft asked for the position of the Angell, and upon receiving it, steamed in search of her. When the Seneca found the Angell the pumps of the latter were just keeping her afloat. The schooner which carried a crew of nine, was towed safely to an anchorage inside Sandy Hook.

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION

It is not always an advantage to be alone in the sphere of your endeavor, as Adolph H. Rau realized when he established what has been described as the first amateur's wireless station in the vicinity of New York City. His opportunities for advancing in the art were limited, of course for he was veritably a Robinson Crusoe in the amateur's field of radio-telegraphy. These conditions didn't dampen his ardor as a wireless man, however. In fact, he kept right on persevering in his pursuit of knowledge of the art till he found himself in the Marconi service. Especial interest attaches to this epitomized version of his career in view of the fact that he was recently appointed engineer-in-charge of the Marconi trans-Pacific stations in Hawaii, with headquarters in Kahuku.

Rau was born in what is now the borough of Manhattan, New York City. He took up his residence in the Bay Ridge section of Brooklyn when he was a boy, however, attending public school in that borough. Even then his tastes ran to science and mechanics, the construction and operation of a station at his home, enabling him to ride his hobby without restraint. His set was crude enough, but he found considerable satisfaction in working it, even though there were no other amateurs' stations within the radius of his equipment to communicate with.

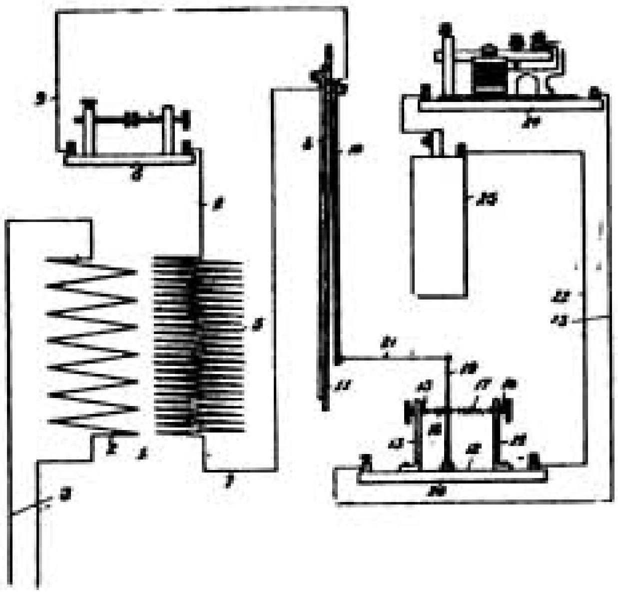
His thoughts were still of wireless when he entered the employ of the Brooklyn Edison Company. In the meantime he had made the acquaintance of William J. Brooker, an operator in the Marconi service, who further kindled his interest in the art. Rau saw that wireless held big opportunities and, deciding to embrace them, he joined the Marconi Wireless Telegraph Company of America.

The initial stage of his employment with the Marconi Company, which began about seven years ago, took him into the repair shop in New York. Afterwards he was chosen as one of the six men to go to England to acquire additional knowledge regarding the construction and operation of wireless apparatus. Upon his return to New York he was again detailed in the repair shops. About two years and a half ago he was sent to Bolinas, Cal., to aid in the construction of the trans-Pacific stations, later becoming engineer-in-charge

His new detail gives him the supervision over stations which have a more extensive aerial and mast line than any wireless plant in the world. The stations, which are able to communicate with both the United States and Japan, have been open for the transaction of commercial business between Hawaii and this country since last fall. Although the commercial service to Japan is not yet in operation, the plant was recently employed in an exchange of marconigrams between Edward J. Nally, of the Marconi Company and Jiro Tanaka, director general of the Ministry of Communications, in Tokio, Japan.

RECENT PATENTS

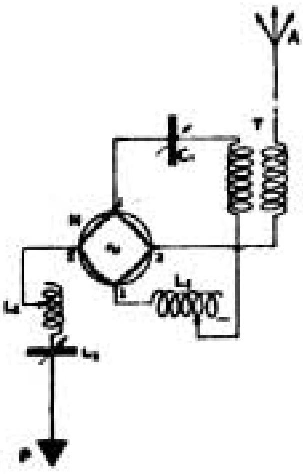
1,148,799. RECEIVER FOR WIRELESS TELEGRAPHY. Ross B. Avery, South Bend, Ind. Filed Apr. 5, 1913. Serial No. 759,205. (Cl. 250—8.)



1. A wireless wave detector including a signaling instrument, a local circuit therefor, means for opening and closing said local circuit, a step-up transformer having the primary thereof in circuit with a normally-energizing circuit, an electrostatic element in circuit with the secondary of the transformer, a spark-gap in the secondary circuit and means operated by said element to control the means for opening and closing of the local circuit.

2. A wireless wave detector including a signaling instrument, a local circuit therefor, a make and break device for said local circuit, a step-up transformer having the primary thereof in circuit with a normally energized circuit, an electrostatic device in circuit with the secondary of the transformer, a spark-gap control in circuit with the electrostatic device, and a mechanical connection between the electrostatic device and the make and break.

1,148,239. SYSTEM FOR DIRECT ENERGIZATION OF RADIOTELEGRAPHIC ANTENNÆ. Emile Girardeau and Joseph Bethenod, Paris, France. Filed June 17, 1913. Serial No. 774,187. (Cl. 250—17.)

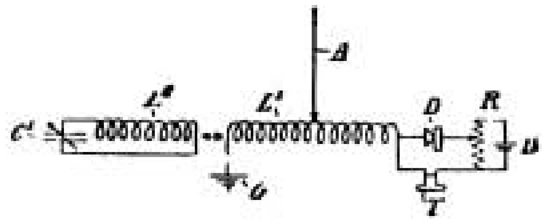


1. A system for direct energization of radio-telegraphic antennæ comprising in combination, an antenna, a high frequency polyphase alternator having the circuit carrying current of one phase in series with the antenna, a transformer having its secondary placed in series with the antenna adapted to be fed by the current of the other phase from said alternator, means for selecting the mutual induction between the primary and secondary of the transformer for allowing a uniform vigorous charging of the antenna by the two phases of the alternator, and adjustable inductances and capacities placed in the circuit of the other phase

2. An apparatus of the character described, comprising in combination an antenna, a two phase alternator having the circuit carrying current of one phase connected in series with said antenna, a transformer adapted to be fed by current of the other phase from said alternator and comprising a secondary placed in series with the antenna, and inductances and capacities in the circuits so adjusted as to equally distribute the energy of the alternator in the antenna.

1,144,969. RADIO TELEGRAPHY AND TELEPHONY RECEIVER. Greenleaf Whittier Pickard, Amesbury, Mass. Filed Apr. 17, 1914. Serial No. 832,592. (Cl. 250—8.)

1. In a system of communicating intelligence by electromagnetic waves which are not materially damped, the combination, at a receiving station, with means for causing such waves of a given frequency to set up oscillating currents of two frequencies differing from each other to such extent as to produce beats of audible frequency, of means for causing the energy of said beats to produce a sound of a pitch corresponding to the frequency of the beats.



2. In a system of communicating intelligence by electromagnetic waves which are not materially damped, the combination, at a receiving station, with means for causing such waves of a given frequency to set up oscillating currents of two frequencies differing from each to such extent as to produce beats of audible frequency, of means for rectifying the oscillations composing said beats, and a telephonic device operable by the rectified beat-pulses to produce a sound having a pitch corresponding to the beat-frequency.

3. In a system of communicating intelligence by electromagnetic waves which are not materially damped, the combination, at a receiving station, with two resonant circuits having such periods and coupling as to cause such waves of a given frequency to set up oscillating currents of two frequencies differing from each other to such extent as to produce beats of audible frequency; of a pick-up coil arranged to receive said beat-pulses; means for rectifying the oscillations composing said beats; and a telephonic device operable by the rectified beat-pulses to produce a sound having a pitch corresponding to the beat-frequency.

4. In a system of communicating intelligence by electromagnetic waves which are not materially damped, the combination, at a receiving station, with two resonant circuits having such periods and coupling as to cause such waves of a given frequency to set up oscillating currents of two frequencies differing from each other to such extent as to produce beats of audible frequency; of a pick-up coil arranged to receive said beat-pulses; of means for causing the energy of said beats to produce a sound having a pitch corresponding to the frequency of the beats.

5. In a system of communicating intelligence by electromagnetic waves which are not materially damped, the combination, at a receiving station, with means for causing such waves of a given frequency to set up oscillating currents of two frequencies differing from each other to such extent as to produce beats of audible frequency, of a pick-up coil arranged to receive said beat-pulses; and means unilaterally connected to said pick-up coil, and operable by the energy of said beat-pulses to produce a sound having a pitch corresponding with the frequency of the beats.

Annual Meeting of the English Marconi Company

A Dividend of Ten Per Cent Was Declared and the Inside Story of the Company's Early Struggles, Together With Some Light on Government Methods, Was Revealed by the Managing Director

IN the report of the Directors for the year ending December 31, 1915, Marconi's Wireless Telegraph Co., Ltd., shows a gross profit for the year amounting to £371,071 14s. 6d. ($1,785,819.54); the net profit carried to the balance sheet is entered as £232,716 8s. 11d. ($1,132,514.58), an increase of net profit over the preceding year of £110,392 ($537,222.66). Adding to the net profit £76,549 15s. 7d. ($372,529.60) brought forward from the previous year the balance is increased to £309,266 4s. 6d., the American equivalent of which is $1,505,044.18.

The basis of remuneration from the British Government for the use of the company's high-power stations since the beginning of the war not having been settled, this sum has not been considered in the report. Mention is made of compensation due for other services, both items to be entered to the credit of the account for the current year.

A dividend of 10 per cent. on the ordinary, or common, shares is provided for and about a third of a million dollars is carried forward.

It is stated that during the current year the company has been engaged to its full capacity in supplying the demands from various governments and orders in hand justify belief that the volume of business this year will exceed that of any previous year.

Regret is expressed over the deaths of General Albert Thys and Major Samuel Flood Page, actively associated with the company for fifteen years.

At the annual meeting of the company, held July 26 at the Hotel Metropole, London, the report was characterized by Mr. Marconi, the chairman, as satisfactory from every standpoint. Commenting on the figures he said to the stockholders: "I am satisfied that you will regard them in all the circumstances as highly satisfactory. They exclude, however, as you have been told in the report, any remuneration from the Government for the use of the company's high-power stations since the beginning of the war, and numerous other services which the company has rendered. As no basis for remuneration has yet been settled, we have thought it better to make no estimate of this amount, but have left the whole item to be dealt with in the accounts of the current year. All that I can be permitted to tell you is that the amount of work which has been done and the services rendered are considerable, and we have very little doubt that the remuneration which will be awarded the company in due course will be proportionate to the value of the services rendered and the work done.

"We all realize that we are passing through most exceptional and serious times, and everybody, I am sure, will appreciate that the outbreak of hostilities at the beginning of August of last year must have caused very considerable disturbance to a world-wide business such as ours. As was to be expected, wireless telegraph apparatus was promptly declared to be contraband of war, and for the time being, therefore, our work in many parts of the world practically came to a standstill. Some of our negotiations had to be completely abandoned and many others deferred. Our programme has consequently undergone complete dislocation, and it is quite impossible at the present moment to say to what extent, or in what way, it will be affected eventually. We can only bide our time and await events. On the other hand, our factory has been kept very fully occupied in carrying out the very important orders which we have received, both from home and abroad, in consequence of the war. The greater part of this work, however, will figure in the accounts of the present year.

Japanese-American Service Soon

"Very naturally, the businesses of our associated companies in some cases have also been very much disturbed. The American company have been deprived of the use of their Transatlantic station, owing to the stations on this side being required for other purposes. It is hoped, however, that in due course they will receive fair compensation. Their high-power stations, however, of San Francisco and Hawaii have been completed, and a telegraphic service is being conducted with very satisfactory results. We are daily awaiting information with regard to the opening of the service through to Japan. Arrangements have been made with the Japanese Government for the conduct of a commercial telegraph service, which they contemplated to inaugurate ere this."

Mr. Marconi then briefly described the activities of other affiliated companies. The Canadian Company, he said, was progressing, but the war had prevented important changes being executed. The Belgian Company now had its headquarters in Marconi House, London, but it had been impossible to make up its balance sheet. The French Company's dividend for 1914 was similar to that of 1913. The Marconi International Marine Communication Company had shown satisfactory progress, although suffering war losses. The Russian Company paid a dividend of 15 per cent., as compared with 6 per cent. the previous year. The Spanish Company's negotiations with its government appeared to be assured of an early and satisfactory termination.

Taking up a subject of great interest to the world at large, Mr. Marconi said: "With regard to the Imperial chain—you will remember that, in their report of last year, the directors informed you that they were permitted to make but slow progress with the erection of the six high-power stations for which they had contracted with his Majesty's Postmaster-General, and the company's interests were being seriously prejudiced thereby. Within a few days of our general meeting war was declared, and at the end of the year the Postmaster-General informed the company that, owing to the altered circumstances resulting from the war, the Government had decided not to proceed with the Imperial wireless chain. We were further informed that the governing factors in determining the Imperial scheme would be better met by means other than the construction of stations of the character and in the situations contemplated by the contract for the Imperial chain, and that the amounts disbursed by the company in respect of the contract would be refunded to us. Subsequently, in February, negotiations were entered into with his Majesty's Government for the erection of certain stations on conditions differing from those contained in the original scheme. Negotiations are proceeding on a basis which, if agreed to, would represent to the company a reasonable equivalent of the terms of the 1913 contract."

Eleven Hundred Employees in the War

Referring in a general way to improvements in the art of wireless telegraphy and applications for several new patents, the chairman added: "I should like to be able to give you a full account of the very important part which your company has played since the outbreak of war, but, unfortunately, this would not be permitted me, nor would it be in the interests of anybody for me to attempt to do so at the present time. All I am able to say is that the company has received more than one letter of appreciation from the Lords Commissioners of the Admiralty in respect of the work they, and members of their staff, have done. It will interest you to know that from our companies some 1,100 men are employed in the Forces on active service or on special duties, apart from the very large number at the head office and works who have been requested to remain at their posts, where by so doing they could render greater service to the country.

Couldn't Pay Salaries at First

"On behalf of my co-directors and myself I wish again to place on record our high appreciation of the services rendered to your company, and I might also say to the British nation and her Allies, by our managing director, Mr. Godfrey Isaacs. He has continued untiring in his work and activities, and it would be difficult to over-estimate the value of his services. As I said last time I had the honor of addressing you, I believe it to be an indisputable fact that it is very largely due to him that wireless telegraphy has become and has remained a great British industry—I might also say a great British enterprise—of perhaps greater value to the nation during war time than in peace.

"You will, perhaps, remember that I said last year: 'The value of wireless telegraphy may one day be put to a great practical and critical test; then, perhaps, there will be a true appreciation of the greatness of the work.' I have full confidence that when the war is over, and the facts can be made public, the appreciation to which I referred will not be lacking."

Managing Director Godfrey C. Isaacs, in seconding the chairman's motion that the report be adopted, said he proposed to take advantage of the opportunity to tell the stockholders "something about the company and the competition which it has experienced—circumstances which at no other period has it ever been possible for me to speak about. I want to remind you that I joined the company," he said, "at Mr. Marconi's personal invitation, on January 25, 1910. At that time the company had an issued capital of £547,299. It had practically no cash resources whatsoever, and it had no credit. It had been extremely difficult to find money in this country for wireless telegraphy.

"Mr. Marconi had personally made great efforts to find the necessary money to conduct the business of the company, and he only succeeded by going to Italy and obtaining there a substantial subscription to the Preference issue which was at that time made. But for that fact—but for his being able to obtain that money in Italy—there is little doubt, I think, that the Marconi Company would have then come to an end. When I joined in 1910 Mr. Marconi personally lent to the company the sum of £12,000, and he then proceeded to Canada upon the company's business. Within a very few weeks of his absence I had to draw a cheque on my own banking account to pay the salaries which were due on the Saturday morning for the preceding month. To-day, ladies and gentlemen, we have a capital issued of somewhere approaching one and a half million sterling, and I think you have but to refer to the balance-sheet to be satisfied that we are in a very sound financial position and that our balance-sheet is a very sound balance-sheet, and that our assets are very sound assets.

"We have to-day nearly one million sterling to the credit of our general reserve account, and we have very large assets in the shape of cash, realisable first-class securities, freehold property, leasehold property (and in speaking of leasehold property I would like to tell you that, although it appears in the balance-sheet at cost, less depreciation, we could dispose of it to-day—and we have had more than one offer for it—at a very handsome profit); and we have, in addition, a large number of shares in our associated companies, most of which have to-day a very substantial value, and all of which we hope in the future will have a very big value.

Competition Created by Germany

"Now, ladies and gentlemen, I want to tell you something of the reasons why the business did not prosper in its first years. I think it is advisable—I think it is desirable—that you should have an insight into the history of this company, which heretofore has of necessity, for reasons which you will all understand, been a closed book. Very soon after Mr.

Marconi provided the company with this very valuable invention the methods which obtained abroad were adopted with regard to this science, and the very valuable patents which were then this company's property, and the property of this company alone, were imitated in Germany, and, with the great ability of the German people and their great foresight, a big German company was created. This German company was created by the German Government. It had for its direction the most, or some of the most, eminent and able commercial men in Germany—men who were then the directors of some of the biggest commercial industries of that country. It had, further, the great advantage of the financial aid of some of the principal German banks, and it had, finally, a very large subsidy from the German Government.

Foreign Negotiations Hampered

"Now, ladies and gentlemen, that was the opposition company against which the Marconi Company for many, many years up to the time when I joined it, and subsequently, had to contend. Mr. Marconi personally, with the aid of his managers, had for many years succeeded, and in my opinion marvelously, in maintaining something of the position of the English company, notwithstanding this very powerful opposition of the German company; and I think that it was very largely due to the magnificent support given to the company—and, perhaps, it would be more correct to say to Mr. Marconi personally—by the Italian Government, notwithstanding the fact that they were the ally of the German company's Government, that the Marconi Wireless Telegraph Company was able to continue in existence. The German company, no doubt, under the direction to a large extent of the German Government, proceeded to create powerful agencies in pretty well every country in the world, and they made great headway.

"With the exception of Italy, France, and this country, they had, I think, obtained the preponderating position in this industry in practically every part of the world, and that was the position which I found in 1910. Wherever one went, whatever negotiations one had with a foreign Government, one was always in competition with the powerful German agency; but that was not all.

"We had not only to contend with the German agents, but we had also to contend with the German Ambassadors, and we eventualy found that our position was so impossible under such conditions that I returned from a journey abroad and made an immediate appeal to Sir Edward Grey, and placed these facts before him; and from that time forward I obtained the support of the British Ministers abroad in our different negotiations with foreign Governments, and from that time also we commenced to make substantial progress until we reached undoubtedly the preponderating position in the industry throughout the world.

"It is easy to understand that to a company like this German company, which had the support of the German Government and conducted the greater part of its business under the direction of the German Government—always with the aim of obtaining the contracts or concessions for the construction of wireless telegraph stations in foreign countries, having a view to the importance which they one day would play, and with the prospect where a German station was built that German hands would work that station—it mattered little or nothing to the German company, with the German Government behind it, at what price or in what condition it entered into contracts for the construction of those stations. In those circumstances I think you will agree that it was not easy for the Marconi Company to maintain its own."

Initial Offer on Imperial Chain

Mr. Isaacs explained that within three months after he joined the company it was evident to all that the future of the company lay in the commercial wireless telegraph service round the world, and adopted the policy of creating such a commercial telegraph service. "One of our first acts in April, 1910," he said, "was to apply to the British Government for the right to erect high-power stations in all British possessions, stating at the time that we had determined to create this telegraph service—that we had determined to create that service on British soil, if possible, but that we had made up our minds that the stations were to be built and the service created.

"Unfortunately the Government did not see its way to grant us that right, although we had asked for no money. We had merely proposed that we should, at our own expense, build these stations and work a commercial service in peace time and, in case of war, hand over the whole of the stations to the Government for Government purposes. It is regrettable that we were not enabled in 1910, when we made that proposal, to proceed with that programme. Out of it was born the Imperial chain. As you will remember, when that was mentioned in Parliament it received most hostile criticism, on the ground that it was alleged that the company was receiving terms far too favorable to it. Immediately the matter was mentioned the German Government resolved to build a chain of wireless stations in all German colonies. The matter was not discussed in Parliament. The stations were immediately proceeded with, and they were built.

Ten Million Dollars for German Chain

"I am informed, and I think I am correctly informed, that the price which the German Government paid for each of those stations was three times the price which we had asked of the British Government. Besides that price, which provided for a very handsome profit, there was a subsidy which represented in amount far more than we ever contemplated we should get in any year from the royalty which we were to receive upon the Imperial stations, and that subsidy was to be paid, not for eighteen years, but for twenty-five years. Those stations, ladies and gentlemen, were built, and, I believe, cost the German Government £2,000,000 sterling. In the light of what has subsequently happened you will probably say that it was a very bad investment, but you would be mistaken.

"You will remember that this country declared war on Germany, at twelve o'clock midnight on August 4th last. At five o'clock in the afternoon of August 4th last Germany sent out a message to all its wireless stations which passed that message on from one to another and each station sent it out to sea covering a radius of something like 2,000 miles or more, to this effect: 'War declared upon England; make as quickly as you can for a neutral port." By that message, which occupied but a few minutes, Germany contrived to save the greater part of its mercantile marine. If it had but saved one of its big ships, the Vaterland, or any one of that class, it would have paid for the whole cost of its wireless stations. We all know that it did a great deal more than that, and that it did a great deal more by sending this message to its mercantile marine, but I do not think I am permitted to go further or to tell you any more than what I have told you already with regard to the saving of the mercantile marine."

Company's Net Profits Total Close to Five Millions

After paying a stirring tribute to the company's officers, his co-workers, the managing director expressed the pleasure all must feel that Mr. Marconi was able to return to London for a few days and be there to preside over the meeting.

"In his work in Italy as an officer supervising all matters electrical for the army and navy," said Mr. Isaacs, "I am sorry to say that he has been nearer to Austrian and German shells than I like to think about; but I am very glad, at all events, that we see him safely home none the worse for his experiences. I also want to tell you that although he has been employed in the capacity which I have just named for his own country, he has nevertheless been able to give to us during all that time all the direction and all the assistance, and has been able to watch over this company's affairs and to work in the interests of this company just the same as he has always done."

In concluding, he added: "There is one thing more I want to mention before I sit down—I ought to have told you sooner—that the five balance-sheets of this company published since 1910 show a net profit of close upon one million sterling, and I think, in face of the difficult conditions under which we have had to work, that is not a bad result."

The retiring directors, Henry S. Saunders and Samuel Goeghegan, were unanimously re-elected as the meeting adjourned.

Marconi Men

The Gossip of the Divisions

Eastern Division

F. Webb, a graduate of the Marconi School of Instruction, has been assigned to the El Sol as assistant operator.

F. Rosenweig is now attached to the Brabant, a one-man ship.

A. C. Berg and George Abbott are attached to the Comanche as first and second operators, respectively.

K. M. Hance is now junior on the North Star.

Henry Markoe is second operator on the Zulia.

Joseph Wombacher is on the Pleiades.

J. E. Jones, formerly of the Philadelphia of the American Line, has been detailed to the San Francisco of the Isthmian Line which runs to South American ports.

Henry Horneij, who was absent from duty because of illness, has recovered and is now senior on the Satsuma.

J. F. Forsyth, formerly of the Boston division, and W. A. McDonald have been assigned as senior and junior, respectively, to the City of Macon, which is expected to make a trip to foreign ports.

Leon Freedom was recently assigned at Savannah to the City of St. Louis as junior.

S. Rosenfeld is no longer in the service.

T. R. Bunting has been reengaged and is now second operator on the Princess Anne. M. Beckerman is first.

W. C. Kay, formerly of the Carolina, has been promoted and is now second on the New York of the American Line. S. R. Kay has been assigned to his old post on the Carolina.

L. Martinez has resigned from the service.

T. A. Tierney and H. L. Goff are attached to the Nickerie as senior and junior, respectively. The latter is a new man in the service.

O. M. Shaw now fills the post vacated on the Philadelphia by J. E. Jones' transfer to the San Francisco.

W. C. Graff and C. Preiss are on the Comus. Graff is senior.

A. E. Ericson has been detailed to the S. Y. Remlick, a newly-equipped vessel.

F. Hues and R. H. Fleming were transferred from the San Juan to the City of Memphis when the former vessel laid up at New York.

J. Davenport has replaced J. Rodenbach on the Larimer. Rodenbach is absent because of illness.

H. A. Carder and Martin Derx have been assigned to the El Rio as senior and junior, respectively. Derk is from the Marconi School of Instruction.

G. P. Hamilton is attached to the Apache as senior.

William Kaiser was transferred to the El Cid as senior upon the lay-up of the Rio Grande, to which he was previously attached.

Samuel Schneider and C. C. Langevin have been placed on the Brazos as senior and junior. The Brazos is one of the first of the ships to be equipped with the new 500-cycle quenched gap set.

H. E. Orben has been transferred to the Havana where he is senior.

H. M. Ash is junior on the Maracaibo.

William Sirkin, late of the Nickerie, is now attached to the Mohawk as junior.

J. A. Bossen and B. N. Lazarus were detailed to the Sabine at first and second, respectively, when she went into commission recently.

M. Myers, a New Orleans man, relieved W. T. Weatherbee on the Caloria at that city.

L. L. Beard has been relieved at Port Arthur by J. McW. Stone.

J. D. Haig of the Philadelphia office relieved W. Neumann on the Texas.

C. F. Schafer has been replaced on the Platuria by H. Koehler.

E. Barnwell has relieved W. Travers on the Santiago.

B. T. Elkins is now attached to the W. B. Keene.

R. T. Willey was transferred to the El Sud upon the lay-up of his old ship, the El Alba.

E. N. Pickerill, who has been selected as operator for the trans-Pacific service, was relieved at San Francisco. C. T. Nichols took his place on the Kroonland.

D. Duffield has been transferred to the St. Paul of the American Line, where he is second.

W. Tylar is now second on the City of Savannah. Tylar recently returned from a trip to England on a British steamer.

P. W. Harrison, a Pacific coast man, has relieved D. Brand on the El Valle.

S. J. Morgan is now attached to the El Occidente.

Earl Thornton has relieved G. F. Evans on the Gulfstream.

C. L. Fagan and J. D. Woltal have been detailed to the Lampasas as senior and junior, respectively.

E. Bambourakis is now senior on the Carolina.

A. C. Brinsmade is doing temporary duty at Sea Gate.

F. C. Justice and T. A. Johnson have replaced H. E. Ingalls and F. D. Pitts on the Bunker Hill.

Southern Division

J. F. Larrimore of the Suwannee recently made a trip on the Howard in place of L. E. Bell, while the latter was absent from duty because of illness.

W. Osterlich was detailed on the Suwannee as junior, vice Operator Larrimore.

L. W. Sinclair, of the Jacksonville station, recently spent a short vacation at Cape May, N. J.

M. W. Mervine, who recently made a trip on the Quernmore to Liverpool, returned to Baltimore on the Swanmore.

H. McKiernan has been transferred from the Dorchester to the Vigilancia, at Savannah, Ga., vice Operator Warner, who is now on the Somerset. McKiernan's place on the Dorchester was filled by P. H. Singewald.

H. W. Shallcross, of the Cape May station, who has been on leave of absence, has returned to duty.

H. Graf, assistant operator of the Baltimore station, recently spent two weeks at Cape May, N. J.

The English Marconi ½ k. w. cargo set on the Charles E. Harwood, was recently replaced with a ½ k. w., 500 cycle panel set at Baltimore. The change in equipments was made by E. M. Murray and J. F. Wyble. The Harwood is now under American registry.

J. D. Haig of the Tuscan, has been transferred to the Texas at Philadelphia, relieving Operator W. Neumann.

H. Koehler was recently transferred from the Lexington to the Platuria at Philadelphia.

D. Dudley, who has been on a short leave of absence, has returned to the Cretan.

William Fithian, who has resigned from the Marconi service, has been relieved on the Toledo by P. Hickman.

J. Casebeer has been transferred from the Olivette to the Persian as senior operator, relieving Operator Batchelder, who is on leave of absence.

E. Thornton relieved F. Evans on the Gulfstream, while the latter was on leave of absence.

The friends and fellow workers of A. Campbell of the Cape May station wish to express their sympathy for him because of the death of his mother.

Gulf Division

The second of the new two kilowatt, 500-cycle panel sets will be installed by Construction Man Grubman on the steamer Ponce.

J. W. B. Foley, chief operator on the Brunswick, has been detailed as second operator at the Port Arthur station, relieving Operator Doane who resigned.

J. E. Broussard, inspector of the Gulf Division, has been transferred from the Excelsior to the Chalmette. Lee Norton of the Olivette will be second operator on the Chalmette.

J. A. Hybarger has been assigned to the Brunswick as chief operator. William Uhalt has been appointed second operator.

M. Myers has been transferred from the Brunswick to the Coloria, relieving Operator Weathersbee who has resigned.

Superintendent Newton has just returned from a trip of inspection to Galveston, Port Arthur, Mobile and Fort Morgan.

J. E. Hayes was sent recently to Baton Rouge to repair the transformer on the Coloria.

L. Asadorian recently made a trip on

the Excelsior as second operator.

John Casebeer has been transferred from the Olivette to the Southern Division.

Great Lakes Divison

H. P. Roberts, relief operator on the steamers City of Erie and State of Ohio, has been transferred to the City of Detroit III as operator in charge.

C. J. Hiller has returned from the Atlantic Coast. He has been assigned as relief operator on the steamers City of Erie and State of Ohio.

C. G. Fuss of the Lakeland, has resigned to enter college.

Operator A. F. Moranty, Jr., of the Lakewood, has been assigned as second operator at the Mackinac Island station.

C. W. Thomas of the Lakeport has been assigned to the City of Cleveland III, as second operator.

A. J. Main, second operator at the Detroit station, has been transferred to Cleveland. F G. Siegel, assistant chief operator, has gone to Detroit for a brief visit.

E. W. Schulthise, second operator at the Duluth station, is on the U. S. S. Gopher for a fifteen days' cruise.

A. J. Thierriault, operator in charge of the Mackinac Island station, has resigned to accept a position with the Canadian Company. D. A. Nichols, second operator, has been placed in charge.

E. Reed, second operator on the steamer City of Detroit III, has resigned. Operator E. Smith took his place.

J. T. Joynes, operator in charge at Frankfort, Mich., is on a leave of absence. Charles Slipfield is acting as relief operator.

W. L. Birren has been assigned to the Virginia.

Operator L. Hansen has been assigned to the Minnesota, relieving Operator M. F. Kliepera.

Pacific Coast Division

E. M. Sutton recently relieved C. H. Canfield as operator of Barge No. 91. Canfield took a vacation for one trip.

E. Diamond acted as operator in charge of the Coronado for one trip while that vessel replaced the Centralia on the Eureka run. He has now returned to the Centralia.

Richard Johnstone, who has been operator in charge of the Wilhelmina for a year and eight months, has been temporarily transferred to the Congress, as assistant. This is a record for the Wilhelmina. Johnstone has been highly commended for his work and good conduct during that time.

H. R. Davis joined the China as assistant operator on July 22nd. Operator Carmine is in charge.

J. W. Russell joined the Coronado on July 14th after thirty days' leave of absence, which he spent in his home in the North.

E. D. Perry, of our Honolulu city office trans-Pacific Department, rejoined the marine service on July 17th at Honolulu, relieving W. R. Lindsay of the Colon bound for Australia.

J. M. Chapple and M. W. Michael are now acting as first and assistant of the City of Puebla.

Lee Fassett has been assigned to the Francis Hanify.

George Shecklen, of the Minnesotan was recently transferred to the Georgian of the Pacific Coast Division, at New York.

J. W. Miller has joined the George W. Elder, as operator in charge.

J. H. Southard and D. W. Kennedy have been assigned to the Great Northern as first and assistant, respectively.

H. C. Hax recently joined the Honolula, as operator in charge, for the trip from San Francisco to New York. He plans to leave the service on arrival at the latter port.

H. W. Faig has been assigned as assistant operator of the F. A. Kilburn.

W. R. Lindsay, who has been at Honolulu for three weeks, joined the Lurline on August 3, as assistant operator for the trip to San Francisco.

J. L. Slater has relieved assistant operator, E. L. Reimers on the Mulinoman.

F. A. Lafferty of the Rose City, has been assigned to the Matsonia as assistant operator.

W. G. Anderson, a former member of the Marconi forces, recently joined the staff as assistant operator of the Manoa, at Honolulu, relieving E. J. Des Rosier.

J. F. Woods has been assigned as assistant operator of the Northern Pacific. G. W. Kelley relieved F. W. Harper as operator in charge.

J. W. Anderson has been assigned as assistant on the Peru.

H. W. Kelley was recently assigned as assistant on the Pennsylvania.

O. Treadway and K. D. Noble are acting as first and assistant, respectively on the Queen

G. F. Roberts has joined the Roanoke as operator in charge and purser, relieving J. A. Wilson. Wilson will rejoin his vessel after a short vacation in the mountains.

H. W. Underwood was recently assigned as assistant on the San Jose.

A. P. Stone and C. E. Goodwin are now first and assistant aboard the Santa Clara of the North Pacific Steamship Company.

G. B. Ferguson and C. E. Capwell are acting as first and assistant aboard the Umatilla.

F. G. Strauss, of trans-Pacific fame, joined the Chapman, as wireless operator and purser.

I. Farwell was recently detailed as assistant operator of the Willamette.

S. Cissenfeld is acting operator in charge on the Wilhelmina.

W. A. Collins has been assigned as assistant of the Yosemite.

C. M. Jackson and F. L. Comins acted as operator in charge and assistant, respectively on the Aroline, for the trip ending August 5th.

After a week's vacation T. L. Atwood has returned to his position in charge of the Aroline, with C. M. Jackson, as assistant.

The Kroonland has left San Francisco for New York, with A. H. Schweider and C. T. Nichols as first and assistant, respectively.

E. N. Pickerill, formerly in charge of the Kroonland, has been transferred to our trans-Pacific staff stationed on the Hawaiian Islands.

B. H. Linden was recently assigned as assistant operator of the Rose City.

Seattle Staff Changes

J. J. Ritter has been transferred from the Paraiso to the tug Onenta. J. N. MacGowan, who was detailed on the former craft, has been transferred to the Pavloff.

J. A. Marriott has been transferred from the Seattle station to the Congress.

H. J. Scott is no longer on the tug Oneonta.

F. M. Ryan, who was on the Umatilla, has been detailed to the Alliance.

C. E. Capwell has been transferred from the City of Seattle to the Umatilla.

A. P. Neilson, who was on the Alliance, has been assigned to the City of Seattle.

W. B. Wilson recently relieved William Christensen, while the latter was on leave of absence from the Seattle station.

A. G. Simpson was recently transferred from the Windber to the Alliance.

B. C. Springer, who was on the Humboldt, has been transferred to the Windber.

C. Pemberton, of the Marconi School has been assigned to the Humboldt.

A. Lang, who was on the Puebla, has been transferred to the Admiral Evans. J. M. Chappel, who was detailed on the latter craft, has been assigned to the City of Puebla.

R. W. Wrenn Dies

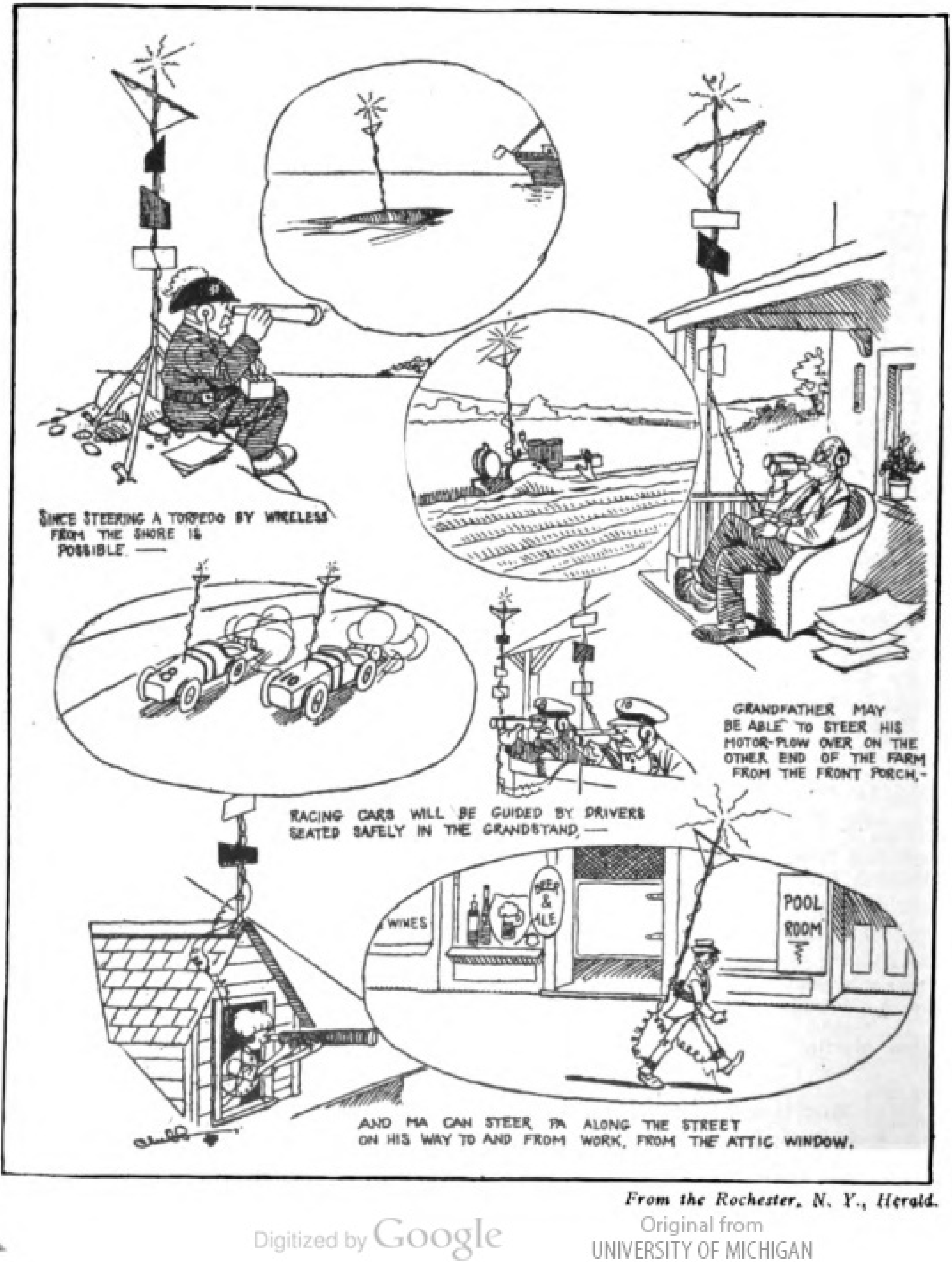
Word was received in New York on August 20 that R. W. Wrenn, an operator in the Marconi service, who had been detailed on the Old Dominion Liner Madison since 1913, had died from typhoid fever in a hospital in Norfolk, Va. He entered the wireless service in 1908.

OPERATOR WALKED 200 MILES

F. M. Williams, wireless operator of the United States gunboat Machias, stationed at Tampico, arrived in San Antonio, Texas, recently after having walked 200 miles through northern Mexico. Williams started by train from Tampico for Laredo on leave, but was forced to proceed on foot when the blowing up of a Carranza troop train south of Monterey destroyed the track. He said that hundreds of Mexicans are eking out a bare existence on wild berries. The only meat he was able to obtain on his entire trip was a small piece of goat's flesh.

WHAT MAY BE EXPECTED

A CARTOONIST'S IDEA OF WIRELESS IN DAYS TO COME



From the Rochester, N. Y., Herald.

RADIO RAVINGS

Conducted by D. Phectiff Inslater

Well, how'd the vacation go? . . .
So did I

Speaking of vacations—

Like many an operator, Hank's one aim in life was "to see Paris and die."

But not by the starvation route, he adds, writing in from the Berkshires where food is had a-plenty and transportation's cheap.

The sad sea waves of summer

Editorial Blurb

All wireless war despatches will hereafter be written by our special correspondent, who leaves tomorrow for the front, having had his desk moved from the editorial room to the composing room to save delay in transmission. Some unusually graphic descriptions of the great conflict now raging abroad may be expected. Our correspondent is specially qualified for this work, having read a life of Napoleon and become the possessor of a brand new encyclopaedia and a rapid-fire typewriter.

Which is being true to Life, eh?

But it's better to be outspoken—

Which reminds me—

In the Marconi Static Room, where all the heroes and heroes-to-be congregate when on shore leave, the Garrulous One maintained that in an argument the day before he stood by his sentiments and was outspoken—

"Who outspoke you?" murmured someone in the corner.

Frank S., who pushes the pen—or do you use a typewriter, Frank?—for a living in Philadelphia (which in itself is strange) says I am not serious. Frank is. Here, listen to this:

War

The searchlight's sword thrust, blinding bright,
Stabs thro' the starry summer night.
Shrapnel and shell tear shrieking by
Where late the white doves* circled high;
Gone from the once-fair village street
The lover's laugh, the childish feet,
Where smiled Peace, Life and Hope before
Red Madness raves.
—And this is War.

* Temptation to be funny resisted here.

Peace-loving readers of this country will now rise up and tender a hearty vote of thanks to Columbus for having discovered America.

Gee, it's depressing, ain't it? Much rather confine war thoughts to neighbor Apgar's little feat of ledgerdemain with Sayville holding the bag.

This country's all right; any way you look at it. Never mind the patriotic effusion; I know! Better things may be in store for us but, as the little boy said to the clergyman: "Don't tell me about Heaven. I want to be surprised."

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

F. C., Yonkers, N. Y., inquires:

Ques.—(1) Kindly explain the action of the graphite resistance rod connected in shunt to a variable condenser in a receiving set.

Ans.—(1) A proper reply to this query would depend upon the type of circuit in which it is employed. If you refer to the graphite resistance rod which is ordinarily connected in shunt to the condenser in the grid circuit of a vacuum valve detector, it is employed to prevent the accumulation of high potentials on the plates of the condenser which otherwise would "paralyze" the detector. Used in other types of circuits this rod would have a different effect, but we should require that you state a definite problem in order to answer properly.

Ques.—(2) Can you give me a formula for calculating the high frequency resistance of an inductance wound with No. 32 copper wire at a frequency of 500,000? The D. C. resistance of the coil is 50 ohms. What is the high frequency resistance of the same coil at a frequency of 40,000 cycles?

Ans.—(2) The formula for the high frequency resistance of a straight wire is as follows:

$$R' = \frac{X\,W}{2\,Y} \quad \ldots\ldots\ldots (1)$$

Where

$$X = 2\rho\,\frac{\sqrt{\pi\omega\mu}}{\sigma}$$

$W = \text{ber}\,x\ \text{bei}'\,x - \text{bei}\,x\ \text{ber}'\,x$

$Y = (\text{ber}'\,x)^2 + (\text{bei}'\,x)^2$

and

ρ = radius of wire in centimeters
$\omega = 2\pi n$ where n = frequency
μ = permeability = 1 for Cu
σ = specific resistance = 1721 for Cu
R = direct current resistance

and

$$\text{ber}\,x = 1 - \frac{X^4}{2^2 4^2} + \frac{X^8}{2^2 4^2 6^2 8^2}$$

$$\text{bei}\,x = \frac{X^2}{2^2} - \frac{X^6}{2^2 4^2 6^2} + \frac{X^{10}}{2^2 4^2 6^2 8^2 10^2}$$

and ber' and bei' are their differential coefficients with respect to X. (Lord Kelvin.)

In the Bureau of Standards publication we find W and Y given, the argument X.

$$X = 2\sqrt{\frac{\pi\omega\mu}{\sigma}} = \pi d\sqrt{\frac{2n}{1721}}$$

$= \frac{\pi d}{29.3}\sqrt{n}$, since for No. 32 wire d = .0202

$$= \frac{\pi \times 0.0202}{29.3}\sqrt{n} = 0.00186\sqrt{n}$$

(a) For frequency of 500,000 cycles per second:

$$X_a = 0.00186\sqrt{n} = 0.00186\sqrt{5 \times 10^5} = 1.32$$

$$\frac{X_a W_a}{2\,Y_a} = 1.01570$$

Ans.—(a) $R' = 50 \times 1.01570 = 50.785$ ohms.

(b) For frequency of 40,000 cycles per second;

$$X_b = 0.00186\sqrt{n} = 0.00186\sqrt{4 \times 10^4} = 0.372$$

$$\frac{X_b W_b}{2\,Y_b} = 1.000105$$

Ans.—(b) $R' = 50 \times 1.000105 = 50.00525$ ohms.

However, the unsymmetrical distribution of current in the section of the conductor, the capacity effect, and the eddy current loss—especially at the ends of the coil—will cause the resistance of the wire to be much greater when wound in the form of a coil. This increase can only be found accurately when the shape of the coil is given together with its operating conditions, and then only from empirical charts drawn up from experimental measurements with previously measured coils.

Ques.—(3) Give the capacity and inductance for a wave-meter to cover a range from 500 to 9,500 meters.

Ans.—(3) A circuit having this range of wave-lengths is described in the February, 1915, issue of THE WIRELESS AGE in the article "How to Conduct a Radio Club." The winding described in that article was intended to be used as the secondary winding of a receiving transformer, but will act efficiently as a wave-meter when used in connection with a crystalline or vacuum valve detector. The resistance of the coil would be too high for use in connection with a current indicating instrument such as a milliameter or a small wave-meter.

Ques.—(4) If a wireless telegraph station was transmitting on a wave-length of 25,000 meters and radiation took place, would it be possible to detect these waves without a detector? Such a wave would have a frequency of 12,000 meters, which is well within the limits of audibility.

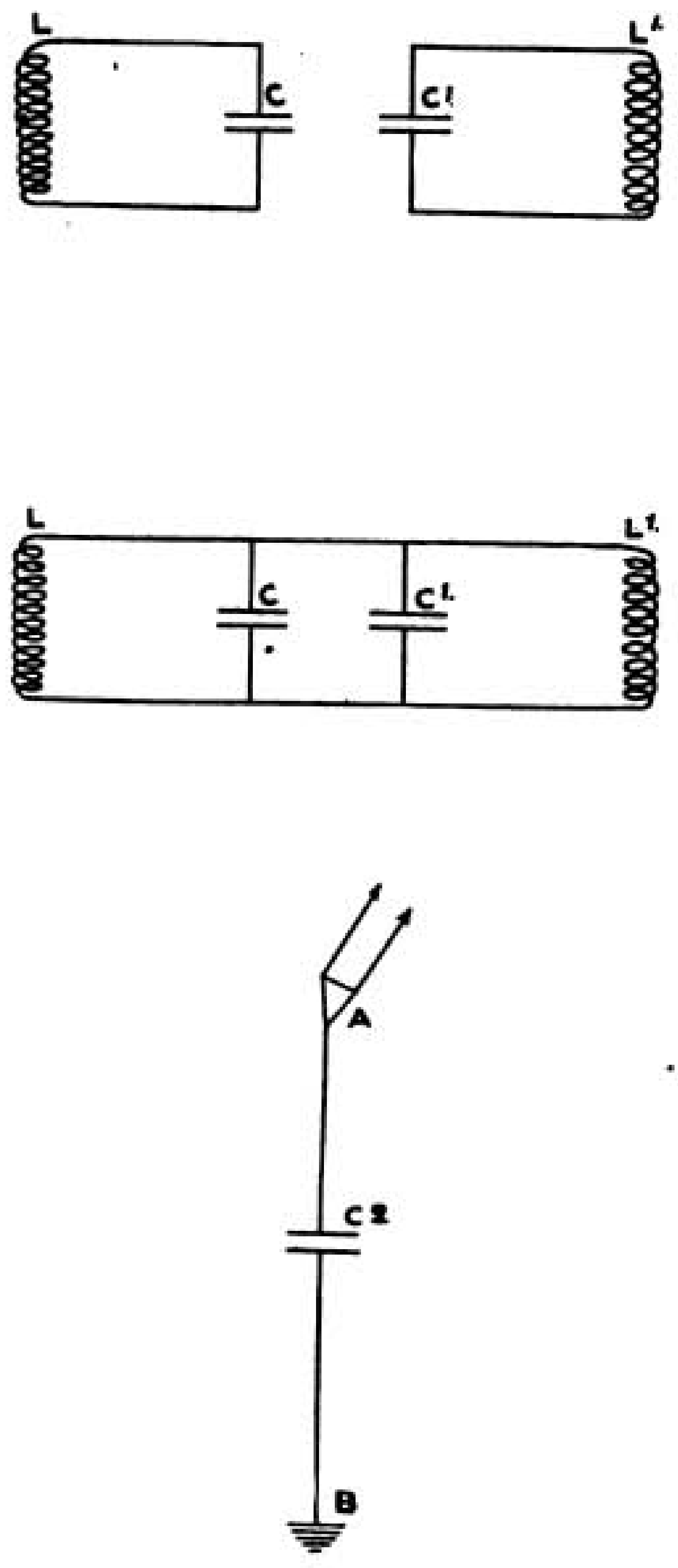
Ans.—(4) While a frequency of 12,000 cycles is well within the limits of audibility from the standpoint of sound vibrations, it is not so in the case of the ordinary magneto telephone. Numerous tests have revealed that the ordinary telephone gives little response even at frequencies as low as 5,000 or 6,000 cycles. It is quite possible that radiation at a frequency of 12,000 cycles per second could be heard if the receiving aerial and head telephones were a few miles distant from the transmitting station, but it is hardly possible that the signals would be received at any great distance. Suppose, for example, that the telephones were connected in series with the aerial. The presence of the core in the telephone winding would have a severe damping effect on the oscillations in the antenna circuit and would prevent the upbuilding of energy which might otherwise ensue. As far as we are aware, transmission has not been attempted at these frequencies although the Marconi Company has done successful trans-Atlantic work at a frequency of 19,000 cycles.

* * *

E. K. Lawrence, Kas.:

Ans.—(1) The confusion existing in your mind in reference to the shortening of the emitted wave from a transmitting set by use of a condenser in shunt to the secondary winding may be explained in the following manner: Let us, for example, consider two closed oscillatory circuits, as per Fig. 1-a, namely L C and L′ C′. These two circuits are taken as being identical, having the same values of capacity and inductance in each and also the same wave-length. Say circuit L C was adjusted to a wave-length of 300 meters, and likewise circuit L′ C′. Then let the two circuits be connected in parallel, as per Fig. 1-b. If the circuit shown in Fig. 1-b is set into oscillation it will have identically the same wave-length as either circuit L C or L′ C′, shown in Fig. 1-a. The explanation is simple. In the case of Fig. 1-b we have simply doubled the value of capacity and halved the value of inductance; therefore the time period or the oscillation constant of the circuit remains unchanged, as compared to either circuit in Fig. 1-a.

Keeping the foregoing in mind it will be readily understood how the wave-length of an antenna system can be reduced by shunt condensers. The method employed by the Marconi Company is as follows: Referring to Fig. 1-c, the antenna system is represented at ac and an adjustable high potential condenser at C2. The condenser, C2, is altered in capacity until the wave-length of the antenna system is 300 meters. The secondary winding of the transmitting oscillation transformer, L′, is then shunted by a high potential condenser, C3, until this circuit also has a period of 300 meters. The circuits shown in Fig. 1-c and Fig. 1-d are then connected up as per Fig. 1-e, with the result that we have a circuit very similar to that shown in Fig. 1-b and the emitted wave from the antenna system is 300 meters. In other words, two oscillatory circuits having wave-lengths of 300 meters are connected in parallel and the resultant wave-



Figs. 1a (top), 1b (center) and 1c (bottom)

length is 300 meters. This will explain some of the phenomena referred to in your second query. It will be understood from the foregoing explanation in reference to transmitting apparatus that with certain receiving aerial systems in which the primary winding of the receiving oscillation transformer is shunted by a variable condenser the wave-length of the antenna system at certain values of capacity at the condenser as a whole will not be changed at all. The effective capacity in shunt to the primary winding will simply make the antenna system act as two circuits of identical wave-length connected in paralled and the resultant wave-length of course will be the same as that of a single circuit. It has been definitely shown by Dr. Austin and likewise reported in the proceedings of the Institute of Radio Engineers that in the average case a condenser in shunt to the primary winding of the receiving transformer results in a loss of received energy rather than in an increase, that is to say provided the complete apparatus is properly designed and has such values throughout that it can be placed in resonance with the distant transmitting station.

Ques.—(3) Is there any method of calculating the high frequency resistance of a stranded cable when the resistance of the individual strand is known? I wish to apply this to cables composed of 6-30 No. 30 enameled wire. Is the increased resistance due to stranding important enough to warrant a calculation? Perhaps a more convenient wave of getting at this would be to compare the resistance before and after winding it up into cables. Would a high frequency Wheatstone bridge, similar to diagram 2, be suitable?

Ans.—(3) If the individual strands composing the cable are not insulated the high frequency resistance will be practically that of a solid cable of the same diameter. If the individual strands are insulated the high frequency resistance will be $\frac{1}{m}$ the resistance of a single strand, if there are m strands in the cable. You will find Thompson's formula for fine wires and medium high frequencies more suitable for accurate calculation.

For measurement of the high frequency resistance the following circuit is remommended: Referring to Fig. 2. either r_1 or r_2 should be of standard high frequency resistance built of extremely fine wire. Starting with the formula:

$$\omega = 2 \pi n \frac{1}{\sqrt{(L_1 + L_x)(C_1 + C_2)}} \qquad (1)$$

Where L_x = the equivalent inductance of the leads.

For zero potential difference between D and B

$$e_1 = \frac{i_1}{w\, c_1} = \frac{i_2}{w\, c_2} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

$$e_2 = r_1\, i_1 = r_2\, i_2 \quad \ldots\ldots\ldots\ldots\ldots (3)$$

dividing (3) by (2)

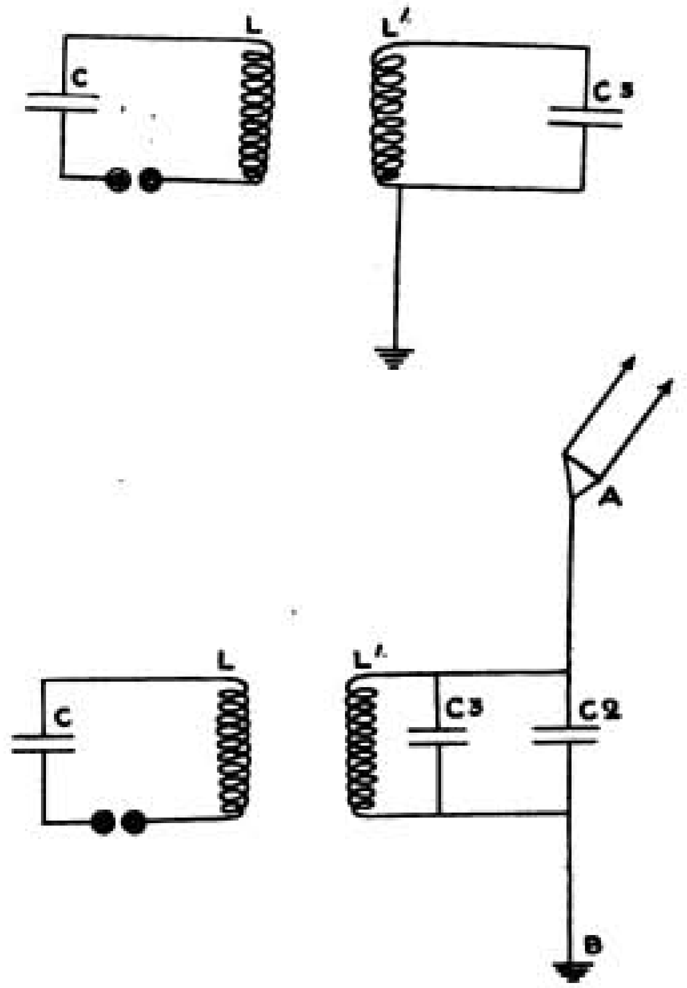
$$w\, r_1\, c_1 = w\, r_2\, c_2 \quad \ldots\ldots\ldots\ldots\ldots (4)$$

hence

$$r_1 = \frac{r_2\, c_2}{c_1} \quad \ldots\ldots\ldots\ldots\ldots (5)$$

Ques.—(4) Is the statement made by a certain writer, that the antenna capacity should bear the relation of $\frac{.02}{1}$ to the capacity of the transmitting condenser correct? This seems unreasonable as the important point seems to be that the requisite energy be present in the primary condenser when charged, the only limiting condition being that the condenser shall not be too large to enable oscillations of the required period to be reduced when the coupling inductance is connected to it, and on the other hand not so small that an excessive voltage must be employed to store up the energy it is desired to utilize. These conditions would permit a large range of values as we witness with various types of wireless telegraph sets placed upon the market today.

Ans.—(4) This is purely an empirical ratio, but there is some basis for its existence. The energy at the moment of discharge of the pri-



Figs. 1d (top) and 1e (bottom)

mary circuit is stored up entirely in the electro static field within the dielectric of the primary condenser. This energy in Joule's is equal to the energy stored up in the antenna electro static field the moment the envelope of the first train of oscillations in the primary circuit reaches zero less some small losses. That is to say:

$$\tfrac{1}{2} C_1 V_1^2 = \tfrac{1}{2} C_2 V_2^2 \text{ Joule's} - \text{losses} \quad \ldots (1)$$

Where C_1 and V_1 are respectively the capacity and maximum potential difference in the primary circuit and C_2 V_2 the corresponding quantities for the antenna circuit. From equation No. 1 we get:

$$\sqrt{\frac{C_1}{C_2}} = \frac{V_2}{V_1} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

or substituting the limiting ratio of $\frac{1.0}{00.2}$

we have:

$$\sqrt{\frac{1.0}{0.02}} = 7.7 = \frac{V_2}{V_1} \ldots\ldots\ldots\ldots (3)$$

That is to say, if the maximum voltage across the primary spark gap is 10,000, the maximum potential at the top of the antenna will be practically 77,000 volts. In other words, the

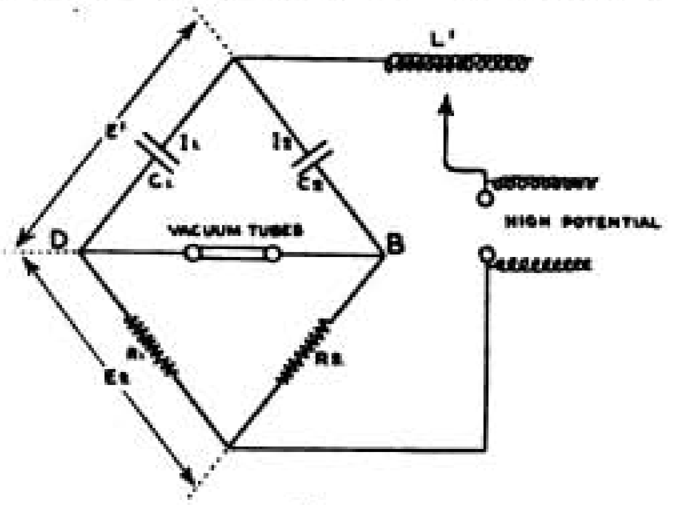


Fig. 2

smaller the ratio of $\frac{C_1}{C_2}$ the smaller will be the antenna maximum potential and the less costly its consequent insulation for the same primary maximum voltage applied.

Ques.—(5) In an article by Mr. Shoemaker and Lieutenant Mauborgne mention is made of the use of a hot wire ammeter and hot wire wattmeter in the circuit of a wave-meter. We have been unable to construct such an instrument which would give the slightest indication in this location even when the wave-meter was so closely coupled to the sending helix that destructive sparking occurred in the coil and condenser. What manner of active element should be employed?

Ans.—(5) A wattmeter can be considered as follows (Fig. 3): AB is a 4-inch piece of .003 inches diameter Therlo wire, having a resistance value of about 10 ohms with a negligible temperature coefficient. EF and CD are pieces of small silk fibre. S is a shaft 1/32 of an inch in diameter which carries the pointer, and an Eddy current damping brake (not shown). A hair spring is used to hold the pointer at the Zero position and is indicated at H. A suitable zero adjustment screw may be placed as shown at B. A scale may be constructed as indicated at S.

The instrument will give a full scale deflection of 90 degrees for .10 amperes. Since

$$(R\ I)^2 = W \text{ watts}$$

$$10 \times (.1) = 0.1 \text{ watts}$$

Or, in other words, a full scale deflection represents an energy rate of consumption in the instrument of .1 watt. There are other types of high frequency wattmeters in use, but this is the simplest form for wave-meter work.

* * *

R. G., Oberlin, O., inquires:

Ques.—(1) I have disputed with several of my friends the statement that a hot wire ammeter registers amperes irrespective of the applied voltage.

The formula for heat developed in a wire for ordinary current is: Calories = Volts × Amperes × .24. Now, if the deflection of a needle in the ammeter depends on the heat developed in the hot wire, does not the amperage reading also depend on the voltage? This seems to be the only possible explanation in my mind of the fact that one can radiate 4 amperes into an aerial at an approximate voltage of 2,500 = 10,000 watts or 10 k.w. with an in-put of 1 k.w. I want to know whether my solution is right. If not, kindly explain.

Ans.—(1) The deflection of an ammeter, d, is proportional to the rate at which heat is dissipated in the hot wire element, or since

$$H = R\ I^2_{eff}\ t \text{ joules} \ldots\ldots\ldots\ldots (1)$$

$$d = K\frac{H}{t} = K\ R\ I^2_{eff} \text{ watts} \ldots\ldots\ldots (2)$$

Where R is the resistance of the hot wire element, I^2_{eff} is the square of the effective current flowing through it, and K is the constant of the instrument.

In damped oscillations I^2_{eff} takes into account the various amplitudes of the oscillat-

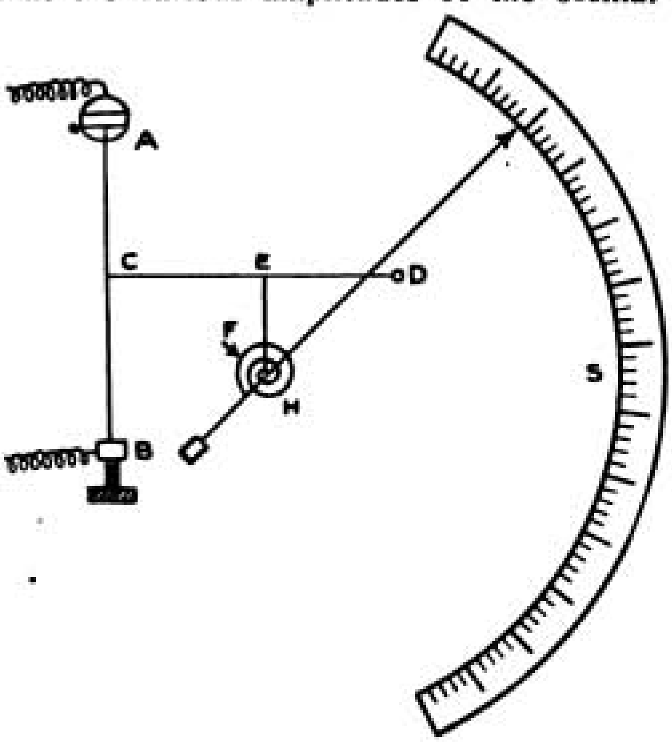


Fig. 3

ing current and the epoch of zero current between three successive wave trains. This is due to the relatively high mechanical period of the moving parts of the instrument as compared to the period of the wave trains and to the fact that the hot wire does not instantaneously regain its normal length the moment the current is shut off. Both these factors prevent the needle from following either the oscillations or the group heating effect and cause it to assume a deflection corresponding to that which it would have for a constant current whose integral heating effect over a complete group period would be the same. The value 4 amperes is a reading of this type.

Since

$$\frac{V\ eff.}{I\ eff.} \cos \theta = R \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

substituting this value of R in equation (2) we have

$$d = K\ V_{eff} I_{eff} \cos \theta \ldots\ldots\ldots\ldots (4)$$

Where V eff. is the effective value of the potential and θ is the phase displacement angle between the voltage and current in the circuit. For direct current work this angle is equal to zero, and since

$\cos \theta = \cos \theta$, V eff. = V, and

$I_{eff} = I$, $d = K\ V\ I \ldots\ldots\ldots\ldots (5)$

For an isolated closed oscillator this angle is approximately 90°. In an open oscillator it is somewhat smaller, decreasing with increasing equivalent resistance of the oscillator or antenna. In any case, it can only be determined by secondary measurements.

You are perfectly correct in saying that the current through the antenna ammeter depends upon the potential of the antenna, but your output conclusions are in error. The output of an antenna is determined by two general methods.

(a) The output of an antenna

$$= P = \frac{1}{2} n\ L\ I^2 \max = \frac{1}{2} n\ C\ V^2 \max \ldots (6)$$

Where n is the spark frequency, L and C are respectively the inductance and capacity of the antenna, and I max and V max are respectively the maximum current in the antenna and its maximum potential.

(b) The equivalent resistance R of the antenna is measured either by means of series inserted resistances or by the decrement method, when

$$P = R\ I^2_{eff} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

If your antenna input rate is 1 k.w. and you obtain an ammeter reading of 4 amperes, you will find that

$$R = \frac{P}{I^2_e} = \frac{1000}{16} = 62 \text{ ohms},$$

for it is contrary to the laws of the conservation of energy for you to get more out of an apparatus than you have put into it. If the antenna input is 1 k.w. and your output 10 k.w., where does the extra 9 k.w. come from? If your line of reasoning were correct every dry cell in the country would be a potential Niagara Falls!

* * *

E. J. R., Fort Hamilton, N. Y.:

Ans.—The diagram of connections given in Fig. 4 should fully cover your question. We cannot advise you regarding the receiving range of your apparatus unless we know more of the local conditions, but, generally speaking, you should be able to hear in the daytime at a distance of 200 miles and at night time up to 1,100 miles.

* * *

H. V. R., Los Angeles, writes:

Ques.—(1) Please tell me the lowest frequency possible to use in wireless telegraphy for the production of electro magnetic waves.

Ans.—(1) The minimum frequency that can be employed has not been definitely determined from a practical standpoint. The Marconi Company has already conducted successful trans-Atlantic experiments with an antenna frequency of 19,000 cycles and it may be possible that satisfactory results will be obtained with still lower frequencies. Radiation will take place at any frequency from the lowest up to those ordinarily employed in commercial wireless telegraphy today, provided the antenna system is in resonance with the source of energy. Whether or not the radiation of extremely low frequencies will be effective at a distance remains an open question.

Regarding your second query relative to the

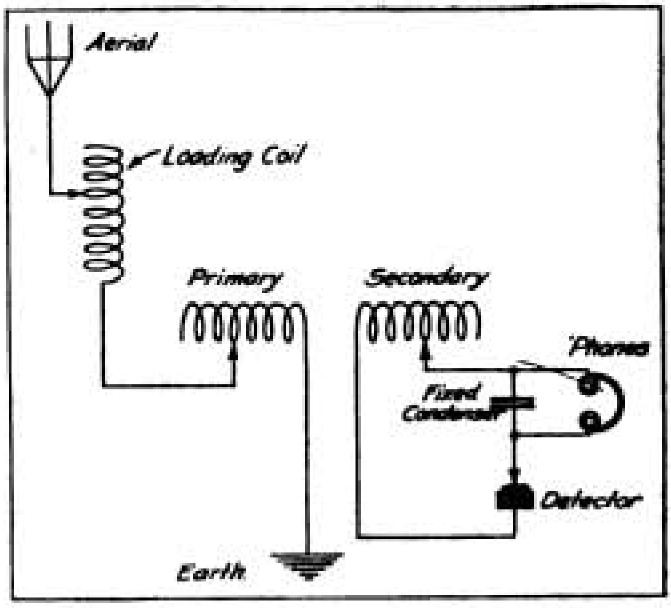


Fig. 4

frequency of interruption in the Poulsen arc: We have been unable to locate in Pierce's "Principles of Wireless Telegraphy" any statement similar to that mentioned. It is true that the oscillations set up in the antenna circuit are not of pure, sine wave form and do possess some irregularities when the Poulsen arc transmitter is employed.

Ques.—(3) Please define radiation resistance and describe briefly how this quantity can be determined.

Ans.—(3) The term "radiation resistance" is an expression employed to represent the effective radiation from an antenna system. In the absence of a specific unit the energy radiated from such a system is expressed in terms of lost energy in the circuit and therefore the unit for resistance, the ohm, is employed. If an antenna has a radiation resistance of 7 ohms it means that the energy extracted by radiation is equivalent to placing 7 ohms of resistance in a similar circuit which is non-radiative.

For a flat top aerial the radiation resistance can be computed from the following formula, namely:

$$R = K \times \frac{h^2}{\lambda^2}$$

Where K = the constant 1,600 meters;

h = the height of the antenna in

meters;

λ = the wave length in meters.

This formula was presented by Rudenberg in 1908.

Regarding your fourth query: If two crystalline detectors were connected in opposition to the secondary winding of a receiving tuner and, furthermore, if a set of receivers were connected to each detector and if the detector had like characteristics, the effects would be equal and opposite and no signals would be received.

* * *

D. C. W., Long Beach, Cal., writes:

Ques.—(1) When I use my transmitting apparatus our house telephone makes such a terrific noise that it cannot be used. My aerial is located at some distance from the telephone line and I have tried grounding the telephone wires through one microfarad condensers without result. The local telephone men are at a loss to solve this problem and I should be glad if there is any method by which the trouble can be eliminated.

Ans.—(1) An ardent experimenter and reader of THE WIRELESS AGE has solved this problem in the following manner:

Knowing that the trouble was caused by electrostatic and electromagnetic induction from the transmitter aerials, the incoming leads of the telephone line from the last pole to the house were made up of triple stranded wire. Two of these wires were, of course, connected to the house telephone and the third one "dead-ended" at one end and earthed at the other end. Electrostatic potentials were thus induced to earth and the trouble entirely disappeared.

* * *

A. P., Kansas City, Mo.:

Ques.—(1) If the condenser plates are made of glass, 8 x 10 inches, having a thickness of 3/16 of an inch, and are to be covered with brass foil, 6 x 8 inches, please tell me how many plates should be required for a Blitzen 1 k.w. transformer, the set to be operated on a wave-length of 200 meters. The condenser will be immersed in paraffin oil. Also, how many plates are required for 300 meters?

Ans.—(1) At a wave-length of 200 meters, the capacity of the condenser cannot possibly be more than .01 microfarad. About seventeen plates of the condenser described connected in parallel will give the desired capacity. At a wave-length of 300 meters, the capacity can be slightly increased and your condenser in this case should consist of about twenty plates of the size named, connected in parallel.

Ques.—(2) Please give the data for a choke coil to limit a Blitzen 1 k.w. transformer to 1/8 k.w., 1/4 k.w., 1/2 k.w. and 3/4 k.w.

Ans.—(2) Having no data as to the constants of the windings of this transformer and the general overall design, we cannot give definite advice. We suggest that you communicate direct with the manufacturer. It should not, however, be difficult to construct a suitable reactance coil by experiment. One fact is certain: The wire on the reactance coil should be at least the size of the wire in the primary winding of the transformer. As a matter of experiment, a core 12 inches in length by 2 inches in diameter made up of rather fine soft iron wires can be wound with one or two layers of wire of sufficient diameter to carry the current. The current input to the transformer can be varied either by variable tap-off connection or by drawing the iron core in and out of the winding.

Ques.—(3) What size wire is best for the secondary winding of an inductively coupled receiving tuner to be used with the vacuum valve detector, namely, 28, 30 or 32? The primary of the receiving tuner is covered with No. 20 wire. It is 4½ inches in length by 5½ inches in diameter. The secondary winding is 4½ inches in length by 5 inches in diameter.

Ans.—(3) Owing to the fact that the vacuum valve detectors are potential operated devices, it is desirable that the secondary winding be so constructed as to supply the maximum value of voltage. That is to say,

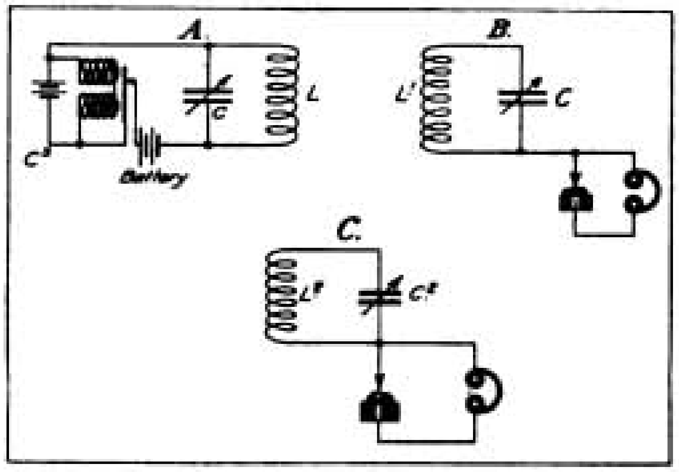


Fig. 5

the capacity in shunt to the secondary winding for a given wave-length should be very small. We advise the use of No. 32 wire in this case, but are not in favor of No. 20 wire for the primary winding. This winding is preferably of No. 24 or No. 26 wire. If the secondary winding is wound full of No. 32 wire with the dimensions suggested, it will be adjustable to wave-lengths in the vicinity of 3,500 meters, depending upon the capacity of the variable condenser connected in shunt.

* * *

L. I. J., New Bedford, Mass., writes:

Ques.—(1) How can I calibrate one wavemeter from another?

Ans.—(1) The complete method is shown in Fig. 5. Herein B is an accurately calibrated standard wave-meter with a crystal detector and head telephones connected unilaterally. The wave-meter under calibration is represented at C and also has a detector connected unilaterally. At A are the circuits of an oscillatory circuit, comprising the fixed inductance, L, the condenser, C, the buzzer, B, the battery, Bat, and the condenser, C 1.

By means of the calibration chart furnished with the wave-meter, B, the condenser, C 1, is set at certain values so as to give the wave-length adjustment desired. The buzzer having been put into operation, the variable condenser of the oscillatory circuit, A, is then altered until maximum response is secured at the head telephones of the wave-meter, B. During this operation the coupling between the coils, L and L', should be as loose as is consistent with the strength of signals in the head telephone. The point of resonance having thus been actually obtained, the coil, L 2, of the wave-meter, C, is placed in inductive relation to L. The capacity of the condenser, C 2, is then altered until a resonant response is secured in the head telephones. Obviously, the wave-length of the wave-meter, C, is now identical with that of the wave-length of the wave-meter, B. In this manner a number of settings can be taken at the standard wave-meter and resonant adjustments made at the condenser, C 2, until a complete set of wave-length values is obtained. If desired, the crystalline detectors connected to the wave-meters, B and C, may be connected in series with the head telephones and then in shunt to the condensers. The connection shown, however, affords increased accuracy because the constants of the wave-meter circuit are not so seriously interfered with.

For less accurate adjustment the excitation buzzer and battery could be connected in shunt to the wave-meter, B, and corresponding readings made on the wave-meter, C; but by the method shown all errors due to the shunting of the circuits are eliminated.

Ques.—(2) How can I make and what is the principle of a ticker to be used with a receiving set to hear stations employing a frequency above the limits of audibility?

Ans.—(2) A ticker is nothing more than a circuit interrupter however it may be constructed. If, in the receiving circuit of the ordinary apparatus, an interrupter is connected so as to break that circuit, say, 700 or 800 times per second, a note is produced in the head telephones corresponding to the rate of interruptions.

The sliding wire ticker is often employed. A complete circuit diagram for it appears on page 1015 of the September, 1914, issue of The Wireless Age. In this apparatus a small grooved wheel has a piece of spring wire in light contact to it. The wheel is revolved at a speed of from 1,000 to 2,000 r.p.m., and by proper adjustment of the variable elements in the circuit, a "mushy" note is produced in the head telephones, making the signals of undamped stations audible. It should be taken into consideration that with this ticker the telephone condenser (in shunt to the head telephones) becomes an active element of the oscillatory circuit and in consequence for adjustment to given wave-length the secondary winding of the receiving tuner need not have the large value of inductance employed with the ordinary crystalline detectors. In fact, the secondary winding of the receiving tuner to be used in connection with a ticker should have rather coarse wire, as compared to that employed in the present day receiving tuners.

Ques.—(3) In what proportion does the addition of more wires in parallel to a single wire aerial increase the wave-length of the latter?

Ans.—(3) This query cannot be answered unless a definite problem is given. The increase of wave-length depends upon the spacing of the adjacent wires and, if the wires were only separated by a few inches, the capacity would hardly be increased at all, the only effect being that the high frequency resistance of the antenna as a whole is reduced. Adding more wires to any aerial increases the capacity and decreases the effective inductance and the high frequency resistance, but the actual increase of wave-length depends upon the spacing.

* * *

E. C., Springfield, Ill., writes:

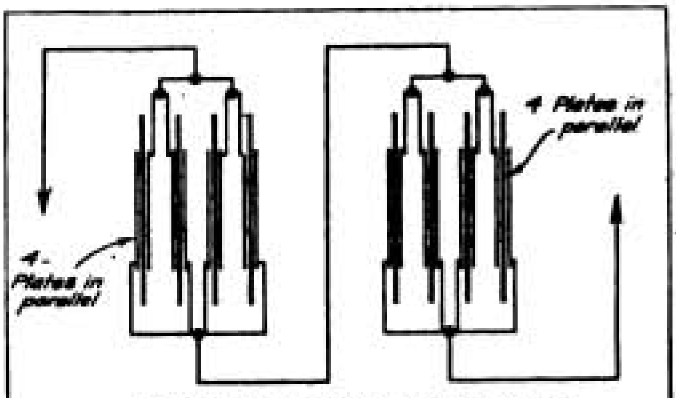
Ques.—(1) Where can licensed silicon and galena crystals be obtained?

Ans.—(1) The Wireless Specialty Apparatus Company, New York City.

Ques.—(2) Where can I purchase a perikon elektra detector and what is the price?

Ans.—(2) Communicate with the same company. We do not know the price.

Ques.—(3) How many plates should be used in a 1 k.w. condenser?



SERIES PARALLEL CONNECTION FOR GLASS PLATE CONDENSER

Fig. 6

Ans.—(3) This depends upon the voltage and frequency of the transformer and the range of wave-length over which it is desired to work. For 200 meters the sending condenser cannot have a capacity value of more than .01 microfarad. Five glass plates, 14 x 14 inches, covered with tin foil 12 x 12 inches, the glass being 1/8 of an inch in thickness, and an oil plate connected in parallel will give a capacity value of .01.

Ques.—(4) What is a series parallel connection of condensers?

Ans.—(4) A diagrammatic sketch of a series parallel connection is shown in Fig. 6.

Ques.—(5) At what speed should a spark gap revolve for a 1 k.w. set when there are twelve studs on the rotor?

Ans.—(5) A speed of 2,400 r.p.m. is preferable.

E. C. H., Niagara Falls, N. Y., writes:

Ques.—(1) I desire information as to the construction of a transformer suitable for 25 cycle current.

Ans.—(1) Please observe the Fourth Prize Article, in "From and For Those Who Help Themselves," in the August, 1915, issue of The Wireless Age.

* * *

O. A., Canton, O., inquires:

Ques.—(1) What is the natural wave-length of an aerial which consists of 4 wires spaced 3 feet apart, 125 feet in length by 55 feet in height?

Ans.—(1) The natural wave-length of this antenna is about 320 meters.

Ques.—(2) Has the licensed amateur more rights than one unlicensed?

Ans.—(2) He is allowed to transmit at a wave-length of 200 meters, which would not be possible without a license. With a special license he may be allowed to work his apparatus on wave-lengths in excess of this value provided the station is located outside of the zone of commercial or naval interference.

* * *

W. R. S., Pittsburgh, Pa.:

Ques.—(1) I am constructing an inductively-coupled receiving tuner with a primary 4½ inches in diameter wound with 160 turns of No. 24 G. S. D. wire. If I make the secondary tube 4 inches in diameter, how many turns and what gauge wire should I wind it with? This tuner is to be used with a mineral detector.

Ans.—(1) This question cannot be definitely answered unless the range of wave-length over which it is desired to work is stated; the same statement applies to the primary. We do not know whether it is of the proper dimensions because we lack data as to the inductance and capacity of the receiving aerial. Speaking generally, if the secondary winding is 4 inches in diameter it might be wound for a distance of 3½ inches with No. 32 S. S. C. wire. With a small variable condenser in shunt to this winding, it should be adjustable at wave-lengths up to 3,500 meters. Used in this manner a loading coil is required in the antenna circuit.

Ques.—(2) If this coupler is used with a vacuum valve detector, what gauge wire and how many turns should be placed on the secondary?

Ans.—(2) No. 32 wire is quite correct for a vacuum valve detector and the actual number of turns will of course depend upon the wave-length it is desired to receive. Therefore no definite data can be given.

Ques.—(3) What is the proper gauge of wire for winding loading coils?

Ans.—(3) These coils are preferably wound with No. 20, 22 or 24 S. S. C. wire.

* * *

D. M. K., Binghamton, N. Y., writes:

Ques.—(1) I have an inductively-coupled receiving tuner, the primary work being wound with No. 22 wire. I also have a double slide tuner wound with No. 24 wire. Could I use a loading coil wound with No. 30 S. S. C. wire to good advantage with either coil?

Ans.—(1) A diagram of connections would have helped us to reply. No. 30 wire is feasible for the secondary circuit, but not for the antenna circuit. The loading coil in the antenna circuit should be of No. 20, 22 or 24 S. S. C. wire.

Ques.—(2) Please inform me whether it is preferable to wind the wire for a loading coil on a tube as a tuning coil, or in layers?

Ans.—()2 Multiple layers are to be avoided by all means. It should be wound in the form of an ordinary tuning coil having a single layer.

Ques.—(3) How many square inches of foil are required for a condenser to be connected in shunt to the head telephones?

Ans.—(3) Sixty square inches of foil separated by paraffined paper, all pressed closely together, will give the desired capacity.

Ques.—(4) How many square inches of tin foil should be used in a receiving condenser to be placed in series with a three-slide tuning coil and the detector?

Ans.—(4) It may have the same value of capacity as that given in the reply to your third query. If the head telephones are connected in shunt to the fixed condenser, which is the proper connection, only one condenser is required.

* * *

I. H., Pittsfield, Mass., writes:

Ques.—(1) What is a good design for the construction of a ½ kw. closed core transformer to have a secondary voltage of about 10,000? The primary supply is 110 volts, 60 cycles.

Ans.—(1) A complete answer to this query appeared in the fourth Prize Article in the August, 1915, issue of The Wireless Age.

Ques.—(2) Can you recommend an efficient design for a loose coupled receiving transformer to be used with an aerial 60 feet in length, comprising 6 wires, erected on 14-foot spreaders, in order that the time signals may be received from Arlington at a wave-length of 2,500 meters? This tuner is to be used for the reception of amateur signals.

Ans.—(2) Lacking data as to the height of this aerial, we cannot give an accurate reply, particularly in regard to the number of turns to be used in the primary winding. The secondary winding for a receiving tuner suitable for the reception of signals from Arlington and to be used in connection with crystalline detectors, can be constructed as follows: The secondary winding should be 3½ inches in length by 3¼ inches in diameter, wound closely with No. 28 S. S. C. wire. This winding may have 12 taps.

The primary winding may be 3¾ inches in diameter by 4 inches in length, wound closely with No. 26 S. S. C. wire. It is intended that the secondary winding shall be shunted by a variable condenser having a capacity value of approximately .001 microfarad.

This tuner will not be entirely suitable for the reception of amateur signals, unless special dead-end switches are employed to cut off the unused turns. It is desirable that a separate receiving tuner be constructed for the reception of 200 meter wave-lengths. It is very probable that the natural wave-length of your aerial is slightly above 200 meters and you therefore require a series condenser for the efficient reception of such signals.

To be adjustable to 200 meter, amateur signals, the secondary winding of the receiving tuner may have the same dimensions as those given in the foregoing case, but the winding need not be more than 1½ inches in length. Likewise the primary winding may be reduced to a length of from 2 to 2½ inches.

In a future issue of The Wireless Age data will be given for Receiving tuners employing No. 32 wire in the secondary.

Ques.—(3) If my aerial is within 3 feet of a tin roof, will the receiving range be affected?

Ans.—(3) If only a part of the aerial is within this distance of the roof it will have little, if any, effect. Of course, the proximity of the tin roof will increase the effective capacity of the aerial; therefore its natural wave-length will be greater than if the roof were not nearby.

* * *

H. J. M. D., Buffalo, N. Y., asks:

Ques.—(1) What will be the result of using a 60 cycle, ¼ kw. transformer on 25-cycle current?

Ans.—(1) The transformer will draw an abnormal value of current, owing to the lack of effective impedance.

Ques.—(2) What can I do to remedy any faults caused by the difference?

Ans.—(2) Increase the number of turns in the primary winding in order that the impedance of the winding may be increased.

* * *

W. C. K., Rochester, N. Y., asks:

Ques.—(1) I have an aerial composed of 4 copper clad wires, 95 feet in length by 40 feet in height, the wires being spaced 1½ feet apart. The lead-in is 15 feet in length. What is the natural wave-length of this aerial?

Ans.—(1) About 230 meters.

Ques.—(2) I have a receiving tuner, the primary winding of which is 7 inches in length by 3¼ inches in diameter, wound with No. 30 wire; the secondary winding is 7 inches in length, 2½ inches in diameter, wound with No. 30 wire. I also have a loading coil, 14 inches in length by 1½ inches in diameter, wound with No. 30 wire. With the aerial referred to what wave-length can I adjust to?

Ans.—(2) Your receiving tuner represents inefficient design. The primary winding should be made with No. 24 or No. 26 wire, while the secondary winding can remain as stated. The aerial tuning inductance is preferably made with No. 20 or No. 22 wire, No. 30 wire being entirely too small. With the windings as you described them, you should be able to adjust to wave-lengths up to 4,000 meters, but please take into consideration that with these windings the aerial circuit can be adjusted to a longer wave-length than the secondary circuit, depending upon whether you have a variable condenser connected in shunt to the secondary winding or not.

Ques.—(3) Please give the data for the construction of a 2-inch spark coil.

Ans.—(3) The coil should consist of a bundle of fine iron wires, 1¼ inches in diameter by 10½ inches in length. It is then covered with 2 or 3 layers of Empire cloth and wound with 2 layers of No. 14 S. C. C. wire. The secondary winding requires 2½ pounds of No. 34 wire, which should be divided in 4 sections, having a total length of 7 inches.

Ques.—(4) Please publish a drawing showing the best method for connecting the following apparatus: A loose coupler, loading coil, galena detector, fixed condenser, 2,000 ohm head telephones.

Ans.—(4) A complete diagram of connections is shown in Fig. 1.

* * *

L. E. B., Roundup, Mont.:

Ans.—We are not familiar with the receiving apparatus shown in the photograph accompanying your communication. If, as the makers say, it is adjustable to wave-lengths of 4,000 meters, you should be able during the winter months at night time to hear signals from stations on the Pacific Coast. Your station, however, is badly located for long distance receiving, particularly at this time of the year, and results are therefore problematical.

You ask for advice as to the very best apparatus for all round experimental work. This cannot be given, unless we know definitely the stations from which you desire to receive. A receiving tuner suitable for the reception of wave-lengths up to 7,000, 8,000 and 9,000 meters is unsuitable for reception of wave-lengths in the vicinity of 4,000 meters and absolutely useless for wave-lengths in the vicinity of 600 meters. We know of no commercial wireless telegraph stations in your immediate vicinity and consequently you will have to rely upon stations on the Pacific Coast. If you are in a mountainous district and your receiving aerial is surrounded by hills the reception of signals will be interfered with seriously. During the winter months you should be able by proper adjustment of the apparatus to receive signals from ships plying on the Pacific Coast. We note that your photograph contains a vacuum valve detector. If you have had no experience with this device, it may be that it is not in proper adjustment. To some extent this is a matter of skill and training and cannot be accomplished at the first test. In the series on "How To Conduct A Radio Club" in the January, 1914, and July, 1915, issues of THE WIRELESS AGE definite information concerning receiving tuners for certain wave-lengths is rubilshed. In the July issue the circuits of a super-sensitive receiving set for long wave-lengths are fully covered.

* * *

S. G. Salem, N. J.:

Ans.—(1) The aerial described in your first query has a natural wave-length of 300 meters and can be reduced to a value of about 200 meters by a series condenser of the following dimensions: 4 sheets of glass, 10 by 10 inches, covered with tinfoil, 7 by 7 inches; all plates connected in series, will reduce the wave-length of this aerial to a value of about 200 meters. You, of course, require a wave-meter for accurate adjustments.

Ques.—(2) Is the enclosed diagram of connections an efficient one?

Ans.—(2) It depends upon the range of wave-lengths it is desired to receive and the general over-all design of the receiving tuner.

Ques.—(3) The primary winding of my receiving transformer is wound with No. 24 S. S. C. wire on a tube 4⅛ inches in diameter. The secondary is wound with No. 28 S. S. C. wire on a tube 3⅝ inches in diameter. It has an 8-point switch. I find that in tuning for NAR, 120 turns of wire are needed in the primary; for WHE, 130 turns; WHI, 140 turns; WCC, 150 turns, and NAA, 225 turns. The amount of wire necessary for these stations seems to be out of proportion to their wave-lengths.

Ans.—(3) Taking into consideration the wave-lengths of these stations, your results tally correctly throughout. Perhaps you have been misinformed as to wave-lengths being used. At present, the wave-length of Cape Cod is greater than that of either the Wanamaker station in Philadelphia or New York. Likewise, the wave-length of Key West is less than that of either of the Wanamaker stations. The wave-length of the Arlington station is greater than all, being 2,500 meters on the time signals.

Ques.—(4) Why is it that I cannot hear amateur stations with this set? With the equipment I formerly possessed, such signals could be received. My present receiving tuner, however, brings in the signals from Key West much louder than the one I had.

Ans.—(4) The dimensions of the present receiving tuner are such that when adjusted to wave-lengths of 200 meters there will be considerable absorption of energy on account of the dead-ends. Again, it may be possible that the tapoffs of your present tuner do not allow a sufficient minimum value of turns for adjustment to wave-lengths of 200 meters. To construct a receiving tuner responsive to a range of wave-lengths of from 200 to 2,500 meters, it should be so arranged that when adjusted to the shorter wave-lengths, the dead-ends are cut off by means of a special dead-end switch.

Ques.—(5) Will the addition of a variable condenser in the secondary circuit bring in stations much plainer?

Ans.—(5) If this condenser is required in order to obtain conditions of resonance, yes; otherwise no increase of signals will result.

* * *

C. B. H., Great Neck Station, N. Y., writes:

Ques.—(1) I am constructing a receiving tuner described on page 294 of the January, 1915 issue of THE WIRELESS AGE, but some of the details are not entirely clear. Referring to the front view of the secondary switch, what function has the lower 1-inch brass segment. No connection for it appears. In Fig. 8 the secondary winding is shown divided into three sections, apparently designed to be connected up by moving the second blade of the switch to the extra point. Won't the usual loop taken out for the tap serve this purpose more simply? In any case the number of turns in use will be those between the left terminal and the point on which the switch rests. In case the second blade is set on the furthest segment connecting sections 2 and 3, doesn't this open the gap between sections 1 and 2, thus rendering the coupler inoperative? Why are the segments used when contact is only made with the protruding points, as shown in the side views of both the primary and secondary switches?

In other words, couldn't the connections be greatly simplified by using a single series of switch points, to which loops of the wire are taken out and connected as taps without impairing the efficiency of the coupler in any way? This would progressively add more turns until all were included. This statement should apply to both the primary and secondary winding. Isn't this the method followed by most manufacturers in making receiving tuners.

Ans.—(1) Apparently you have failed to grasp the underlying idea of our contributor's design. This tuner was constructed to eliminate the effect of dead ends which are detrimental in a receiving tuner employed for a large range of wave-lengths. You have already observed that the primary winding is divided into a number of sections and that the secondary winding is divided into three distinct sections. The extra fan blade switch mounted on the rotary switch (which controls the amount of inductance in use in the secondary winding) is employed to cut off the unused turns at various wave-lengths. When the taps of inductance in use on section No. 1 of the secondary winding are employed, the segment on the fan blade switch does *not* make connection with the two extra points shown in dotted lines directly underneath the handle. But when the switch is about to be shifted to the second section of turns the first segment of the fan blade switch makes contact with the protruding points and closes the electric connection to the second section of the winding. In this position the third section still remains disconnected.

When the handle of the secondary switch is about to be moved to the third section the first fan blade makes contact with the second set of protruding points connecting in the third section while the lower segment maintains the electrical connection between the first and second units of the secondary winding. In this manner the three units of the secondary winding are connected to the circuit as needed, but when not required for given wave-lengths they are disconnected and the continuity of the dead end circuit is broken. You, of course, understand that the two brass segments shown in Fig. 5 on page 296 are mounted on an insulating section and also that the two segments are insulated from each other. We believe the design presented by our contributor is superior to that ordinarily found on the open market and, if the receiving tuner has a range of wave-lengths up to 2,500 meters, as this one probably will have, considerable energy losses will be side-tracked by this arrangement when receiving signals at a wave-length of from 200 to 600 meters.

The design furnished by our contributor should give a range of wave-lengths up to 2,500 meters. Previous issues of The Wireless Age have contained a number of articles on the subject of dead ends.

* * *

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

Ques.—(1) In the transmission of wireless telegraph messages what power is considered the best and also the most economical?

Ans.—(1) The amount of power employed in a radio transmitter depends upon the frequency of the current supply, the capacity of the condenser, and the voltage of the secondary winding. It is not advisable to use a voltage of more than 25,000 at the secondary winding on account of the strain on the insulation of the set. The frequency of a wireless telegraph transmitter varies from 60 to 500 cycles and the wave-length is governed by United States regulations. For amateur transmitting purposes, the condenser capacity cannot have a value of more than .01 microfarad to obtain a wave-length of 200 meters. This being the case, the amount of power used by the set will depend upon the voltage and the frequency supply.

Ques.—(2) Does ordinary rubber covered wire give sufficient insulation for handling when used in connection with a 1-inch or 1½-inch spark coil?

Ans.—(2) The insulation of this wire cannot be considered sufficient for such circuits. There is a special type of high tension cable made for automobile ignition purposes which is applicable to this work. This can be purchased at any automobile supply store.

Ques.—(3) Is copper wire considered better for an aerial than aluminum wire?

Ans.—(3) Copper wire has a high degree of conductivity and, strictly speaking, is preferable. If, however, a number of aluminum wires are used a similar degree of conductivity is afforded and consequently the results obtained are practically identical.

Ques.—(4) What is a good protection for a wireless telegraph station against lightning discharges?

Ans.—(4) When the aerial is not in use, it should be connected to earth through a very soft copper wire or a piece of sheet copper. This wire should be at least No. 4 and larger if possible. A piece of iron gas pipe may be driven to a distance of 15 or 20 feet in the earth, or a small sheet of copper or zince buried in moist earth as near to the station as possible. A receiving aerial may be permanently connected to earth through a toothed gap lightning arrester and thus powerful discharges will be conducted to earth immediately at all times.

* * *

C. M. D., Passaic, N. J.:

Ques.—(1) Is the peroxide of lead detector more sensitive than the silicon detector?

Ans.—(1) No.

Ques.—(2) How is the peroxide of lead detector connected in a receiving circuit?

Ans.—(2) In a manner similar to that of an electrolytic detector. The platinum electrode of the peroxide lead detector is connected to the positive pole of the local battery, while the lead electrode is connected to the negative pole. The current flowing may be adjusted by a potentiometer in the ordinary manner.

Ans.—(2) We cannot advise regarding the wave-length adjustment afforded by a tuning coil, unless we know the inductance capacity of the aerial with which it is to be employed.

The receiving set you describe should give you a daylight range of 100 miles and a night range of 500 or 600 miles.

* * *

L. M., New York City, writes:

Ques.—(1) Can I connect two spark coils in series to increase the spark length? Kindly publish a diagram of connections.

Ans.—(1) A diagram of connections is unnecessary. The interrupter of one coil should be screwed up tight and the circuit broken by the interrupter of the second coil. The primary and secondary windings should be connected in series.

* * *

W. H., Middlefield, Ohio:

Ques.—(1) My interrupter does not work well. I should be glad if you would advise me how to construct an interrupter which will carry 220 volts direct current and at the same time be efficient.

Ans.—(1) The electrolytic interrupter is preferable for this work and can be purchased at a nominal price from a number of supply houses. A constructional article on this subject will be published in the forthcoming issue of The Wireless Age.

THE WIRELESS AGE

An Illustrated Monthly Magazine of
RADIO COMMUNICATION

Incorporating the Marconigraph

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

Volume 2 (New Series) **September, 1915** **No. 12**

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.

CHANGE OF ADDRESS Notify us promptly of any change in your address, giving both the old and new location. Since our mailing list for each issue closes the 20th of the month, changes received after that date must necessarily take effect with issue for the second month following. Postmaster as well as Publisher should always be notified of changes in order to forward mail sent to old address.

Issued Monthly by Marconi Publishing Corporation, 450 Fourth Ave., N. Y. City

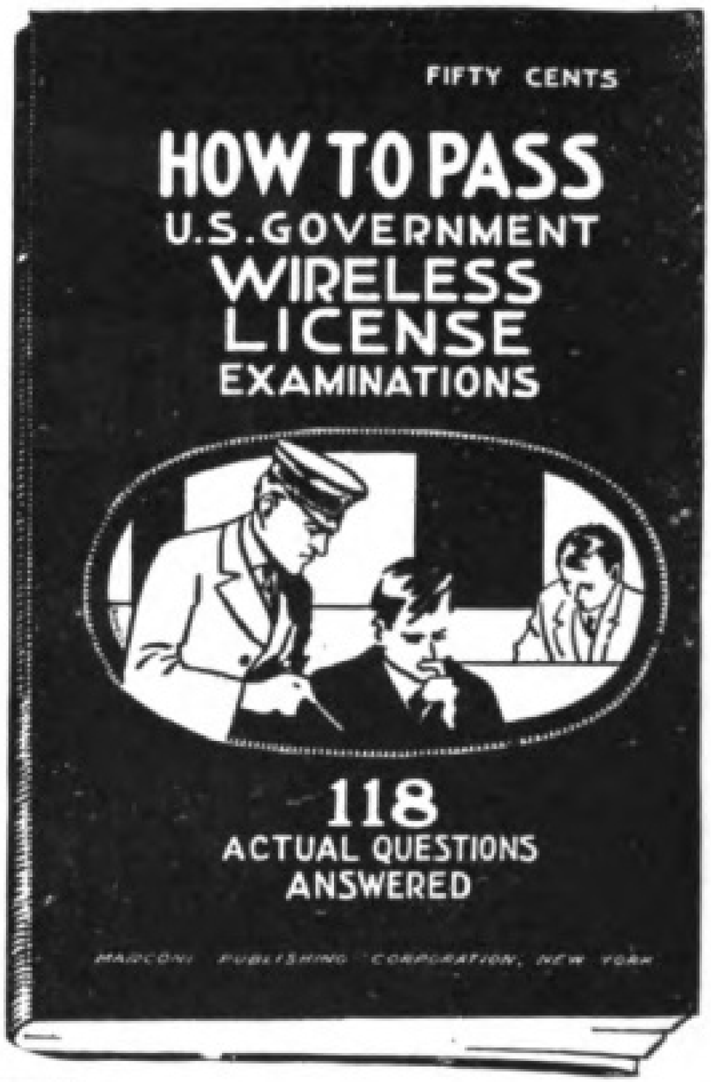
John Bottomley, Pres. G. S. De Sousa, Vice-Pres. G. Harold Porter, Secy. John Curtiss, Treas.

Yearly Subscription, $1.50 in U. S.; $2.00 Outside U. S.; Single Copies, 15 Cents

Entered as second class matter at the Post Office, New York

Read

What the Man Who Employs the Marconi Operators Has Said of This Book



Marconi Wireless Telegraph Company of America

(EASTERN DIVISION)

New York June 23, 1915.

The Marconi Publishing Corporation
450 Fourth Avenue
New York City.

Dear Sirs

I have read your recent publication entitled "How to Pass the Government Wireless Examination" I consider it invaluable to all aspirants who wish to become commercial operators. Operators will also find this little volume extremely useful in assisting them to obtain renewal of their licenses.

The author, who has had many years of experience in the commercial field of wireless Telegraphy and who speaks from experience, is perhaps better qualified than any one I know of to compile a book of this kind.

Very truly yours,

Superintendent.

ate r

Educational Institutions All over the Country are Sending in Quantity Orders

Only 50 cents

Book Department
THE WIRELESS AGE
450 4th Ave., New York

New Edition of LIST OF

Corrected and Completed up to August 1, 1915

RADIO STATIONS OF THE WORLD

Compiled by

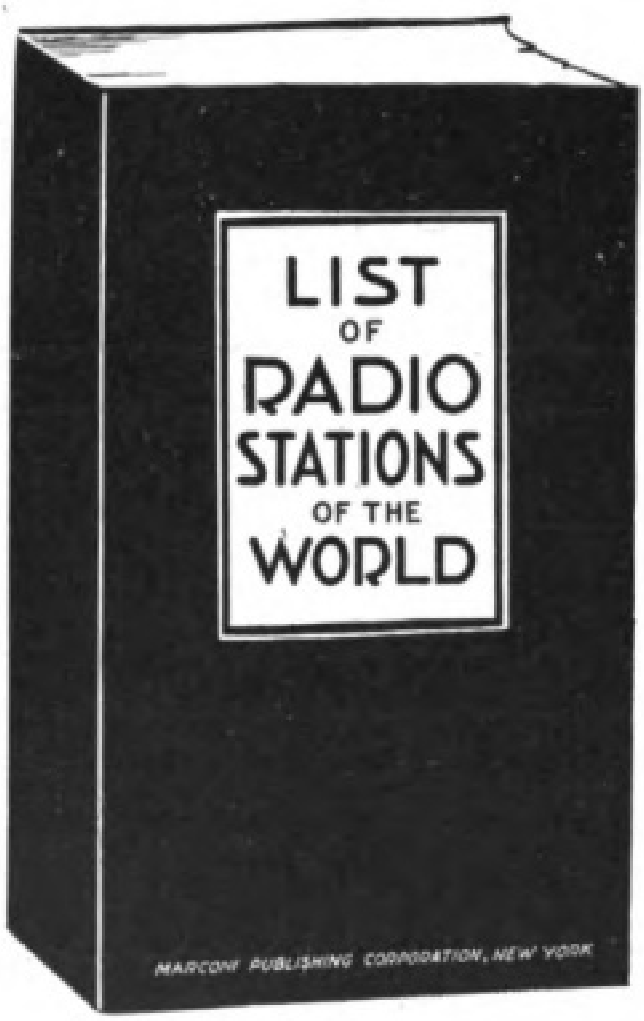
FRANK A. HART *and* **H. M. SHORT**

Chief Inspector of the Marconi Wireless Telegraph Company of America

Resident Inspector (U. S. A.) Marconi International Marine Communication Company, Ltd.

Following is reproduced the preface from the book:

"This book has been compiled for the use of operators in wireless telegraphy and for all those who have receiving instruments. It is so arranged as to be equally available to the operator who desires to find the call of any given station, and to the operator who wants to trace instantly the calls that come to him over his receiver.



"The tabulation of naval vessels gives, at a moment's glance, a comparison of the wireless equipment of the Powers. The list of commercial ship stations not only enumerates vessels equipped with wireless, but also gives the character of wireless control, the owner and the nationality. The list of coast stations is so devised that any ship operator can find the nearest station without any delay. This volume has been compiled by practical men for practical use, and every point needed will be found to have been included."

Contents Arranged as Follows:

Key to Lists in Volume.
All Ship Stations Alphabetically by Call Letters.
Naval Ship Stations Alphabetically by Country and Vessel.
Commercial Ship Stations Alphabetically by Vessel, giving owner, nationality and control.
Key to Control of Stations.
Coast Stations Alphabetically by country and Stations, with control.

Compiled for use by all who have wireless receiving sets.

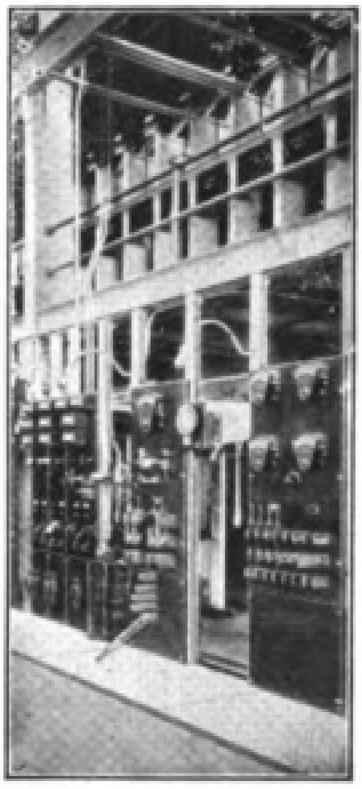
PRICE 50 CENTS PER COPY, Paper Covers—In Cloth, $1.00

Foreign Postage 20c.

Published by

MARCONI PUBLISHING CORPORATION
450 Fourth Avenue New York, N. Y.

The Perfect Insulating Base



Station "I" Pacific Gas & Electric Co.
San Francisco, Cal.

must possess all the properties of Marble and Slate and none of their limitations.

With this in mind we set out to provide a material of high permanent insulating quality. One which would be free from possibility of breakage and defacement—clean to handle and easily worked with ordinary tools—one which would take any finish and be impervious to oil and moisture. And such a material is

J-M TRANSITE
EBONY ASBESTOS WOOD

On insulation test it withstands 40,000 volts potential under conditions which applied to marble would have caused its failure at 10,000 to 12,000 volts. For panels, instrument bases, switch-tops, barriers, etc.

J-M Transite Ebony Asbestos Wood is the ideal insulating material. Write for Special Bulletin at any branch.

H. W. Johns-Manville Co.

Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Denver, Detroit, Galveston, Indianapolis, Kansas City, Los Angeles, Louisville, Memphis, Milwaukee, Minneapolis, Newark, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, St. Louis, Salt Lake City, San Francisco, Seattle, Toledo

---

PATENTS

WILLIAM N. MOORE

PATENT ATTORNEY

Loan and Trust Bldg., Washington, D. C.

The first important step is to learn whether you can obtain a patent. Please send sketch of your invention with $5, and I will examine the patent records and inform you whether you are entitled to a patent, the cost and manner of procedure.

TRADE MARKS, LABELS and COPYRIGHTS OBTAINED

Personal Attention Established 25 Years

Protect poles, masts and other wireless property with the *longest* service paint.

DIXON'S

SILICA GRAPHITE **PAINT**

is specified by engineers and owners where economy and durability are desired. Booklet No. 30-B upon request.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

Established 1827 B-74

BIGLOW QUALITY STANDS FOR

Tasteful Printing

L. H. BIGLOW & COMPANY 62 BROAD STREET NEW YORK

Dickinson Manufacturing Co.

Makers of

HIGH GRADE MOULDED ELECTRICAL INSULATIONS. Composition Specialties.

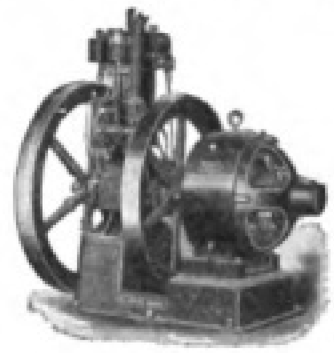
SPRINGFIELD, MASS.

HABIRSHAW WIRE CO.

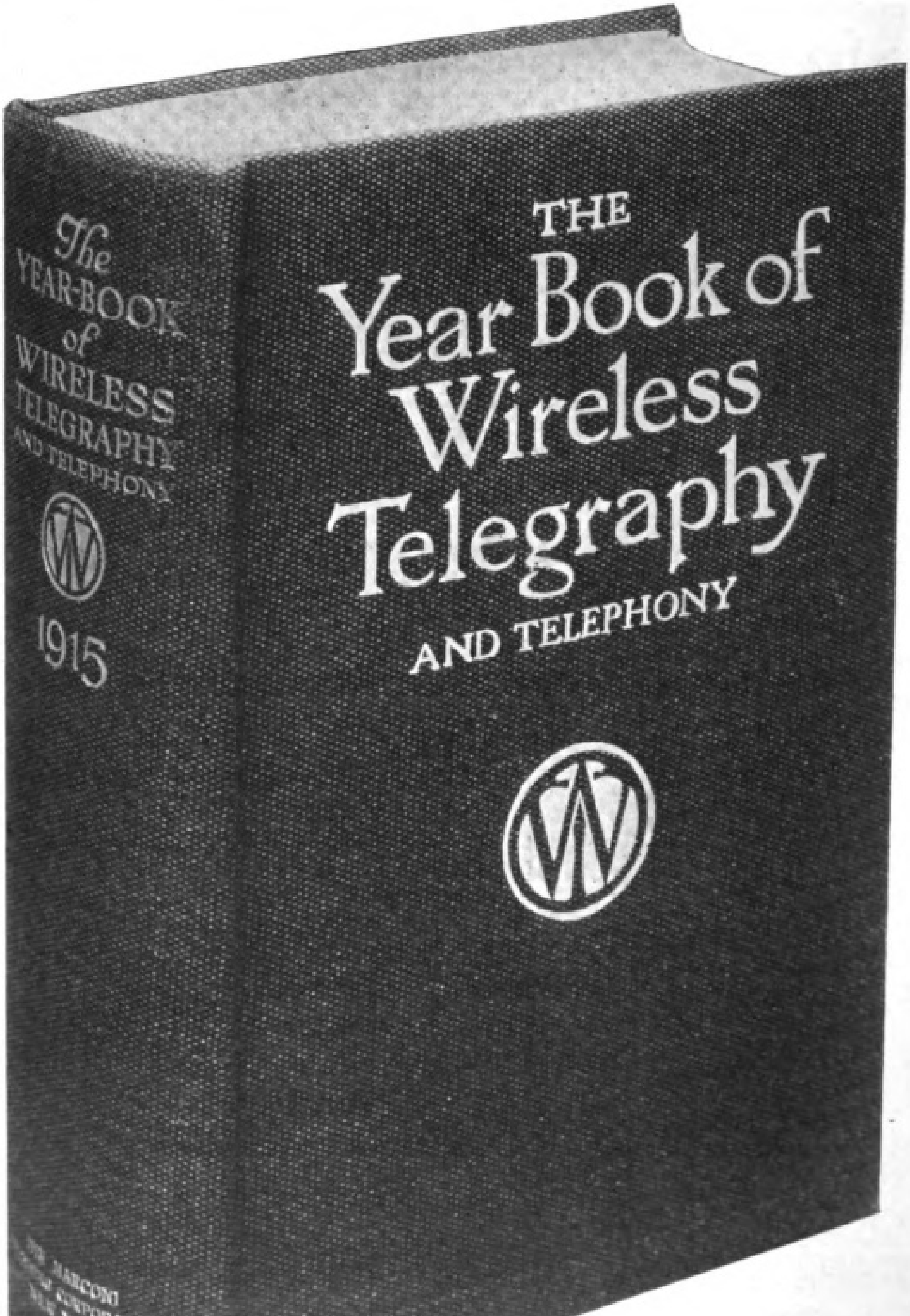
Manufacturers of HABIRSHAW WIRES and CABLES

Lighting—Power Transmission—Railway—Telephone—Telegraph—Signal Cables

Offices and Works: YONKERS, N. Y.




Underwood
No 5
Underwood Standard Typewriter
No 5



Reduced Illustration of Year Book

Full Size, 6 x 8½

Motor-Generators and Rotary Converters

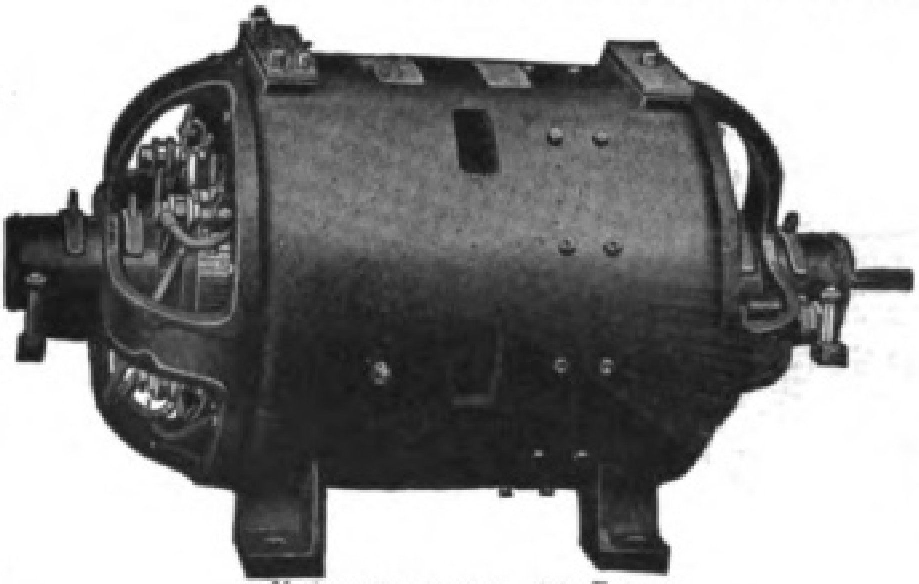
OF SPECIAL DESIGN

To meet the exacting conditions of Wireless Telegraphy

MANUFACTURED BY THE

ECK DYNAMO AND MOTOR CO.

BELLEVILLE, N. J., U. S. A.



Motor-Generator. Pig Frame

MANUFACTURERS OF

Electric Motors and Dynamos of Standard or Special Designs

Wireless Telephone Receivers

The upper cut shows Type "A" the regular type of 'phones as used at all the Marconi shore and ship stations; over 15,000 in use.

The case is of nickeled brass.

Total weight including cord and headband, 16 ozs.

The lower cut shows type "B" a later design. The case is aluminum, as small as it is possible to make and get the proper amount of magnets in the case.

The case is curved out to permit the use of a diaphragm 2" in diameter, the size which has proved the best for good commercial work.

This type 'phone is provided with an enclosed protective spark gap.

Total weght, including cord and head band, 13 ozs.

Both types have double polished German silver headbands, hard rubber caps, and six-foot cords. The magnets are made from the best imported steel, and these 'phones are guaranteed in every respect.

Prices of type "A" and type "B" 'phones and the resistances connected in series per set.

160 ohms	$6.25	1000 ohms	$6.50
500 ohms	6.35	2000 ohms	7.50
3000 ohms	$8.25		

Shipped express prepaid on receipt of price, but none sent C. O. D.

Electrical Industries Mfg. Co.

328 West 41st Street, New York

Marconi Wireless Telegraph Company of America

Office of the Vice-President and General Manager

New York, August 25th, 1915.

TO ALL EMPLOYEES:

The Marconi Company solicits suggestions from all its employees regarding improvements that can be adopted for the betterment of its service.

Those in direct contact with the various branches of our organization learn from their actual experience much that is valuable which, if properly suggested and considered, would lead to general improvements.

This applies to ALL DEPARTMENTS and particularly to wireless operators who, in their daily duties, have every opportunity to observe the equipment, its operation, its care and maintenance, the methods employed in communicating between ship and shore stations, traffic regulations and the many other elements of which the organization consists.

For the purpose of properly considering and acting upon ideas submitted by the members of our staff, a committee has been chosen and anyone having suggestions to offer should address:

Chairman,
Suggestions Committee,
Marconi Wireless Telegraph Company of America,
New York.

In submitting ideas the following requirements must be complied with:

(a) Make your suggestions brief.
(b) Express your ideas clearly.
(c) Confine yourself to matters which will raise the standard of operating efficiency. Expressions of petty personal prejudices are of no value.
(d) Write only on one side of the paper.

Substantial cash prizes will be given to those whose suggestions are favorably acted upon by the Committee.

E J Nally

Vice-President and General Manager.