THE WIRELESS AGE

OCTOBER

1915

THE NEW PANEL TYPE MARCONI SET ILLUSTRATED AND DESCRIBED

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.

OCTOBER, 1915

A Talk With the Operators

Wireless Communication from the Viewpoint of the Man on Shore—The Value of Courtesy, What to Do and What Not in Disposing of Traffic, Something About Transmitting Through Static and General Comments on Speed, Superfluous Words, Coil Tests, Idle Gossip, Poor Spacing, Abbreviations and Service Messages

By N. E. Albee

Manager Marconi Station at Cape Hatteras

THERE are many emergencies in the daily routine of wireless work not covered by government regulations or official instructions. This may be partly accounted for by the fact that the men responsible for these orders depend largely upon the operators to keep posted. The process verbal, or log, is an illustration of how this information is obtained.

A better understanding between the operators at ship and shore stations would be of immense benefit to all of us and greatly improve the efficiency of the service. This article is not intended to cover the entire situation, for that would be a very difficult task for one person to accomplish. It is earnestly hoped, however, that what I have written will be instrumental in drawing forth similar articles from other operators who may offer additional suggestions.

The trying circumstances connected with our work—circumstances which tax the operator's patience to the utmost—are many. It has often been said that it is impossible to be a Christian and a wireless operator at the same time, but let us hope that conditions have not reached such a pass. It goes without saying, however, that the wireless man occasionally is ruffled and says as much as law and prudence will allow. During the early days of wireless, before the government took charge of the incorrigibles, the latter were prone to voice thoughts that would shock an outsider. Terrific battles were fought in the ether and only distance prevented physical encounters. We are glad, though, that times have changed and that we can deal with one another in a more courteous manner. At times, even now, a few uncomplimentary epithets are hurled into space, but it is noticeable that personal feeling rarely exists.

I have often thought of the sentiment contained in the Marconi Ideal, as recently presented by our vice-president and general manager on the back cover of THE WIRELESS AGE, and wondered if it were not possible for us to be more like him. Its logic and worth can only be realized by those who have cultivated and experienced his precepts. A word spoken harshly to a friend, fellow worker or subordinate often causes a sting that lingers indefinitely, though apparently forgotten. Remembering the old adage that "man can never master others until he first masters himself," we see that when he loses his self-possession he eventually loses control of those under him, and when he allows his inward feelings to become prominently displayed outwardly he is at a great disadvantage in dealing with his fellow-men. It has been observed that when a man becomes imbued with disagreeable qualities he not only displays them to his associates, but carries them home where something of the same spirit is instilled into the minds of his family.

Courtesy commands respect and admiration for the man, be he humble or great. It inspires others to do his bidding with good will, promptitude and great earnestness of purpose. Man can cultivate almost any habit he desires, whether good or evil, and it is surprising what a short space of time is necessary for it to become a real part of him. That the Marconi Ideal is deep rooted and a reality is evident to all who come into personal contact with the various officials of the Marconi Company; hence it is our duty to live up to the same standard.

Before the service can be materially improved it will be necessary for us first to ascertain and then eliminate the causes of interference. Numerous reasons may be offered in explanation, but boiled down, they amount to careless watch, poor judgment, useless work, inexperience and inefficiency. The fault is greatest in the order named.

When a careless watch is maintained it is impossible to follow the proceedings accurately. One of the chief difficulties the coast station has to contend with are calls from ship operators while the former is receiving traffic from another vessel. It is plainly evident that few adhere to the five-minute rule prescribed by law. When it is known that the coast station is not working with any ship or shore station it would be a waste of time to remain inactive for five minutes. But if there is any doubt or, to be more explicit, if the operator is not certain the coast station is not actually engaged in handling traffic, he should refrain from calling until the five minutes have elapsed.

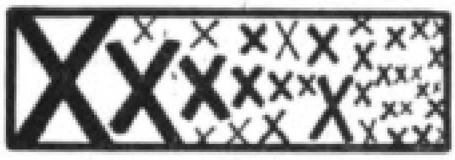
Operators on freight ships should pay attention to this rule, for when an operator comes on duty at various times during the day it often happens that the coast station is working with some ship outside of his range and he is not able to hear the message which is being sent. Preference is sometimes given to the freight ships so as not to unduly prolong the working hours of the operator. Preference, consistent with the nature of the message, is always given to ships known to have only temporary power. There are scores of ships built long before wireless telegraphy came into existence and suitable provision has not been made for supplying constant power, although to comply with the law they start the one dynamo aboard whenever requested to do so by the operator. Yet the chief engineer does not care during the day to run the ship's dynamo for what he considers an unnecessarily long time; therefore we favor vessels of only temporary power whenever the circumstances are known and conditions will permit. In return we ask the operator to be equally considerate about calling.

QRW

On passenger ships, where the operators are required to maintain constant watches, there should be little to hinder them from keeping in close touch with radio work at all times. There are times, such as on the occasion of a passenger filing messages for transmission, when the operator's attention is temporarily diverted to other things. It is immediately following circumstances of this nature that he calls the coast station without first ascertaining whether the latter is clear. Some operators make the figure 4 (meaning are you clear), which is a very good method provided they wait until the station answers and do not follow it up after a short interval by calling the station, as is often the case. If we started the machine and answer "no" we should in all probability lose several words of the message being sent to us because the noise of the motor drowns out weak signals. When the sending station ceases for the moment then AS, QRT, QRX or K is given to the operator making the figure 4.

If a station operator gives a ship operator QRT or QRX and does not give him clearance within a reasonable length of time, the ship operator is justified in proceeding to dispose of his business. When I say reasonable time I mean that a station should be entitled to clear all ships calling it first.

Poor judgment often comes from inexperience and lack of familiarity with the general method of handling business. Operators of the old school, i.e., those who have grown up with the business, have a capable way of handling traffic with a minimum amount of work and are able to transact a surprisingly large amount of business even in the most adverse circumstances. Static, or strays, as they are scientifically called, tax the ingenuity of every operator and it requires no little skill in receiving and disposing of messages under such conditions.



I quote from Special Order No. 33 as follows:

"Consideration for the receiving operator should be the guiding principle when transmitting through static. To transmit a message at high speed when static renders reception difficult at even low rate of speed, results only in loss of time and energy.

"The number of repetitions required and the speed of transmission should be determined by the nature of the prevailing static as well as the ability of the receiving operator.

"When the transmitting operator decides as to the number of times he will repeat each word of the message, care should be taken to send steadily and to space properly. The transmitting operator should be particularly careful to see that each repetition is made in identically the same manner as not to confuse the receiving operator with different signals. It should also be borne in mind that superfluous signals, while always detrimental to efficient operation, are especially hindering during static conditions and they should therefore be eliminated."

The question of fast and slow sending has frequently been discussed, and I believe the general opinion is that comparatively fast sending—say about eighteen or twenty words a minute when each word is repeated—produces the best results, if static is intermittent and signals are good. Too many clicks occur in each word sent slowly, whereas it is possible to get nearly the whole word if sent somewhat rapidly and repeated. If the static is continuous the operator should always send slowly. It is possible to receive through weak static without repeating, if a low rate of speed is employed in sending.

Figures should be spelled out when static is bad. On account of the similarity of figures and the short space of time required to make them, one or two loud clicks or "grinders" will knock them higher than a kite; therefore, in spelling them out, we are able to fill in one or two missing letters, thereby making reception more sure and speedy. Sending each word once, then repeating the whole message, does not improve matters; instead it is a valuable waste of time.

Short numerals are often easier to receive than long numerals. For instance, the figure 0 becomes confused with the figure 1, in static, owing to the similarity of the cipher and the numeral. The writer strongly advocates the use of the long dash for the figure 0, and greater use of the short numerals. Unless we do this we shall be handicapped when the time comes for trans-Atlantic work where they will be used considerably, if not exclusively.

When there are no atmospheric disturbances, speed is what we most desire, though it should always be accompanied by good sending. It is useless to think that an operator can "fall down" on a word and pass it by, for he will surely be asked to repeat the missing word. A little advice, given to me when I was learning telegraphy in a railroad station, comes to me now. An old operator in the Philadelphia Postal Telegraph-Cable office, one hundred and thirty miles distant, said when I tried to "burn him up" over the wire: "Take it easy, learn to send steady and space well before attempting speed!"

When good sending is combined with speed the operators in the coast stations should have no difficulty in handling messages as fast as over the ordinary land wires. There is nothing more exasperating than to have an operator drag along at a snail's pace when conditions are favorable and half a dozen ships are waiting to get their messages off. Operators of this caliber should be compelled to wait until all others have finished before they are permitted to send. It is not an infrequent occurrence to have operators dally along two or three minutes on one "manager" message when thirty seconds should be sufficient. "Manager" messages, not unlike train orders, are practically all of the same order and should be disposed of as rapidly as possible. It is folly to assume that the coast station men are not capable of receiving messages at a faster rate, for if it were not so the Company would soon weed them out. Why not employ a little more zest, therefore, when sending?

We would be astounded if confronted in writing with the useless work done during each twenty-four hours. A ship operator recently called NAN and NAM at short intervals for three hours; during one of our busiest hours he took it upon himself to send press to another ship for forty minutes without a break and without first having requested or obtained permission from the nearby coast station. During this time seven ships stood by waiting to send their massages to this station. It is estimated that during these three hours the offending operator took up more time than the coast station which handled about twenty-five messages. The sum of the ship operator's labors was only one message. Like many other operators he thought he was at liberty to call as often as he chose just as soon as the coast station acknowledged receipt of a message. Operators should realize that we cannot hear the ships calling while interference is taking place so close to us.

(Sig)

Another ship relayed a "manager" message to us and called a few minutes later, saying the office of origin wished the letter S omitted in the word shoals and the letter E changed to I in the captain's name in the signature. Such piddling is positively absurd. Neither the word "shoal" nor the signature is ever used when compiling position reports for the Marconi Press Agency. All superfluous words are omitted, merely advising as follows: "Noon Havana 365 Scotland." Or when reporting freight ships or other steamers having no regular port of entry a slight addition is made, thus: "7 pm Archbold Port-Arthur for Bayonne ninety SW Diamond." If some of the unnecessary words were cut out before sending "manager" messages there would be less difficulty in disposing of them through atmospheric disturbances and outside interference.

Messages have come to us like this: "Manager Marconi station Cape Hatteras, s.s. Springfield bound from New York to Galveston was 227 miles south southwest of Diamond Shoal Lightship at 6.50 p.m., July 18th, (signed) H. B. Woodland, master, s.s. Springfield. This message should have been transmitted in this manner: "Mgr WHA, Springfield New York for Galveston 227 SW Diamond 7 p.m., (signed) Woodland." The words "Marconi station" are useless in the address because every operator knows that Cape Hatteras is a Marconi station. One or two operators have adopted a form in which all prepositions are omitted. For instance "New York Galveston" in the text indicates the ship is bound from the former to the latter port. The word "commander" in the signature has come into general use and is easier to receive than many of the captains' names. However, this is a small matter because the names themselves are not used, as previously stated. Consequently the operator is seldom asked for a repetition of the signature in a message of this kind.

Operators have said to me, "We've got to send what the Old Man gives us." Why worry the skipper with details when he does not understand the situation and you are doing him full justice? The moral aspect is the same whether the ship or shore station operator eliminates the unnecessary words. You understand, of course, that these statements apply only to "manager" messages. In a through marconigram we must have proper authority to make any changes.

I have heard coast station operators remark that coil tests—QSA and QRU

—were a nuisance. Coil tests are necessary and should be made as often as required by law. It is gratifying to note that operators are confining such tests to inactive periods. QRU is employed somewhat frequently. It is all right on one-man ships and craft far distant, especially if there is considerable interference in the vicinity, but on vessels close to shore on which it is customary to maintain a constant watch it seems quite unnecessary. It is not amiss to say here that operators who are given to enjoying tete-a-tetes with passengers of the gentler sex should not reveal the fact with a QRU immediately after the conversations have ended.

Unnecessary communication has been a very troublesome factor in the service, resulting in reprimands for many operators. It usually occurs when those engaged in it believe that quiet prevails. In the meantime other ships call and are obliged to wait until the exchange of words ceases. Occurrences of this kind are fast becoming events of the past, however. Four or five years ago idle wirelessing was carried on to such an extent that it precipitated clashes with operators who had been waiting to transmit messages or failed to copy press news. For instance, a ship operator who had been offered a detail at the Cape Hatteras station in the days when the United Wireless Telegraph Company was active, was told to "talk it over" with the operator at that station when passing. I shudder to think of what would happen if the messages exchanged were repeated now—five years later. About all we hear at the present time are a few choppy words—some form of greeting for the most part—which will also be done away with in the near future. In fact the Marconi Company has forbidden its operators to engage in any idle exchange of words, even forbidding them from passing GM, GE, 73, etc.

Some of you, when in the middle of a message, may have heard an operator break in, calling CQ or QST and say, "QRA starboard side," giving ships call letters several times, soon followed by "QRA starboard side here s.s. Nicholas bound from Petrograd to Berlin." If you have you will never do so yourself; if you have not, please have compassion on us and refrain from doing so.

It is with a feeling of misgiving, in view of the government examination, that I use the word inefficient in connection with the work of some operators, so perhaps inexperience would be more appropriate, except in a few rare cases involving bad sending and spacing which might be remedied with a little practice and forethought. Making the letter V for the figure 4, adding an extra dot to the figure 3 thus confusing it with the figure 2; jerky sending, intermingling of words, running the street and house numbers together, omitting the full name of ship in office of origin, failure to put the state in parenthesis when not counted, stumbling over words and not repeating them, inserting a number of periods and omitting the double dash, proceeding with the message after the spark has gone bad and repeating words and figures in endless succession without spacing properly are a few of the irregularities in sending.

Calling the station a great number of times without making your own call letters often enough is another fault which should be avoided. About the time this was written a ship gave me two very long calls, but I could not catch the call letters. The third time the operator called WHA eighteen times, flashed MSG twice, then signed once. Failure to answer a ship is largely due to this cause. Calling a station is very much like calling a man's name in a crowd; it immediately attracts his attention.

There seems to be a general misinterpretation of the prefixes used in relayed messages. Four-fifths of the operators, including the coast stations, will relay a message and prefix it with an X to the office of destination. Prefixes are not only intended for abstracting, but as a guide to the receiving station in the use of proper message forms. It is because of the latter purpose that they are sent first. If the letter X is included in the prefix the receiving operator naturally reaches for the relay pad. In practice most operators will relay a message to a coast station and prefix it in just such a manner, compelling us to recopy some of them on different blanks.

A relayed message should be prefixed with an X to the ship that relays it, but the latter should omit it when forwarding to the office of destination. Thus an MSG originating from the s.s Caracas and relayed to Hatteras by the s.s. Lenape should be sent by the KDB as an XMSG to the KVL and the latter should forward it to WHA as an MSG. Coast stations must be treated as the office of destination for all "manager" messages and those intended for retransmission over the land wires. Such messages should be sent to the coast stations as ordinary messages regardless of how received. If desired the word Via may follow the name of the office of origin to indicate that it is a relayed message, but it is not essential.

OFM

The prefix OFM is used only by the naval stations and should be excluded; the letter S should then be used. Ships not equipped with the Marconi system and not caring to use our prefixes should use the word Radio, omitting the prefix, according to international rules. It does not matter what prefix is used by other systems; the rates are not affected. As a matter of convenience, however, we prefer them to use the prefixes P, S and A, as the case may be.

There are a few operators who are unfamiliar with the form used in sending messages. Several weeks ago an operator sent us a message, placing a period at the end of each word; he also omitted the double dash which separates the address from the text and the text from the signature. I can see no excuse for this lack of knowledge; the operator should have learned the form by listening while others were working the form.

There is also a noticeable lack of knowledge in handling of service messages. When a message is received at a coast station for a ship that has passed beyond that zone, the office of origin is serviced in this manner: "Undelivered unable to communicate yours date Johnson s.s. Mexico signed Father, ship may be reached via Tampa Fla if you resend, we cancel and file." The message is marked cancelled and entered accordingly on the report. If the ship does not pass within the range of any other station the message is held for several days and special efforts are made to relay it or deliver direct should the atmospheric conditions prove favorable at night. In the meantime the sender is notified that efforts are being made to reach the ship and that he will be advised later. If the vessel is due in the station zone two or three days later the message is given to some other ship bound in the opposite direction and delivery confirmed after direct communication has been established.

When a message is received for a passenger who is not on board, a service message should be sent addresed to the office of origin, *not the coast station*, thus: "Undeld party not aboard yrs Williams sined same (sig) S.S. Hamblin."

If the addressee does not understand any part of the message, a paid service message should be sent to the office of origin, thus: "Repeat fourth text word not understood yours dated 9th Lambert sined Perkins."

Some of the principal abbreviated terms used in service mesages are: SYS, see your service; SFS, see former service; DFS, disregard former service; NSN, no such number; GSA, give some address; GBA, give better address; and HA, hurry answer. Service messages should be short and to the point. In other words, say all that is necessary in as few words as possible. When an operator wishes to rectify a mistake in a message it is always a good policy to put it in service form, not only comply with the rule prohibiting conversation, but to clear the operator from neglect or error should it come before the Claim Department.

This reminds me of an instance that occurred several months ago. A service message was sent to a ship advising that a certain message was undelivered because the person to whom it was addressed had moved, and his present address was unknown; whereupon the operator informed me that the sender wished his money refunded, asking if it would be all right to do so. He was promptly informed that all claims must be made to our claim agent in New York. The only time an operator is permitted to refund the money is when for any reason he is unable to communicate with the coast station direct or by relay prior to docking, or when he has held the message so long that the sender regards it of no further importance and wishes to cancel it.

The Marconi Company charges only for services rendered. It wishes to please its patrons and favor them whenever circumstances will permit, but after a message has been properly transmitted it has no further responsibility in the matter.

For the information of those who are not thoroughly posted, it should be stated that on all cablegrams sent via Hatteras there is an additional charge of one cent per word—ten word minimum—to be added to the Virginia state rate given in the tariff book. On all W. U. Frank messages there is also a charge of one cent per word, ten word minimum.

Counting of words seems to be exceedingly difficult for some operators. It is evident that they do not refer to the examples given on page 47 of the General Order Book issued by the Marconi Company and page 116 of the Handbook of Regulations, issued in 1913 by the Naval Radio Service. It is hoped that operators not entirely familiar with the counting of words will make careful study of pages 111 to 116 inclusive in the last named book.

The words "ck off" are usually given to the sending station when the count does not agree. It does not necessarily imply that the sending station is wrong for it is possible that the receiving station has missed a word. "Letter" is an invitation to transmit the first letter of each word counting and is a quick method used to locate the missing word. In such words as "New York," where the sender is permitted to forward it as either one or two words in the text, only the letter N should be lettered if counted as one word. In a group of figures give only the first figure of the group counted as one word.

When it is not possible to "letter" with any degree of satisfaction during bad atmospherics it is suggested that a word like "unite" be used as an invitation to unite and transmit the number of words in each of the component parts—for instance "adds 6 text 13 sig 2." This plan has been followed to some extent; except in present practice it usually follows in the nature of a request for the number of words in each, i.e., "how many ws in adds, text and sig?"

There are a few abbreviations in general use, not included on the two large cards issued by the Naval Radio Service, with which many of the operators are not familiar. They have proven a great saving of time and should be learned by all. WA, word after; WB, word before; AA, all after; AB, all before. Preceding these the repeat signal . . - - . . is usually given. It will thus be seen that these signals used with the repeat signal made three times for a repetition of the whole message and inserted between two words, thus: "will . . - - . . morning," asking for all between these two words, cover any and all parts of the message to be repeated without loss of time, or unnecessary words on the part of the sending or receiving operator.

It appears like a useless proceeding to make the ship and station call letters several times before giving the invitation to transmit. The letter K should be sufficient except in the case of ships at long range. Some ignore, mostly from doubt, while others readily respond to this short method. If more than one ship calls, the letter K is preceded by the call letters of the ship with which the land station desires to communicate first, thus: "KVS K." When the letter K is unaccompanied by call letters the ship calling may assume it is for him and proceed to dispose of his business.

To set at rest any doubt on the part of the sending operator, his call letters are usually given once either with K or at the finish with the letter R.

Wireless communication, like the English language, was founded on words that best describe its meaning; therefore the introduction of new words and letters cannot be considered excessive indulgence of liberty when by so doing the entire service is put on a more progressive basis. As every philologer knows, Webster, in his compilation of a dictionary, adopted many terms of common expression in preference to more intricate words; thus we have a great number of idioms in present day use.

With the advancement of science, words and phrases become obsolete as new ones, that more adequately describe the nature of the work, are supplied. While most of the abbreviations and convention signals ratified by the Berlin Convention are in general use, some of them are giving away to better methods of communication.

In conclusion I wish to state that "logging" your fellow workers is not a pleasant task, but anyone who has witnessed the marvelous changes brought about during the last two years can appreciate its value to our employers and to ourselves. It is a duty rightfully imposed upon us and one that we should not hesitate to fulfill. Some (not many) operators take it as a personal affront. On one occasion an operator was "logged" for a lengthy conversation, but being under the control of another system he believed it was malice on the part of the station operator and threatened to write to all the operators of his line in an endeavor to prejudice them against the coast station man. He was a splendid fellow by nature, and as soon as the situation was made plain to him he immediately changed his attitude.

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We sincerely hope you do not look upon us as informers. We are not malicious; we are merely performing our duty. We regret being obliged to "log" operators derelict in their duties, but we cannot allow sympathy to stand in the way of business. This matter was discussed recently with the traffic manager, and he assured me that every operator will receive due consideration and be dealt with as leniently as the circumstances permit, although it is necessary to take proper steps to safeguard and improve the service.

I am convinced that if we exercise care and thought we shall have little trouble in the future.

TUCKERTON PRIVATE MESSAGE SERVICE INTERRUPTED

Announcement was made on August 31 that the wireless station at Tuckerton, N. J., will not accept private messages until further notice. All wireless messages for Germany and Austria, it was said, must be forwarded by way of Sayville, the rates for which are the same as those at the Tuckerton plant.

"If messages are held by the censors for explanation of the text, the published rates for messages from the censors to the sender and also for the reply must be charged to the sender. Only government or embassy messages can be handled via the Tuckerton station," the announcement adds.

Officials at Washington said the decision not to accept private or commercial messages at the Tuckerton wireless station was made necessary by the installation of new machinery, but that the interruption in service will be only temporary. Official messages will continue to be sent.

SAGAPONACK STATION CLOSED

The Sagaponack station of the Marconi Wireless Telegraph Company of America (call letters WSK) has been temporarily discontinued and, until further notice, traffic will be handled by the coast stations at Sea Gate (WSE) and Siasconset (WSC) in place of the Sagaponack station.

The Man Who Directs The Nation's Wireless

Interesting Facts Regarding Captain Bullard Whose Activities as Superintendent of the United States Radio Service Have Brought Him in the Public Eye

Captain W. H. G. Bullard

CAPTAIN W. H. G. BULLARD, U. S. N., superintendent of the United States Radio Service, frequently in the public eye because of his many official activities, which included the taking over of the Sayville station for the United States, was born December 6, 1866, in Media, Delaware County, Pennsylvania. In his boyhood he attended the public schools in that place, being graduated from the high school at the age of fifteen. In the summer of 1882 he won an appointment to the United States Naval Academy after a competitive examination and entered that institution in September, 1882. Four years later he was graduated No. 3 in his class and began a term of two years' sea service preliminary to final graduation before promotion to the lowest grade of commissioned personnel, ensign.

After promotion to this grade he was detailed to duty on the Coast Survey, serving on both coasts of the continent. Sea duty and shore duty alternated and the various grades were passed through until July 1, 1912, when he reached the grade of captain. During this time he saw service in most parts of the world, spending one full term of sea duty in South America and South Africa, and another in the Asiatic station and the Philippines. He also took several sea voyages in the home or Atlantic fleet.

Ambitious to specialize in some particular branch, he began the study of electricity, which he continued to keep up. His first shore duty was in the Electrical Bureau of the Navy Department. The greater part of his shore duty was spent at the Naval Academy, where for four terms he was in the department of physics and chemistry and the department of electrical engineering. He was assigned in July, 1907, to organize the department of electrical engineering, being the first head of that department. He served in this office for four years. Recognizing the need for a text book on electricity for the special use of midshipmen, he prepared the "Hand Book for Naval Electricians." This book, which was merged into the "Naval Electrician's Text Book," has undergone three revisions and enlargements. It is now the standard text book at the Naval Academy for the use of midshipmen in their electrical course. A special laboratory was established under the charge of Captain Bullard. This has grown until it is now used for all kinds of electrical testing and experimenting.

Captain Bullard early identified himself with wireless telegraphy and has devoted particular study to the art since 1899. The Navy Department established the Radio Service in November, 1912, to supervise the government work, and it now includes more than 250 vessels and more than fifty shore stations. Captain Bullard is the first superintendent of the Service. In accordance with the law, certain naval stations are required to handle commercial traffic. The details resulting from this business, including the accounting and auditing, are performed in Captain Bullard's office. International accounting, as required by the London Radiotelegraphic Convention, is also performed in his office.

Captain Bullard was married in 1899 to Ellen Beirne Saunders, daughter of John S. Saunders, of Baltimore, Md. He has one son who is an assistant naval constructor in the United States Navy.

A ROMANCE OF LETTERS AND JEWELS

A New York newspaper relates that Walter Condon, Marconi wireless operator on the steamship Minnehaha, recently came into possession of a woman's handbag containing much jewelry, a few keys, some money and a scandal. It descended upon him as he stood at Fifth avenue and Fourteenth street like some favor of the Caliph in the Arabian Nights, flung from a passing automobile in which five women were quarreling. And then he went to sea with the treasure, including the letters, the blazing, incriminating letters.

"Would have left all in New York if it were not for the nature of the letters," he writes, using the pilot as a postman. The "all" includes keys to vaults, a sum of money, a pearl necklace and three diamond rings, the accoutrements and symbols of a fortune guarded against reclamation by a hissing dragon of scandal coiled all about them.

Condon promises to muzzle the dragon. "The lady missing the same (the handbag, not the dragon) can rest assured," he continues, "that the contents of the letters will not be divulged by me to any one, and if the steamship Minnehaha is met on her next arrival in New York by any one who can fully describe the contents of the bag I will surrender it at once."

But perhaps the lady who flung the thing to the unexpectant multitude at the street corner hoped she was casting her secret, weighted down with jewelry, into an ocean whose waters would close over it forever. And now, like Jonah, it is to return from the depths. Will she welcome it? Will her four quarrelsome companions welcome it also and at the same time? Will Condon escape from the mêlée uninjured? Is honesty the best policy?

WIRELESS HELPS NAVAL OFFICERS

Because of wireless telegraphy the officers of the United States Navy are not compelled to exercise as much initiative as they did in previous years.

The following dispatch was recently sent by Secretary of the Navy Daniels to all commanding officers of the navy:

"Due to the ease with which the Navy Department can be communicated with from all parts of the world, no commander-in-chief, divisional commander, or commanding officer, shall issue an ultimatum to the representative of any foreign government or demand the performance of any service from any such representative that must be executed within a limited time without first communicating with the Navy Department, except in case where such action is necessary to save life."

The Wreck of the A. W. Perry

By L. F. Whitehead, Marconi Operator

ONCE in a while a wreck occurs of which the public hears nothing. I took part in just such a marine mishap, an experience which I will not soon forget.

Four months have elapsed and little or nothing has crept into print about the wreck of the steamship A. W. Perry, so, ill-equipped as I am for the task, I expect it is up to me to guide my unskillful pen as best I can to the end that one more instance of summoning aid by wireless may be recorded.

The Perry was a Plant liner, had a long and serviceable record under her former name, the Byerly, a well-known passenger steamer operated by the United Fruit Company. In the service of the Plant Line she was running between Boston, Halifax and Prince Edward Island. Owing to the scarcity of Canadian operators ever since the war began, I was assigned to this vessel by the American Marconi Company at the request of its affiliated Canadian company. H. D. Phillips, the second operator, who accompanied me, was an American also.

We left Boston on Sunday, June 6, bound for Halifax. We had been given to understand that this was the last trip to that port, as the vessel had been sold to Mexicon interests and was to proceed to New York to be turned over to them.

Sunday was foggy, so was Monday and also Tuesday; I don't remember much about Wednesday. We were in one of those fogs which are so thick that all one can expect to see is the dock in Boston receding and the dock in Halifax approaching. To add to our enjoyment it was one of those "off" voyages when nothing goes right. We left with a record cargo of freight and everything and everyone disagreeing; and so we continued; not one of the crew seemed to sleep at any time, no matter what the hour; the same faces were seen about the deck, even when the men were supposedly off watch.

Thus had time dragged along when on Tuesday at two in the morning I came off watch and Operator Phillips went on. We were proceeding then at reduced speed, trying to pick up Sambro Light Ship. I hadn't slept since noon of the previous Sunday and after about two hours on deck I turned in with most of my clothes on. At 4:45 a. m. there was a crash and a bump. Instantly, I was wide awake and sitting bolt upright; I could hear things tumbling about in the wireless room. . . .

Just as it began to dawn on me what had happened, Phillips came tearing in shouting, "Come quick, we are on the rocks!"

He then stood by at the bridge.

In about five minutes Captain Ellis passed the word to Phillips and the S O S signals went flying. The first station to answer was the Camperdown, N. S., Naval station, acknowledgments being quickly received from the U. S. S. Miami and the Canadian Coast Guard Service ship Premier. The Miami was twenty-four hours away and could not help us, but the others sent encouraging replies.

Tugs dispatched to the scene by telephone from Camperdown arrived in good season, but at the first attempt we saw it was hopeless to expect them to move the Perry. Meanwhile the forty-two passengers had been taken off by a wrecking boat in a manner not particularly graceful, but certainly agreeable.

At noon the steamer was leaking badly; at four in the afternoon the forward hold was flooded and water was rushing in the passageways. The vessel had an ominous list to port and as the wireless room was on that side we watched the water creeping up to the boat deck apprehensively.

The water cut off our power at noon, but I used the coil steadily until 5 p. m., when we were ordered out on deck to stand ready. Preparations were then being made to attempt pulling the vessel off the rocks at full tide.

This attempt proved not only a failure, but caused the ship to shake and pound and list worse than ever. We experienced three hours of suspense while four powerful boats pulled at the lines on our stern. At any moment we expected they might get the ship clear from the rocks, in which case it was very doubtful that she would right herself. Those hours of suspense and the sight of the cruel, grim pinnacles of rock rising as high as the flying bridge of the ship, will stand out in my memory for many a day to come.

Eventually, however, we were ordered to leave the ship—which in itself was some job—and landed safely on a tug boat.

The next morning we thought it possible that some of the wireless apparatus might be taken off; we found, however, that we could not get aboard. Then, as the boats stood waiting around, the Perry was seen to slip down stern first, rock back again, tilt again stern first, and go down. Each time she took a dive the water forced the air out and the cargo shot out of the ports. The roof of the cabin next came off. Great quantities of ashes and soot from the stokehold followed. When she had gone it seemed as if the vessel had been a human being struggling and fighting to the last.

Not a very thrilling story, as I tell it. Nor is the event which it reports written high in the annals of the sea. A good ship was lost. No one won undying fame for heroism. It was just a wreck.

But wireless summoning the tugs made the safety of all possible. And that alone means a great deal to me.

MARCONI SETS ON MORE STANDARD OIL CRAFT

German-owned Telefunken wireless apparatus removed from twenty-two ships of the Standard Oil Company of New Jersey is to be replaced by American equipment, under the terms of a contract closed on September 23 with the Marconi Wireless Telegraph Company of America. The agreement runs for a period of years and the consideration is announced as sufficiently large to be considered the most important transaction in marine wireless telegraphy since the Marconi interests took over the equipments of the United Wireless Telegraph Company in 1912.

At the Marconi offices in New York City it was stated that the ships to be equipped have all been admitted to American registry under the Act of August 18, 1914, and formerly sailed under the German flag. Negotiations have been pending for some time to place the Marconi system throughout the Standard Oil fleet, but the deal could not be consummated while the vessels were under German registry. The contract signed with the New Jersey corporation brings the total of Standard Oil ships equipped to date up to forty-seven. Control of operators, international accounting of message tolls and inspection and maintenance of equipment will be assumed by the Marconi Company under the provisions of its rental policy; coast tax charged for messages to stations along the American coast will also be saved by the Standard Oil fleet.

The following are the twenty-two ships which will be equipped with Marconi apparatus: Ardmore, Baton Rouge, Bayway, Bradford, Brindilla, Caddo, Corning, Cushing, Dayton, De Soto, Moreni, Motano, Muskogee, Petrolite, Pioneer, Polarine, Princeton, Sumerset, Matinicock, Standard, Communipaw, and Glenpool.

Running the Blockade

By J. Edward Jones

HOW would you like to turn in with the thought that at any moment you may be awakened and assisted to leave the ship—perhaps somewhat disconnected—by the explosion of 500 pounds of gun-cotton at the water-line? Well, that is the mental picture with which we who are running the submarine blockade are frequently confronted.

I was a wireless operator on the American liner Philadelphia before the declaration of war; in fact, I was in London at that eventful time. We sailed the following day from Southampton, experiencing great difficulty in passing throught the mines in the Solent. However we got safely away after being stopped by a French torpedo-boat destroyer which gave chase. Since that time we have been running to the port of Liverpool, the Philadelphia being the first American ship to pass through the war zone as declared by Germany on February 18, 1915. It must be exciting, some people say. Exciting? Yes, for a while at least, but the excitement soon gives way under the suspense. It excites many to sing. Not ragtime, but "Will You Meet Me at the River," "Nearer, My God to Thee," "Where the Surges Cease to Roll" and other similar selections.

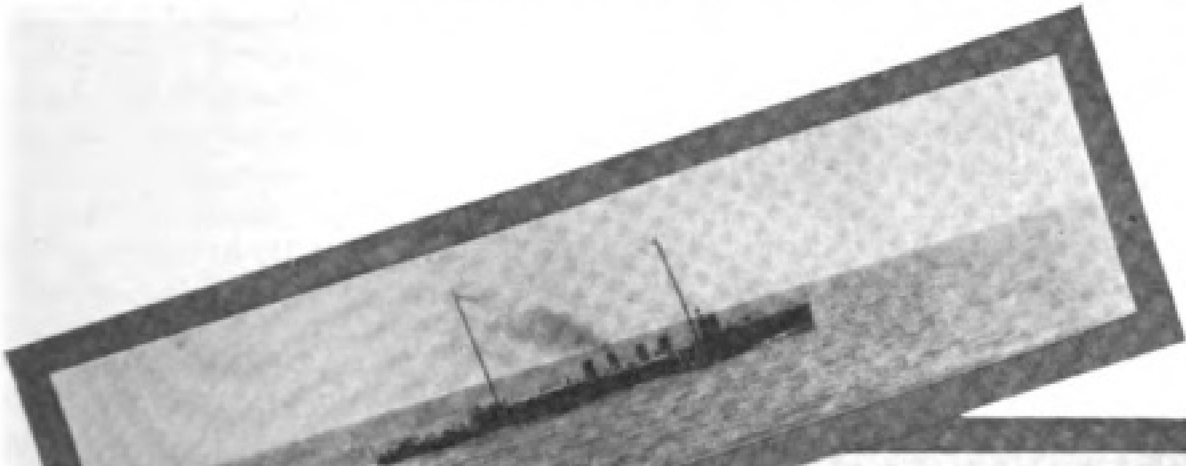
Many little incidents occur on war time voyages that are really interesting to travelers and those who have a thorough knowledge of conditions at sea at the present time, but as they would not be appreciated by the majority of persons, they will not be told of in this narrative. I can truthfully say that the operators are now quite accustomed to war time conditions, in fact, some of the circumstances born of the new order of things have grown somewhat monotonous. On one occasion, for instance, when we were still 900 miles west of Ireland, a woman passenger asked me "Shall we be torpedoed?" This question was followed by "Are there any submarines around us now?" It is needless to say that I could not answer these questions satisfactorily.

Personally I do not consider a voyage through the war zone more hazardous than crossing the remainder of the Atlantic, but it is obvious that others do not share my views. As the ship approaches the war zone measures are taken to pacify the passengers, and perhaps some of the crew. Rumors of dangers to come which, almost without exception, are baseless, are denied, and life-preservers are distributed throughout the vessel, all of the voyagers being instructed in the adjustment of these buoyant vests. The latter are placed so as to be accessible to every person on board. I have heard passengers remark that upon awakening during the night while in the vicinity of the war zone, they have found relief from nervousness by leaving their berths and trying on life-belts.

The life-boats are swung over the side, and hang in the davits ready to be lowered at a moment's notice. Although the emergency for which the boats are actually prepared would not, speaking generally from similar occurrences of the past, necessitate a long stay in the water, yet they are provisioned to meet any requirements of the passengers as well as the law.

On each side of the vessel the words, American Line, are painted in immense letters, six feet high, and just under this is painted, in letters of the same dimension, the name Philadelphia. An American flag flies forward, and the usual small flag aft is replaced by one eighteen feet in length. There could hardly be an excuse, therefore, for mistaking the Philadelphia for a vessel of a belligerent nation. It has been said that a submarine cannot operate in the dark, that it is blind and has a few other drawbacks, so in order to insure protection for those on the American Liner other precautions are taken. At night six clusters of electric lights are placed in such a position that they bring into prominence the name of the ship and the steamship line; an American flag is also placed in the bright glare of these lights. Two clusters of lights, containing six bulbs each, are placed aft in order to illuminat the eighteen-foot flag. These lights produce a striking effect which is greatly admired by the passengers, some of them apparently believing that the illumination is for the purpose of decoration instead of protection. The extra display of lights undoubtedly conveys an emphatic "Do not touch me," to those for whom the warning is intended.

While passing through the war zone the sight of a small barrel may cause a rush to the rail to see a supposed submarine. One man who believed he had sighted an underwaters craft voiced the fact loudly. Followed a commotion which only ended when it was found that the "submarine" was a trawler. A peculiar coincidence occurred on the St. Paul, on which Mr. Marconi left America to respond to the war call of the Italian Government. Steaming on her way from Liverpool to New York, the Philadelphia met the St. Paul on the day before the latter entered the war zone, all our passengers knowing, of course, when we passed her. The rumor that she was being chased by a submarine because Mr. Marconi was on board, circulated about the Philadelphia, the report becoming so persistent that an officer of the ship visited the wireless room to inquire concerning the gossip. I was greatly surprised on my arrival in New York to learn that the same rumor was current in that city, notwithstanding the fact that



"Shall we be torpedoed?" is the uppermost thought of some persons

When a steamship is in the submarine zone the lifeboats are ready to be lowered on short notice. Life-preservers are distributed throughout the vessel, all of the voyagers being instructed in the adjustment of these buoyant vests no word of it had passed from ship to shore or vice versa.

A rather stirring incident happened—or rather we expected it to happen—on one of our recent voyages. We left New York, July 3, and on the night of July 6 we received information from Washington that a bomb, timed to explode on the seventh, had been placed on a ship that left New York bound for England on the third—in all probability the Philadelphia. Now this was something new in the form of sea perils. As we were in mid ocean and there were few ships about, we thought our days, yes, even our hours and minutes, numbered.

I came on watch at fifteen minutes to eleven o'clock at night, eastern Standard time, just after the message had been received. It requires but little imagination, therefore, to realize my feelings as I watched the hands of the clock slowly approach midnight, the beginning of the seventh, listening and waiting during those morning hours for that which I had no desire to hear. A thorough search of the ship was made in an effort to make sure that we did not carry a bomb, the ominous ticking of a quantity of alarm clocks in the ship's cargo adding thrills to the task. The contents of the marconigram were not revealed to anyone on board with the exception of a few of the ship's officers. During this time, we in the wireless cabin expected to hear of an explosion working havoc on some other ship. The ether remained at rest, however, and it was not until after our arrival in England that we learned that a bomb had exploded on the Atlantic transport liner Minnehaha. It caused little damage.

The reader will observe that this article deals for the most part with expectation which in war experiences is in every way preferable to realization. However, there are pleasanter thoughts than those of a little machine which is relentlessly ticking off your last minutes under the deck which holds you, and I can think of more enjoyable ways of employing my time than watching for that thin white line which marks the wake of a torpedo.

War Incidents

APPEALS for aid were flashed by means of Marconi wireless when the White Star Liner Arabic, bound from Liverpool to New York, was torpedoed by a German submarine off Fastnet on the morning of August 19. The vessel was sunk, but the majority of the passengers took to the boats and were picked up by passing vessels. Forty-four persons lost their lives as a result of the attack.

One of the operators on the Arabic, a newspaper dispatch from London says, was Leonard Batchelor. He was twenty-one years old and was taking his first voyage on the liner. He was formerly call boy at a theater and Cyril Maude, who became interested in him, gave him several small parts to play. Afterwards, through the good offices of Mr. Maude, he entered the wireless field.

Among the survivors of the Arabic was J. Edward Usher, a wireless operator, who was on his way to San Francisco to take a detail on a Pacific oil tank steamship. A dispatch from London says that he talked as follows regarding the sinking of the Arabic:

"When we left Liverpool the thing I noticed was that the life-boats were swinging out and that each one had jugs of water and biscuits in it. Also that life-belts were lying on the edge of the decks so as to be handy for passengers if anything happened.

"There was the utmost confidence among the passengers to whom I talked on the first day out, not one seeming to think that there was really any danger of being torpedoed. Being a wireless operator I made myself acquainted with the operators on the ship and they assured me that it was a 100 to 1 shot against our being submarined.

"On Wednesday morning about half past nine o'clock, after breakfast, I went to the promenade deck and sat writing, when suddenly a woman sitting in the chair next to me cried: 'There's a submarine!' The next instant, before I had a chance to get out of the chair, came a terrific jar and it seemed as if the ship was keeling over. At the same time there was an awful roar. The woman next me scrambled up and that's the last I saw of her until at Queenstown when she was standing on the quay.

"After the torpedo struck I ran across the deck to the port side, the torpedo striking us on the starboard side, and began helping women into the boats swinging over the side.

"The amazing thing about it all was that, while many men and women were making for the boats, there was not the slightest uproar and not a sound of excited voices. All seemed bent on getting into the boats as fast as they could and without losing their heads. The crew aided tremendously in getting the passengers into the boats, making sure that they had life-belts and telling every one that they had plenty of chance to escape safely. I must say that I never in my life expected to see a crew so calmly going about their work in such a time, and never thought to see passengers in the face of death be so cool.

"The boats were so accurately handled by the crew that after the passengers got in them there was not the slightest hitch in dropping them to the water. It seemed as if all the passengers must be getting out as all the boats seemed loaded at once.

"As the boats dropped to the sea the Arabic began dipping down, stern first, until as the last boat reached the water, the bow of the liner suddenly leaped straight up into the air. I looked up and saw Captain Finch standing on the bridge. His face was calm and pale, as if he were facing death with the grim resolve not to desert his post. The next moment, as the Arabic plunged with a sizzing roar into the water, I lost sight of the captain. He went down far into the water, into the vortex of the sinking vessel, and the next time I saw him he was on the deck of one of the cruisers that rescued us.

"In the boat I was in were some thirty others, among whom was Stella Carroll, the singer, and her husband.

"When the boats struck the water we became aware of a severe, heavy sea. The waves were not high, but quite choppy, and the boats rolled like corks. As we started to row away from the sinking Arabic we saw two boats drawn down by suction. The passengers in those boats and also at the point where the torpedo struck were probably the ones who lost their lives. Those inside the ship at the point of contact were probably killed instantly.

"There was not a strip of land in sight when the Arabic sank. We rowed around for an hour and a half before we sighted a cruiser. Another cruiser came to the rescue, taking all passengers aboard."

Marconi wireless telegraphy was employed to summon aid to the Allan Line steamship Hesperian, bound from Liverpool to Montreal, when she was attacked by a German submarine about 150 miles west of Queenstown on the night of September 4. The vessel was not sunk, however, and according to newspaper reports, there was little or no life loss.

When the Hesperian was struck, the wireless, according to a passenger, was put out of action. It was quickly repaired, however, and appeals for succor were flashed across the waters. The passengers and crew were ordered into the lifeboats and picked up by the vessels which had been called by the S O S. The Marconi operators were among the last to leave the ship.

The wireless log of the American Line steamship Philadelphia tells a graphic story of the attack. It says that at twenty minutes to nine o'clock on the night of September 4th the "Hesperian sends out S O S. Reports has been torpedoed and sinking. Sent position to bridge. Getting our position. MSN (Hesperian) says: Hurry!" At four minutes after nine o'clock the log records: "ZAAW (patrol boat) now tells MSN (Hesperian) that he is thirty-five miles off and asks if MSN has any passengers aboard. MSN says: "O. K. About 500 passengers aboard." Five minutes afterwards the Hesperian asked the Philadelphia at what speed the latter was going. The Philadelphia replied: "About sixteen knots." At nineteen minutes after nine o'clock the following marconigram was sent from the Hesperian: "Think everyone has abandoned ship except captain and selves. Lights all burning and rockets being sent up."

This cheering message was sent by ZAAW three minutes afterwards: "Will be there in half an hour and have hot coffee, etc., for 500." A few minutes later the Hesperian said: "Torpedo struck forward and she seems to be slowly going down." In the meantime there was still considerable anxiety on the Hesperian, notwithstanding the fact that wireless communication had been established with other ships, for MSN said: "Have told the captain to send up another rocket." Soon after eleven o'clock the patrol boat told the Hesperian: "Coming nearer to you now." At five minutes after midnight the work of rescue had evidently been completed, the Hesperian sending the following message to the Philadelphia: "Your assistance not needed."

Fears were felt for the safety of the Fabre Line steamship Sant' Anna following the receipt of a Marconi wireless message at the Cape Race station on September 12 saying that the vessel was on fire. An official report to Washington later revealed that there were a number of bomb explosions on the vessel. The Sant' Anna steamed from New York for Naples with almost 2,000 Italian reservists on board. The marconigram telling of her peril follows:

"Steamer Sant' Anna in distress, on fire and in need of assistance. Position: Latitude, 40.23 north; longitude, 47.30 west."

This position is nearly in mid-ocean and is in one path of trans-Atlantic liners.

The wireless was used again, this time to give reassurance regarding the safety of the vessel, the following marconigram being received in New York on September 13, from Captain Pavy, the commander of the Sant' Anna:

"Fire in hold No. 2. Fire is now out. Proceeding to Azores escorted by Ancona. Pavy."

The State Department in Washington received advices regarding the fire on the Sant' Anna from Walter H. Schultz, the American consul at St. Michael's, Azores. He reported that when the vessel arrived at Ponta Delgada she brought the news that on Sunday, September 12, at midnight, fire was discovered in hold No. 2, which was filled with general merchandise and baggage. Eighteen fuses—as the bombs are called in the State Department's dispatch—were found and there were a number of explosions.

The Sant' Anna was 1,100 miles east of Halifax when the fire was discovered. The Ancona came to the rescue and the fire was extinguished. The Sant' Anna then proceeded to the Azores, escorted by the Ancona.

As an indication of the demand made by the British Navy for wireless operators, it is reported that up to the present 5,250 Marconi operators have gone into the navy. Among those serving on warships one has earned the Victoria Cross, one the Cross of the Legion of Honor and four the Distinguished Conduct medals.

TUFTS COLLEGE TOWER FALLS

The new wireless telegraph tower at Tufts College, 304 feet in height, was blown over during a gale on September 26, and fell a few feet in front of an express train from Concord, N. H., on the Boston & Maine Railroad. The locomotive was derailed when it plunged into the steel framework, but no one was injured.

Passengers in a trolley car also had a narrow escape. The car was approaching the tower when the motorman, glancing upward, saw it swaying, and brought the car to a standstill within 100 feet of the falling steel. The breaking of a temporary guy wire as the structure swayed in the wind is believed to have led to the accident.

A National Association Promised

Leading Scientists in the Field of Radio Communication Purpose to Combine Efforts for the Development of the Art

CAREFUL investigation into the conditions surrounding the remarkable growth in numbers and importance of amateur wireless workers is to result in the creation of a great national association, if the plans of the most prominent men in the field of radio communication are carried through as promised.

Details of this important undertaking have not yet been fully disclosed, but it is understood that the famous inventor, Marconi, is to head the organization, and among the array of American experts on the executive staff will be Professors Goldsmith and Kennelly. Instruction in the latest developments of the art will be furnished regularly to all members, and, under the present plans, all American amateurs of good standing will be eligible to membership. Existing clubs and associations may later be taken in on a co-operative basis and special discounts on purchases of club material arranged for through national headquarters.

The association will have for its primary purpose the promotion of experiment under capable direction. It will offer a medium for interchange of ideas and experiences and act in an advisory capacity in the conduct of tests that will enable new workers to progress to more interesting fields. Every encouragement will be held out to novices desirous of devoting a lifetime to the end of definite scientific achievement and as progress warrants it, members will be recommended for admission to prominent engineering societies.

With the support of the leading scientists in America, the association is assured of success and will fill a long felt want in the development of experimental work in a new but vastly important field. It has been recognized for some time that only through co-ordination of effort between clubs and individuals will the differences between conflicting commercial and experimental interests be adjusted. Through the acquisition of a national voice the new association will be in a position to state clearly and authoritatively the sentiments of the amateurs as a whole, without disturbing the identity of existing clubs and associations of limited spheres of activity. It is understood that every effort will be made to promote the welfare of these smaller bodies and special facilities for their individual development will be made available by the national council.

A formal announcement of the formation of the organization is promised in time for the November issue of THE WIRELESS AGE, and from the character of the preliminary details already disclosed this magazine feels it imperative that every established amateur call the attention of friends new in the field to the importance of the coming announcement. For the first time in wireless—or any other art or science, for that matter—the humble seeker for truth will be given the opportunity of absorbing at first hand the teachings and counsel of the world's greatest scientists and receive full recognition of whatever attainments qualify him for consideration in the world of scientific research.

TUCKERTON SUIT HEARING DESPITE THE WAR

Vice-Chancellor Stevens has filed an opinion in the Court of Chancery in Trenton, N. J., in which he concludes to hear the suit instituted by a French corporation against corporations of Germany to compel compliance with a contract entered into for the sale of the wireless station at Tuckerton. The vice-chancellor holds that if a suit could be heard in times of peace it could be heard in time of war.

An application was filed by the German companies seeking to have the New Jersey courts kept from taking cognizance because of the existing circumstances, that Germany is at war with France and that to enforce the contract at this time would cut off the only means of communication between the German Empire and the United States. The bill for specific performance was filed by Compagnie Universelle de Telegraphie et de Telephonie Sans Fil against the United States Service Corporation and the Hoch Frequenz-Mackinen Aktiengesellschaft Fuer Drahtlose Telegraphie of Berlin, Germany, which is referred to in the litigation under the abbreviated name "Homag," while the French Company is known under the designation "Cutt."

After holding that the present controversy concerns title to land in New Jersey and is a subject over which New Jersey courts have almost exclusive control, the vice-chancellor said:

"In times of peace the courts take jurisdiction as a matter of course for the benefit of denizens and aliens alike. If foreign nations are at war among themselves, this nation does not cease to be friendly. Its courts remain open to their subjects. Certainly a French citizen may still sue an American citizen. Why should he not sue a German subject? No law of France prohibits it. On the contrary, he may sue even France, if to his advantage and not to the advantage of his enemy. Why may he not sue in the court?

"If he may not, it can only be on the grounds that this court will give some effect to German legislation enacted as a war measure—as a means of crippling its enemies. As I have already shown there is nothing in this legislation, disclosed at least by the plea, that prohibits the German subjects from defending against a French claim. But suppose there were. If this court gave effect to it, it would, in a measure, be enforcing German laws, which, on well settled principles, can have no extra-territorial operation to the detriment of the French citizens asking to be heard. This, it seems to me, would be an unneutral act. I therefore think that the plea should be overruled and that the defendants who have not disclaimed should answer."

Under the contract entered into between the French and Prussian corporations, it was agreed that certain patents of invention for the production of high frequency currents specially intended for wireless telegraphy, together with the Tuckerton radio station, should be transferred to the French corporation. The consideration under the agreement was to be 2,500,000 francs and 50,000 founders' shares in the French company.

It is alleged by the complainants that the time has come to carry out this contract, but that because of the war the Germans refused to live up to its terms. "Homag" asserts that the Tuckerton station can communicate only with the German station at Eilvese, and that to give possesssion of the station to the French at this time would be to prevent Germany from communicating directly with the United States.

Speaking of the latter contention, the vice-chancellor said that this objection seems to be met in the plea that the Navy Department of the United States has exclusive control of the station, which is being operated under the supervision of a naval officer in charge, and that all tolls for messages are being collected by the government of the United States, which holds the station in trust.

Notice of an appeal from the vice-chancellor's order has been filed on behalf of the German company.

A government wireless station will be erected at Coos Bay, Oregon, according to a San Francisco newspaper.

Out of the Static

A Fiction Story

By S. Ten Eyck Bourke and Charles Francis Bourke

In Which You Will Hear of a Fake S O S, a Fool Joke, and a Near Tragedy. A Queer Story of the Immutable Mystery of the Wireless

IT was Blaney, the second operator of the Pandora, who picked out of the crackling static the report of icebergs in the path of her sister ship, the Pacific, then bound eastward on her voyage to Liverpool, and a hundred miles to the north of the Pandora's position.

It was a time and a season when the antics of the ice were turning the heads of the liner captains gray in a single passage, and ocean liners depended for their safety on the high-strung aerials of the wireless—slaves of the telegraph key, as the jinn of old were slaves of the lamp. Any moment a call might come, sending a vessel from her course full speed ahead to the succor of a sister ship.

The Pandora herself, the greatest of ocean steamships, swinging far down over the southern ship lane from Liverpool to New York, out of the zone of such dangers, had not escaped. For five days she had been boring into the heart of the spring equinox and fighting for every mile of her westward passage.

And for five days Blaney, the assistant wireless operator, and Hallowell, his newly appointed chief, who was making his first voyage on the Pandora, had been holding watch and watch in the white-walled wireless room. The men's nerves were on edge from the strain of the responsibility resting upon them, with the safety of the ship dependent on the touch of the telegraph key, and the voice of the vast void filtering into the receptors that the operator on watch wore clamped to his ears.

The myriad voices of the static had become an obsession that pursued them to their sleeping cabins, where, without undressing and sometimes forgetting the food that the stewards had laid out for them, they dropped into the sleep of utter exhaustion.

It was that, more than the steady hours, that was telling on them, though the two operators had been changing places every six hours, day and night, at the key.

It was no time for the human equation to fail or for men's personal feelings to interfere with the work of the wireless. Hermetically sealed against the storm, with a treasure in bullion in her strong room, and twice a thousand souls under her hatches, the Pandora, practically a huge, helpless steel hulk, trusting for eyes and ears to these two men, was racing to save her Royal Mail subsidy.

But trouble was brewing in the wireless room—trouble no man could foresee.

It did not help matters between the two operators that Hallowell, by some influence, had been promoted into the place left vacant when Cameron, former chief operator of the Pandora, was transferred to the Pacific, a place which by all the rules of the game should have been Blaney's.

The first sign of trouble came on the morning of the fifth day when Blaney picked up the message from the Pacific. The warning from the liner in the north came at noon, when he was waiting for Hallowell to relieve him and growling because the chief operator was taking his time about it.

"His lordship thinks he can pound his ear, when there's no glory to be gained—just hard work," Blaney growled.

In that place of crackling electrical devices, resentment had kept the two operators from exchanging any confidences; for the few moments that they met at the relief they confined themselves solely to business; the new chief asked no favors and Blaney offered none—and the message that he picked out of the ether, sent out, as it happened, by his old chief, Cameron, of the Pacific, revived all Blaney's bitter feelings.

It was all nerves, of course; but he couldn't help drawing a comparison between the two men.

"It would be just like luck to smash up old Cameron up there in the ice lanes, and leave dubs in good jobs that are not fit to handle a key with him," Blaney said, swinging around in his chair when he had sent the answering "O. K."

He had supposed he was addressing the remark solely to one of the Pandora's passengers, a young broker, who had struck up an acquaintance with him; but as he spoke, the chief operator came in through the inner bulkhead door. Hallowell had his own sleeping cabin.

He was a younger man than Blaney, but he knew how the assistant operator felt, and he merely picked up the report. Neither operator noticed that the visitor's curiosity led him to read over Hallowell's shoulder:

"s. s. Pacific, New York to Liverpool, one day out, sighting icebergs moving south, latitude 50, longitude 40.

"L. Cameron, Opr."

"So that's her position?" Hallowell said, "only fifty, forty—a hundred miles north of us?"

"That's her position," Blaney answered sullenly, "and Cameron is not a man to repeat his messages. He always gets it over straight first time, ice or no ice, and lets it go at that. There isn't anything else to report."

That was all that passed between them, but the passenger, who knew he didn't belong there, saw how matters stood between the two operators.

He went out with Blaney when the latter clawed his way aft to his sleeping cabin on the deck below. It was blowing great guns. The Pandora, in spite of her great size, staggered as she sheared her way through the huge seas, parting the swells like a great edged knife. As they stood watching the welter of waters Blaney's resentment welled up anew.

"When old Cameron was aboard we didn't have to climb over the decks in weather like this," he said; "we could chin with each other over our own private system, just as well from down here as up above."

He was speaking to himself rather than to the passenger, but the other caught him up, following him into the little sleeping cabin.

"You mean you fellows had a way of communicating with each other?" he said. "A telegraph line, or something. I'd like to see that!"

Blaney was dead tired, and wanted to turn in, but it seemed the quickest way of getting rid of the man. From behind the bulkhead he pulled out a little telegraph instrument, merely a key and sounder, with connecting wires that ran back of the partition.

"It's just a cut-in wire," he explained. "Cameron and I used to have this cabin together, and he rigged it up; ran the wire in between the bulkheads, and connected it with the ship's aerials up on top of the wireless house.

"If it was a green lad up there now in the wireless room," Blaney chuckled, "he'd think he was getting a message right out of the ether. Only, as it happens, this wire isn't working now; it's cut off from the ship's wireless."

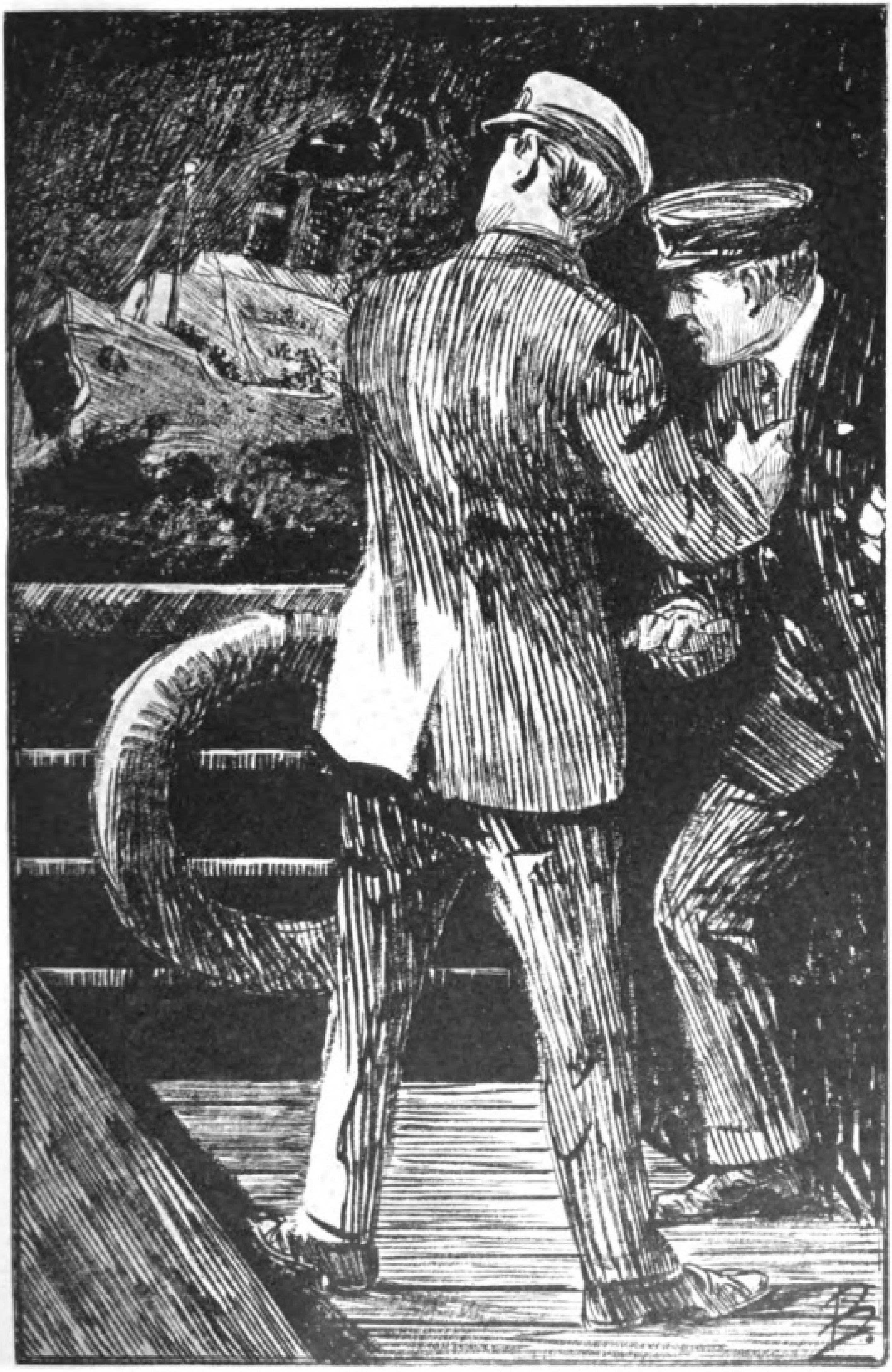
It struck him as a grim joke, nevertheless. It had never occurred to him to tell Hallowell, his new chief, about the little telegraph instrument—a man was not apt to swap confidences with another who had snapped up a job from him. But if he wanted to——

The young broker seemed to read what was passing in his mind.

"By jove!" he said; "you could fool a green operator with this thing. You could shoot a fake S O S up into her aerials when he was listening, and send a big bullion ship like this wheeling miles out of her way. It would mean big money to some speculators to do that," the passenger remarked. "How would you send a message of distress on this thing, anyway?"

If there was anything behind the other's eager acceptance of a "fake" call of distress, Blaney was too sleepy to notice it. It may have been only the possibilities of the thing that got into the young broker's blood.

Outside, the storm seemed to boom louder than ever. The shrieking of the wind and the lashing of the salt spray seemed to assault the great liner like live things, striving to batter her back, hoot-



Out of the murk loomed the Pacific, half swamped, her spars and aerials in a hopeless tangle, her bow splintered and smashed by the seas ing at the puny efforts of officers crowded like bugs on the bridge.

The uproar shut out the sound of the spark that Hallowell, in the wireless room, was sending up into the aerials, then listening for a possible answer, and sending up his tentative call again. On the bridge, the watch, in dripping oilskins, clung on for dear life.

"The S O S message? Why, there's only one form for distress calls." Blaney was tapping mechanically on the little telegraph key. "This thing is cut off from the aerials now, of course," he interpolated. "Cameron himself disconnected the wires before he left the ship. Otherwise it would sound just like a wireless call up above."

He was wishing the passenger would go, but he was too tired himself to take the initiative. His practiced fingers clicked out the terrible call of a ship in travail, as he repeated it aloud:

"S O S. s. s. Pacific. Struck iceberg. Sinking. Latitude 50, longitude 40. Rush help. S O S. Cameron, Opr."

The suggestion, so fresh in his mind from his friend's former message, sent the call clicking off from the key without his own volition. When he glanced up the face of the young broker had gone suddenly white, and he remembered himself, tossing aside the instrument.

"That's a kind of fool joke. Good thing it isn't connected up!" he said with a yawn.

He threw himself on his bunk, too tired to notice the passenger's departure; too dead beat even to touch the lunch that was set out for him. The tumult of ocean sounds passed him by—the pounding of the Pandora's great heart, the sudden thumping of sea boots, and the shouts of the officers, and the snarling, cracking whine of the wireless, like a struck harp string, leaping, blue-flamed, into the aerials and out into the immensity of the void.

Up in the white-walled wireless room, Hallowell, equally white, crouched over his spark-spitting instruments, searching vainly for a faint, little voice that had leaped, without warning, at him out of the ether—the call of a ship in distress in the icy sea—the steamship Pacific, that only a short time before had sent out her warning of ice in the northern lanes, and now lay sinking, a wreck, on the ocean.

Breathlessly Hallowell sent out his answering spark, calling on the Pacific to repeat—to confirm her S O S call.

"No other ship on the ocean seems to have heard it, and I can't raise him again," the chief told the hastily summoned commander. "But the call came from Cameron, on the Pacific, giving her position and all."

It was not customary for a ship to send up an S O S call, and then suddenly "die," even in such a storm as was raging. The officers in the white-walled room stood scowling, awaiting the captain's verdict, while Hallowell sent up his spark and sought over the length of his tuner to pick up some sound out of the miles of murky waters.

"The distance would be nothing to the Pacific, if she could work her set—five hundred miles would be the same as a hundred," the operator said; "but she's just quit, dead!"

To the experienced commander that fact sufficed; the earlier warning of ice that the Pacific had sent out confirmed the crackling summons from the static sufficiently for him. The old sailor's scent of danger leaped, like the wireless, over a hundred miles of storm to that other ship lying somewhere out on the spray-lashed ocean, a helpless wreck, or —since she did not send up her call again —plunging fathoms deep in the icy seas.

"She's sent for us, and we're going!" he said. "Maybe she's only smashed down her machinery, and maybe she's under brine, but——. Turn her head for the north, men, and push her! We'll stop for nothing. And you," he turned on the white-faced Hallowell, "keep on trying to raise her—send out no other messages of any kind."

The great Pandora, till then marking time, engineers at throttle, officers waiting the signal, leaped into life. From her aerials the blue flame of the wireless crackled and spit; her boilers foamed under forced draft, and, turning her lean bows to the north, with the following storm urging her on, she straightened into her stride regardless of obstacles or ice or the peril of death impending for her in her headlong dash.

The call of the wireless had sounded. For the Pandora there was nothing to do but obey—men, machinery, wireless. Only the voice of the Pacific could stop her, once she struck into her stride.

Blaney woke to a sudden realization of a change in the ship's motion, and a sense of trouble in the air that made him leap from his bunk and swing open the door of his cabin. A glance at the tumbling ocean showed him what he wanted to know.

"By George, she's changed her course," he said. "They're driving her straight into the north, with the sea after her. What's that for, I wonder?"

Next moment he knew. Over the boom of the sea and the shrieking of the storm in the rigging came the one sound for which there is no counterpart—the cracking snarl of the wireless spark in the aerials, calling on some ship to answer! Blaney read it off, his hair crisping:

"RR. Tell us where you are, Pacific. Got S O S and coming. RR. Pacific, for God's sake repeat."

"Good heaven!" he said. "Hallowell's heard from the Pacific—she's in trouble with that ice she warned about. That's what they're going north for!"

He snatched up his cap and sprang on deck—face to face with the young broker, who had followed him down to his cabin from the wireless room. The man thrust a crumpled paper at him, a wireless message form, Blaney noted at a glance.

"Here," the passenger said, "your partner won't send that for me to New York—you've got to do it."

Something in his tone, the emphasis on the last words, chilled Blaney with sudden remembrance of what had passed between them in the little cabin.

Had the private wire been connected, after all, when he tapped out that foolish message at this man's insistence? Was the other gambling on that chance, trading on Blaney's open resentment toward Hallowell to compass his own ends—jeopardizing every life aboard, and the great steel hulk herself, in this heedless dash into an ice-mined ocean?

The thing was too dreadful! Hallowell *had* picked up a message from the Pacific—she was in trouble. Hadn't Cameron already sent out one warning, and wouldn't she answer the Pandora's call if all was well with her?

As for this vermin with him—— His eyes blazing, Blaney swung on the passenger. "See here," he snarled, "you're trying to work some of your speculating games, because the ship's delayed—going to the succor of a ship in distress. I'll see you hanged first!"

"You're responsible for sending her," the other snarled back. "Dont you suppose I know the game you put up on that man upstairs? You send that message, *somehow*, or——"

"You're a fool!" Blaney said defiantly. "I'll tell the captain about it myself, if that's what you're thinking of."

He started to claw his way forward, staggering to the lurch of the speeding vessel. Suddenly it swept over him what confession meant. Not dismissal for himself alone, but what if the law of chance, which no man denies who dares old ocean, had turned an antic trick? The Pacific might have sent in a message, even if his own message had gone through; what responsibility was he taking upon himself in turning back the Pandora, when men might be dying up there in the north?

And now, for the first time, he was conscious of another sound, as he clung there, hesitating in the grip of a great fear, the fear of dooming his own ship to imminent disaster, the terror of turning succor from men facing certain death.

The sound grew in volume, rising above the snarl of the wireless—the animal cries of men in anger; stokers, fighting their way up from the engine room. Mutiny!

Blaney knew what mutiny in the fireroom meant. The overworked stokers were in fear of their own lives—lives that hung in the balance with all aboard while the Pandora forced her way through the gloom of the storm.

Running forward, he found himself in a jam of fighting, snarling men; firemen forcing their way out on deck, met by the officers with pistols and handspikes fighting them back. Before he knew it, he found himself in the thick of the mob, fighting side by side with the officers of the ship, dealing blows and taking them.

With the fear in his own heart forcing him on, Blaney fought like a madman. Back and forth on the deck the men struggled. Then suddenly the tangled mass swarmed to the gangway. Panic-stricken, in face of the flaring pistols, the stokers fled like rats back to their hole. Quickly as it had arisen the mutiny melted away—and the great Pandora pounded on.

Blaney, with the fog of fight still on him, staggered forward till he fetched up at the bridge ladder. He would see what Hallowell was doing, anyway. Perhaps by now the Pacific had picked up the Pandora's insistent call; had answered. Then he would know——

Hallowell, crouching, white-faced, over his instruments in the wireless room, sending up his ceaseless cry to the Pacific, glanced up, to face a man as drawn and haggard as himself. For the first time since Blaney had been superseded his eyes, peering out of his bloodstained face, met the other man's without animosity. But there was a fear in them now, a fear that the chief operator could not understand.

Fumbling on Hallowell's desk for the record of that S O S call, Blaney listened as the other mechanically reported what he already knew. His own brain was in a tumult of doubt and anxiety.

It couldn't be, in face of the Pacific's continued silence, that it was his telegraph message that had misled Hallowell. Cameron had said he had disconnected the private wire from the aerials, and it wasn't like old Cameron to be mistaken about a thing like that. Besides, there was always the chance of the two messages coming in together. He clung to that hope. Stranger things had happened over the wireless.

He found that he was searching for, pounced on it—the Pacific's call of distress. Thank God, the report was not in the exact words he had sent—but a man, especially a new operator, might miss a word or two in receiving a call like that. The parallel was terribly close.

His mind was spinning in the deadly circle, torn between silence and confession, round and round. He knew himself to be on the breaking point—and then, the final blow fell.

Suddenly Hallowell's hand ceased rapping out the interminable call of the wireless. The hoarse roar of the Pandora's siren flared up, bellowing like a bull in the night, swelling in its bell-like blast in a roar of triumph as over some long-sought object, suddenly found. Then it died down, listening.

From the ocean, startlingly close aboard, same an answering siren's scream, fainter, but with the unmistakable note that thrilled men's hearts—the human cry of an insensate thing, that had surprise and joy in it, as of men who had been long gazing into the jaws of death and suddenly saw rescue in sight.

"By Jove, they've picked up a ship!" Hallowell cried.

Together, the chief and Blaney sprang to the door. Out of the murk ahead a shapeless hulk had loomed up, black of lights, save for a few firefly lanterns that gleamed palely, like battle lanterns in the squattering smoke and spume that covered her. A great liner!

The Pacific! Drunkenly rocking on the spray-lashed sea, half swamped, her spars and aerials in a hopeless tangle over her side, her funnels gone, and her bows splintered and smashed into shapelessness by the terrible impact of the ice —but unquestionably the lost liner—the Pacific!

"We've found her! She must have struck hard, from the looks—down by the head and her top works raked clean to the rail—but she's still afloat, and her people on her. Thank God, we got to her in time!"

Almost with the roar of her commander on the bridge, the Pandora's boats were racing for those splintered bows, regardless of the high seas, regardless of everything save to reach the black mass of passengers on the sinking ship, who wept and prayed and cheered on the rescuers they had never hoped to see.

"The Pacific!" Blaney stood, with dropped jaw, watching while the boats of the liners shot back and forth under the lee made by the giant Pandora—saving life while yet there was time. "Then she did send out that S O S call, after all!" Blaney said.

Hallowell stared at him, not understanding. "Why, who else sent it?" the chief said. "It didn't come out of the static by itself. Sure," the chief laughed, "she squeezed out one yell, I guess, just before she struck the ice and everything went by the board—And I got it. And there she is, and here we are, and here comes the last boat. There's the cap and the officers, and there's Cameron himself. Come on, Blaney, and greet the procession!"

"Thought we were gone for good when the wireless went!" the Pacific's captain said, as he came over the side. "How in Heaven's name did you happen along?"

"Why, you didn't think we were going to desert you, did you?" his brother commander returned. "We came wheeling for all we were worth the minute we got your S O S."

"Our S O S? Our—— Why, Heaven's name, man! Our aerial wires and spars went first crack when we struck! Operator Cameron couldn't get out an S O S if he wanted——"

"But he did!" Hallowell broke in. "And I got it. Blaney's got the record there—giving your position and telling what had happened, and signed by Operator Cameron. Who else could send it?" the chief repeated his question to Blaney. "It didn't come out of the static!"

"I never sent it," Cameron repeated. "God knows I tried to send up an S O S, but I didn't have time."

Bewildered, he stared at the record Blaney handed him. There it was, the S O S call, the Pacific's position, and her peril, and Operator Cameron's own signature.

Then the eyes of the Pacific's operator met his former assistant's.

Cameron remembered the little telegraph instrument in Blaney's cabin that they had both used so often to talk to each other by way of the Pandora's aerials, so the man on watch could listen to the telegraph and the wireless at the same time, and a strange suspicion, vague, unformed, leaped into the Pacific man's mind. Blaney read his glance, and nodded.

"But it couldn't have been that," the Pandora's assistant repeated doggedly. "That wire wasn't even connected up."

"That's where you're wrong," Cameron said slowly. "I meant to disconnect the wires, but I left the ship in a hurry. I forgot to cut it out."

MARCONI MAN WINS WIRELESS CONTEST

The wireless telegraph contest, one of the features of the telegraphers' tournament held in San Francisco in connection with the Panama-Pacific Exposition, took place on August 27 and was won by A. E. Gerhard of San Francisco, representing the Marconi Wireless Telegraph Company of America. J. L. McKinnon of Los Angeles won the toss for the choice of first transmission, sending thirty-one and a quarter words a minute, which Gerhard received. The latter retransmitted the same messages at the rate of thirty-two and a half words a minute, McKinnon receiving. Through an error the same messages transmitted by McKinnon were given to Gerhard for transmission. The judges decided that Gerhard excelled both in sending and receiving. The following acted as judges:

R. B. Woolverton, United States radio inspector in charge in San Francisco; V. Ford Greaves, United States radio engineer, Washington, D. C., and W. L. Stevenson, in charge of the electrical department of the Postal Telegraph-Cable Company in San Francisco.

The Carnegie diamond medal, representing the all-around telegraphic championship, was awarded to T. S. Brickhouse of San Francisco. Brickhouse also took first honors in the commercial contest for sending 60 messages. H. E. Barfield, of The Associated Press, San Francisco, was the winner in the receiving event. In sending the messages in this contest Brickhouse also established a new world's record.

The New Marconi Standard Equipments

A NEW type of commercial radio apparatus—the Marconi standard 2 k.w. 500 cycle panel set, the power being measured at the transformer primary terminals—has been designed by the Marconi Wireless Telegraph Company of America in order to meet the changing conditions in wireless. These include the great increase in radio traffic, the stricter requirements of the government and the development of the art which makes necessary the substitution of equipments from time to time. As a result of the rental policy which the Marconi Company maintains its patrons receive the benefits of the various improvements in wireless, this fact being attested by the large number of the new sets which the company is installing on coastwise vessesls.

Constructed to conform to the various conditions found on shipboard and with the view of simplifying the handling of the apparatus, the equipment gives increased facilities for transmitting and receiving the great volume of traffic which is met with in congested waters like those of New York Harbor and other ports. In the past, on ships where the wireless cabins were on passenger decks, voyagers frequently complained that they were unable to sleep while the apparatus was in operation. On vessels where the wireless cabin adjoined the quarters of the ship's officers, a similar complaint was made by the latter. The new panel set being of the noiseless quenched gap type, this objectionable feature is eliminated. It has, moreover, the high pitched penetrating musical note which is produced by high frequency apparatus and can be read through static when low frequency notes are unreadable.

The installation of the equipment is considerably simpler than any other type of set, all of the apparatus being mounted on the panel which occupies a minimum amount of space. This feature has a distinct advantage on coastwise craft where the problem of finding accommodations for wireless equipments is a vexed question because of the small size of the cabins on the majority of these vessels. It was impossible to install the earlier type of equipments in a uniform manner because the cabins vary in their dimensions, thereby making different arrangements necessary. Because of the panel feature there is only one way to install the new set. This affords the advantage of standardization, one of the most important essentials in any large industry, both from the viewpoint of operating efficiency and economics.

The telephone companies and other concerns realize the value of standardization and in wireless telegraphy it is perhaps more important than in any other industry. This is a truism for the reason that interchangeability of parts and familiarity with radio equipments by the various operators who are required to handle the same sets are the nucleus of reliable and efficient wireless communication. The efficiency of the operator naturally will be increased with the standardization of marine equipment because of the fact that with one set to learn and master he will become more familiar with the operation of the apparatus than if he were required to work various types of installations. Then, too, the discussions which take place among the operators concerning the operating details of the equipments, will enable each man to obtain the cumulative experience of his fellow-workers regarding the standard set.

Another noteworthy advantage of the new set is that its use makes more practical the transfer of operators from one vessel to another—changes which are frequently necessary. With all ships equipped with standard sets, the operators will not be compelled to spend time and effort in acquiring knowledge regarding how to operate the apparatus. Consequently they will render more efficient service.

A detailed description of the equipment is as follows:

The complete set consists of a transmitting and receiving apparatus and various switches and appliances for manipulating the equipment. The transmitter, which is of the panel type, has all of the regulating and manipulating appliances mounted on the front of the panel so that they are easily accessible. Means are provided so that three wave-lengths—300 meters, 450 meters and 600 meters—can be transmitted, the change of wave-length being accomplished by throwing a switch to the desired position. The control of the switch adjusts all circuits so that the wave-length wanted can be transmitted immediately. This enables the operator to handle traffic with a minimum amount of interference when in congested zones.

On the front of the panel is mounted a wattmeter which indicates the amount of energy consumed at the terminals of the transformer; a radiation meter which indicates the current flow in the aerial circuit; a motor field rheostat which enables the speed of the motor-generator to be varied; a generator field rheostat which permits the variation of the generator voltage; an aerial inductance handle which permits the variation of inductance in the aerial circuit and indicates the amount in turns; a wave-length switch which permits the change of transmitted wave-lengths; a handle which permits the variation of coupling between the closed and aerial circuits, and a low power switch which permits transmission at extremely low power in order

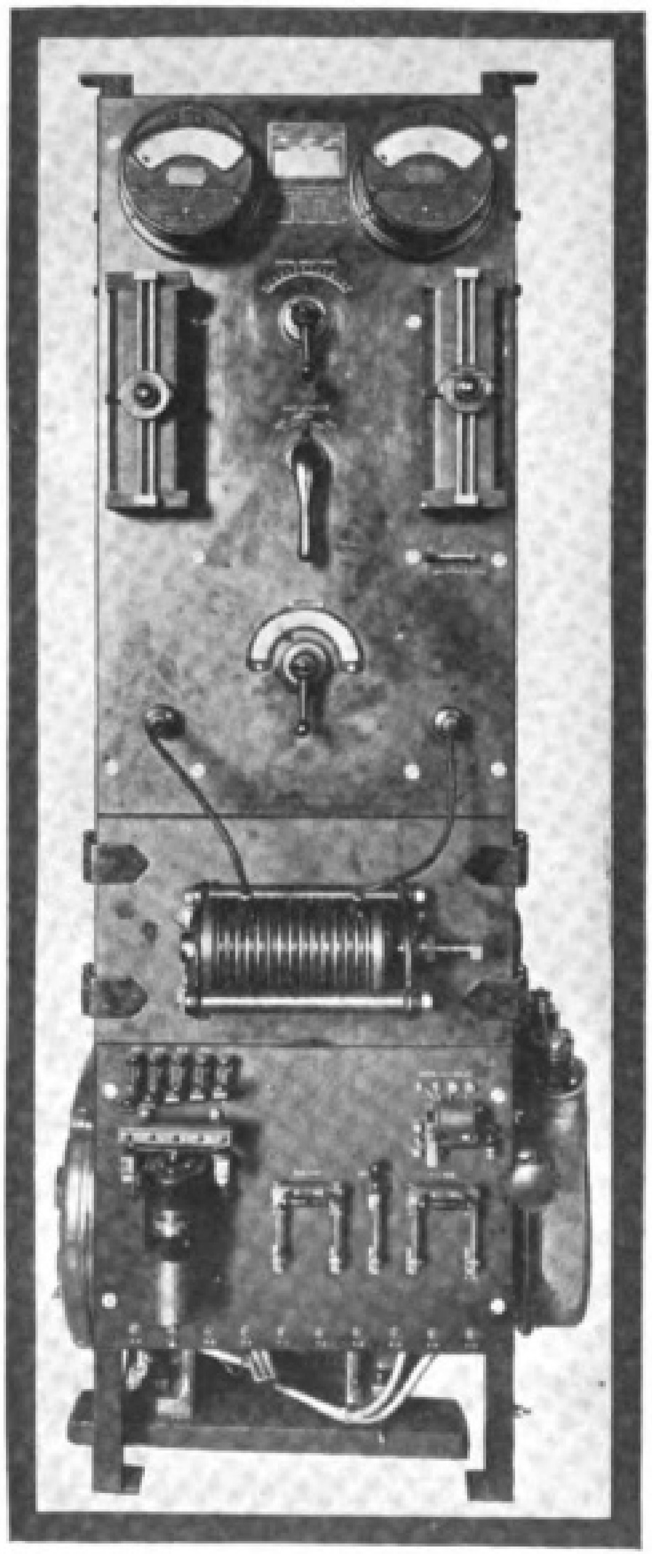


Fig. 1—Front view of the complete transmitter in the new Marconi standard 2 k.w. 500 cycle panel set

to reduce interference to a minimum. Beneath this panel is another panel which contains the quenched spark gap. The latter panel is mounted on hinges so that it can be opened from either side for the purpose of re-

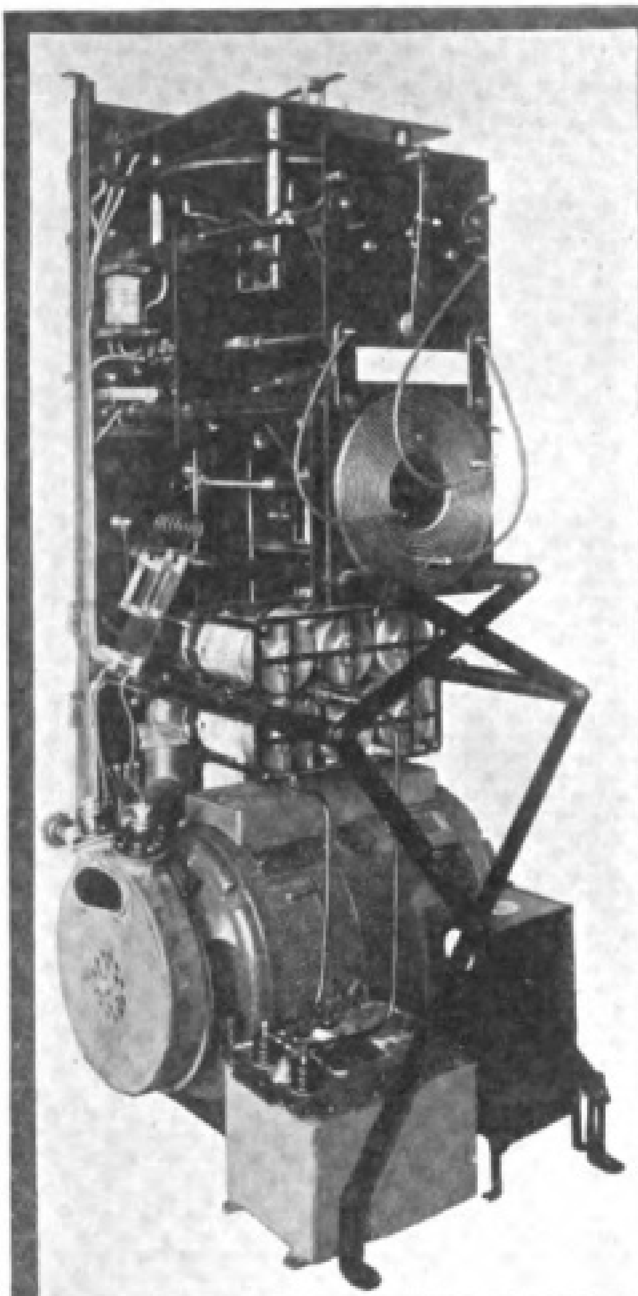


Fig. 2—Side view of the 2 k.w. panel set

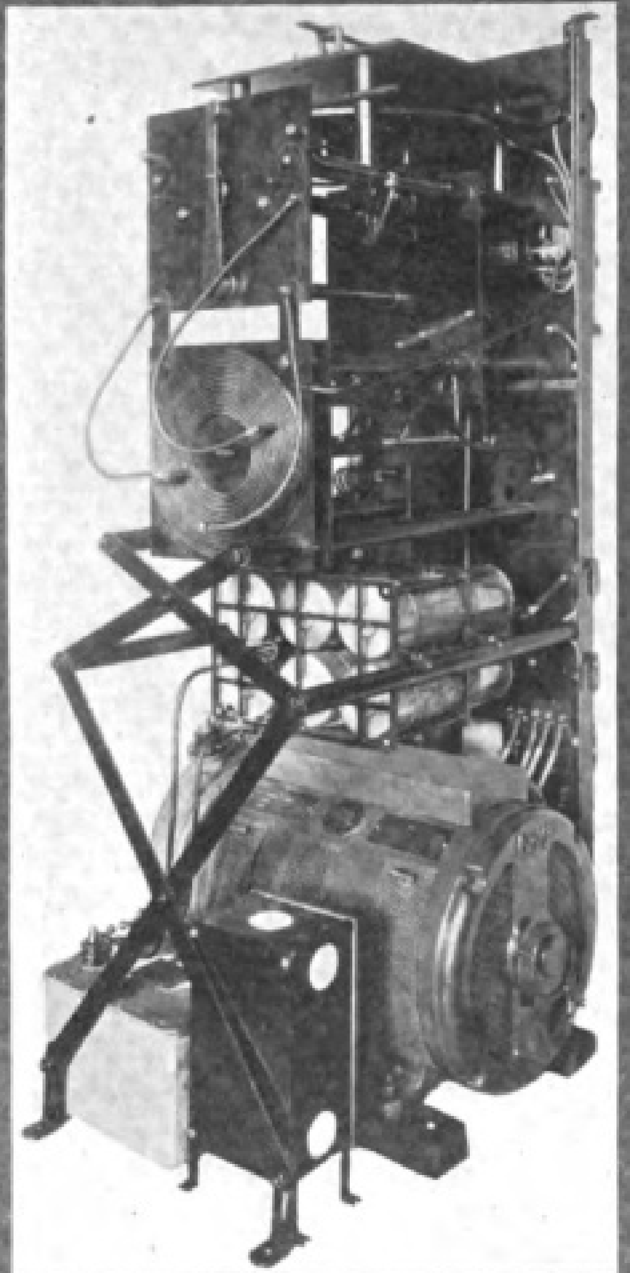


Fig. 3—Back view of the equipment

moving and replacing the condenser jars.

The quenched gap is cooled by an air blast delivered from the combined rotary gap and blower mounted on the end of the motor generator. Beneath the quenched spark gap is placed the starting panel on which are mounted all the starting appliances, control switches and protective devices. A number of posts or lugs are also mounted on this panel, permitting the external connections to be made without difficulty. An automatic starter enables the motor to be started from a distant point by means of a single pole switch. The starter cuts out three steps of resistance when starting and energizes the generator field when the motor is up to full speed. This prevents the operation of the set until all resistance of the starter is cut out. When the control switch is opened the starter automatically connects a resistance across the motor armature terminals which quickly brings the motor generator to a stop.

The fields of the motor are connected to the line voltage until the D. C. switch is open. By means of this mechanism the motor can be started in ten seconds and stopped in approximately the same time. This enables the operator to stop his transmitting set quickly when receiving, an operation which is necessary when the received signals are faint. An over-load relay, which is mounted on the front of the starting panel, opens the motor circuit when an ber of blades are mounted on the rotor which acts as a pressure blower for furnishing air to the quenched gap, as well as ventilating the rotary gap itself. A cast iron case surrounds the rotor, a duct made of insulating material connecting the casing with the quenched gap. A portion of the casing carrying the stationary spark terminals is made rotateable for the purpose of adjusting the spark gap to the proper position for operating. This casing is rotated by means of a handle mounted on the side of the panel.

The transformer, which is of the closed core type, is enclosed in an iron case. The windings and core are supported from the cover of the transformer, together with the primary and secondary terminals. The windings are completely immersed in a transformer oil, which is solid at ordinary temperatures. A protective spark gap is provided at the terminals of the secondary which permits a discharge to the case of the transformer when the potentials become excessive. The case of the transformer is grounded.

The starting and stopping resistance units are mounted in a case which is installed on the floor of the operating room, back of the panel.

The motor-generator is mounted on the floor of the operating room back of the starting panel. The transformer and resistance units are mounted on the floor immediately back of the motor-generator. Connections between these appliances are made by means of lead covered cables to the starting panel. The cables are made up in groups of proper length, so that the set can readily be connected up.

Fig. 1 shows a front view of the complete transmitter; Fig. 2 a side view, and Fig. 3 a back view.

The elements of the high frequency circuits are mounted back of the transmitting panel and supported on insulating rods. The inductance coils are of spiral form and consist of a bakelite dilector slab having a spiral groove cut in one face. Into the spiral groove is fitted a strip of copper of the desired number of turns. This form of inductance has been found very convenient and economical from the standpoint of space. It also permits contact at any desired point on the spiral. The closed oscillating circuit consists of an inductance called the primary, a condenser consisting of six jars having a capacity of .002 microfarad each, the quenched spark gap, the rotary spark gap and the wave-length switch. All of these elements are connected in series. A switch permits either the rotary spark gap or the quenched gap to be connected in the circuit. The wave-changing switch is controlled by the handle on the front of the panel and, when in the 300-meter position, three jars, or half of the total capacity, are connected in the circuit. This was necessary, due to the fact that on this short wave-length and with the total capacity of .012 microfarad in the circuit, there would not be enough inductance used to permit the necessary coupling between the aerial circuit and the closed circuit. When operating on 300-meter wave-length only half power, or 1 k.w., can be used. A reactance is automatically connected in the circuit of the transformer primary which gives the proper working conditions for operating on this power. When the wave-length switch is set at 450 meters, six jars, or the total capacity of .012 microfarad, is inserted in the circuit, together with the proper amount of inductance. When set for 600 meters the total capacity and the proper amount of inductance are inserted in the circuit.

The aerial circuit consists of the antenna; the aerial inductance, which is varied by means of the handle on the front of the board; a loading inductance which permits contact to be made at any point, and another inductance called secondary. All of these elements are connected in series to the ground through the thermo junction of the radiation meter. The primary or the inductance of the closed circuit can have its distance from the secondary varied by means of a handle marked coupling. This permits varying the mutual inductance between the two circuits. A wave-length changing switch is also inserted in the aerial circuit which is controlled by the handle on the front of the board. The handle controls both the primary and secondary switches so that one operation not only connects in the proper amount of inductance and condenser in the closed oscillating circuit and the aerial circuit, but also permits the change of wave-length and still maintains the proper coupling between the two circuits without varying the distance between the primary and secondary. When operating on the quenched gap the distance between the primary and secondary is very short and is kept constant. In tuning up the sets, therefore, it is necessary to get the proper coupling between the two circuits by adjusting the correct amount of inductance in the secondary, at the same time providing the necessary inductance in the loading coil for obtaining the desired wave-length. The primary circuits are set for a definite wave-length, and in tuning the set it is not necessary to use a wave-meter.

Operation with the rotary gap requires a much looser coupling than with the quenched gap and when the former gap is used the coupling is adjusted to a considerably greater distance. The proper coupling for operating on this gap is determined by varying the handle until a maximum reading is observed in the aerial ammeter.

The receiving set is made up of a type 106 tuner with a crystal detector. The tuner consists essentially of a variable inductance which is placed in series with the antenna and the ground. This inductance is called primary. A small variable condenser is also in series with this circuit being used to shorten the natural period of the aerial so that signals of short wave-length can be received. When this condenser is not needed it is turned to the "off" position where it short-circuits itself. The closed circuit consists of a variable inductance and a variable condenser in series. The variable inductance is movable relative to the primary so that the coupling between the two circuits can be varied. In shunt to the variable condenser of the closed circuit is connected a potentiometer, with the detector and a condenser, all in series with each other. The telephones are connected in shunt to the last named condenser. A battery provides the necessary current for operating some types of crystals. Other types of crystals do not need this current; therefore a switch is provided by which the battery circuit can be opened or closed at will. A buzzer circuit is provided for testing the sensitive condition of the crystals. Provision is made not only for adjusting the capacity and inductance of these circuits to resonance with the received signal, but also for varying the ratio capacity to the inductance of the circuit while maintaining the same wave-length in the circuits. It has been found in practice that crystals operate best with a certain value of inductance in the circuit. Fig. 4 shows a front view of the complete receiving set.

An antenna switch, while in receiving position, throws the receiving circuits into operative condition and at the same time opens the primary circuit of the transformer and the generator field and stops the motor-generator. When the switch is thrown into transmitting position, the last named circuits are closed and the motor-generator is started. The receiving circuits are automatically short-circuited in order to protect them from the transmitter. A single-pole switch, when closed, keeps the motor-generator running continuously.

A key of special construction permits the opening and closing of the transformer circuit in accordance with the signals to be sent.

In some cases a series condenser, connected in series in the aerial circuit, is provided, being employed to shorten the natural period of the aerial in order that a 300-meter wave may be transmitted. The condenser is short-circuited when the other wave-lengths are employed. When the natural period of the aerial is below 250 meters it is not necessary to use the series condenser.

Fig. 5 shows a diagram of connections of the complete set. Great care was taken in designing the apparatus to provide a large factor of safety in order to do away with all causes of trouble. The equipment is complete in every detail and only a very short time is required to install it on shipboard. In the majority of installations a storage battery is used so that the set can be operated independent of the ship's power.

A ½ k.w. set, which is similar in all essentials to the 2 k.w. equipment, has also been designed by the Marconi Company. It is intended for use on smaller vessels and as an auxiliary set on large craft. As the generator, transformer and other appliances in the ½ k.w. set are of such weight as to permit mounting on the panel frame work, the transmitting apparatus is made in a complete unit.

IN THE SERVICE

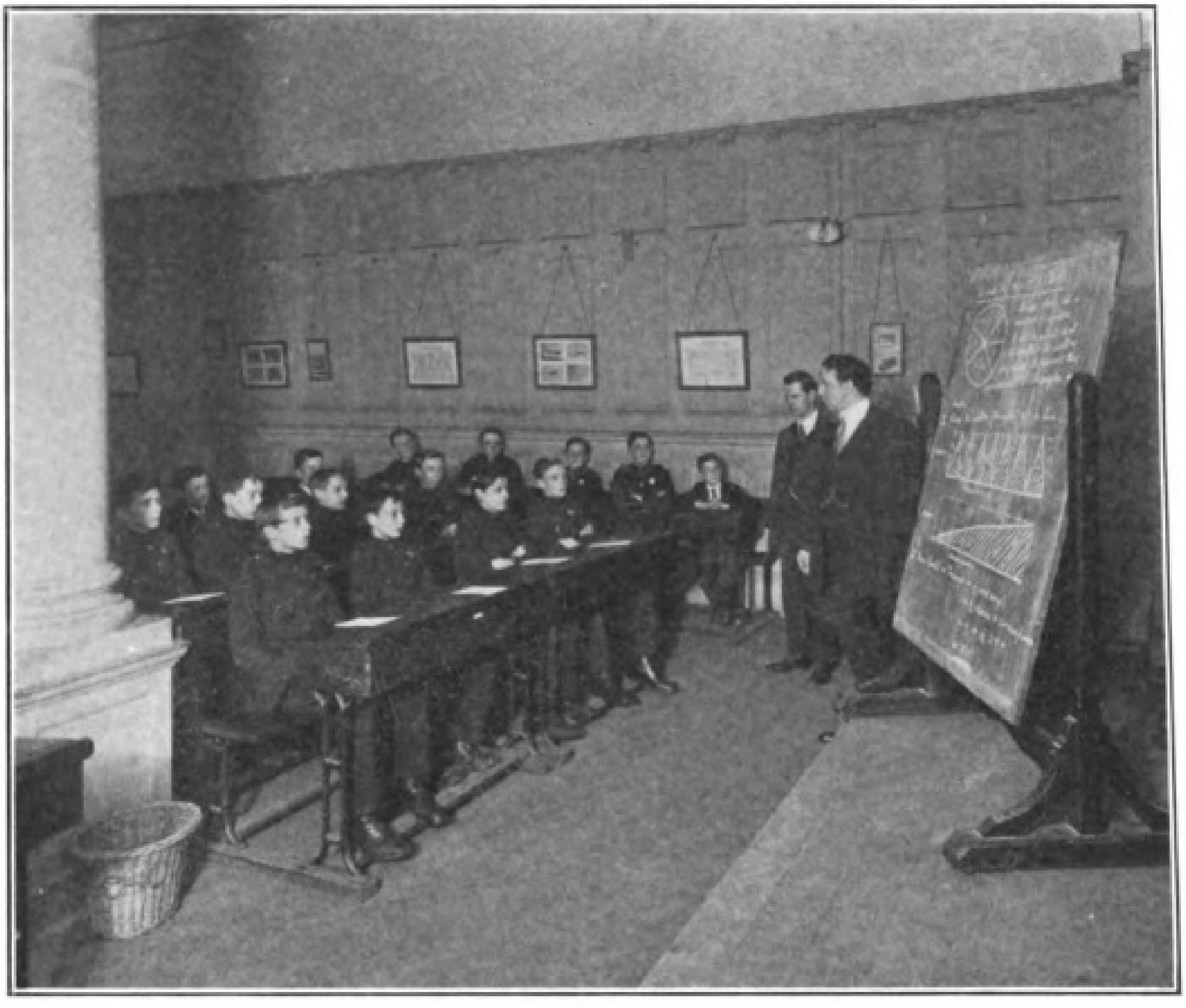
The wireless equipments and the men who operate them have been written of in THE WIRELESS AGE at various times. Little has been said, however, of George W. Hayes, who, as superintendent of the factory of the Marconi Wireless Telegraph Company of America at Aldene, N. J., oversees the construction of the apparatus. Who he is and what he has done have a timely interest in view of the fact that the factory recently turned out a new type of commercial set, a description of which is published in this issue.

Hayes was born in Rexfords Flats, Saratoga County, New York, in October, 1884. He attended the grammar and high schools and the electrical night school in Schenectady, afterwards obtaining employment in the engineering department of the Schenectady Railway Company. His next step in the working world took him into the employ of the General Electric Company in Schenectady. During this time he showed his interest in wireless by conducting experiments in the art at his home. He remained in the employ of the General Electric Company for three years, leaving its service in October, 1907, to become assistant superintendent of a factory maintained by a wireless telegraph company in Jersey City.

When the Marconi Wireless Telegraph Company of America extended the field of its operations in 1912, Hayes was appointed superintendent of the factory at Aldene. Some idea of his responsibilities can be gained from the statement that practically all of the American wireless sets in commercial use are manufactured in the Aldene factory. In fact, the demand for apparatus has been so great that it has been necessary to keep the factory in operation both day and night for long periods.

In one part of the building are almost a hundred types and styles of various machines which are used to prepare the many parts of apparatus for the assembly departments. The task assigned to each man is checked up by means of a system which effectively guards against mistakes. Not less interesting than the machine shop is the precision department where the parts which call for minutely precise machining and very delicate handling are made. Exactness in every task is the keynote of the work in this department. The transformer department, the testing department and the electro-plating room should also be mentioned as features of the work connected with Hayes' activities. Protection against fire is afforded by two Marconi fire companies, fully equipped with apparatus to fight the flames. The efficiency of the members of the companies is increased by a drill which is held twice a month.

Notwithstanding the multitude of details born of his responsibilities, Hayes has found opportunity to cultivate a fad—photography. A large collection of photographs attests his skill with the camera.



The Marconi service has a particularly strong fascination for youths and young men. In this photograph are shown the members of the messengers' education class in Marconi House, London

HONGKONG WIRELESS SERVICE

After about six years of agitation and negotiation, including lively debates in the Hongkong Legislative Council and official communications between various governmental authorities concerned, the port of Hongkong finally has a wireless telegraph service with ships and coast stations within a radius of 500 to 700 miles in daytime and 1,300 miles and over at night in that part of the world. The wireless plant, which has been under construction for the past six months, under the supervision of an expert sent out from England, has been completed and placed in regular service by the government. The service is in charge of the post-office department of the colonial government, and the Hongkong post office handles the local business. Messsages are now received in the Hongkong post office. A charge of $3 local currency, or about $1.32 gold at present exchange, is a minimum for sending a message, this charge covering a 10-word radiogram. For each additional word a charge of $0.30 local currency, or 13.2 cents gold, is made, the address and signature being counted in the message in each case. These charges do not include the ship or receiving-station charges.

The wireless service thus inaugurated is from a well-equipped station erected in a most substantial manner. The service is independent of the military and naval wireless station erected on Stonecutters Island in Hongkong Harbor, which has been erected under the supervision of the same expert.

From and For those who help themselves

Experimenters' Experiences.

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

FIRST PRIZE, TEN DOLLARS

A Cabinet Receiving Set of the Panel Type

The receiving set about to be described is specifically designed for the reception of comparatively long wave-lengths. Within the cabinet is combined an inductively-coupled receiving transformer, an aerial tuning inductance, an audion and a perikon detector with the associated appliances for obtaining conditions of sensitiveness. A feature of the set is the use of rotary movements for all the variable elements such as condensers, potentiometer switches, primary and secondary switches, etc. The coupling between the primary and secondary winding is likewise altered by a knob with a rotary movement mounted on the front of the box, as in Fig. 1.

A general view of the front elevation of the assembled apparatus is shown in Fig. 1, a corresponding diagram of connections in Fig. 2 and the details of the switch parts and crystal holders in Fig. 3. Fig. 4 shows a side elevation of the assembled apparatus with the panel removed, while Fig. 5 shows the dimensions of the various transformer parts.

The construction of the cabinet will first be considered. The following pieces, preferably of surfaced cherry, should be ordered: Base (one piece), 21 inches by 13 inches by 1 inch; top (one piece), 21 inches by 13 inches by $\frac{5}{8}$ of an inch; back (one piece), 20 inches by 12 inches by $\frac{5}{8}$ of an inch; ends (two pieces), 12 inches by 12 inches by $\frac{5}{8}$ of an inch. As a support for the inductances of the primary winding and the antenna circuit two pieces are required which should have dimensions of 5 inches by 10 inches by $\frac{1}{2}$ inch; for the secondary winding heads, two pieces, $4\frac{1}{2}$ inches by $4\frac{1}{2}$ inches by $\frac{1}{4}$ of an inch are required. To insure accuracy the four latter pieces should be taken to a cabinet shop for turning.

After the back corners of the cabinet are mitered all pieces should be drilled for binding-posts and screws just previous to the application of sandpaper. This completed, they should be rubbed with No. 00 sandpaper, followed by a coating of mahogany wood dye. When thoroughly dry the surface should be waxed and rubbed until a perfectly satisfactory polish is secured.

The front panel of the box may be either a piece of bakelite or hard rubber, 20 inches by 20 inches by $\frac{1}{4}$ of an inch. The dimensions for drilling of the panel are shown in Fig. 1. The necessary positions for taps, scales, and screws should be plainly marked, as per the drawing.

The places marked for taps are to be drilled out with a 3-16 inch auger bit followed by the drilling of holes for the

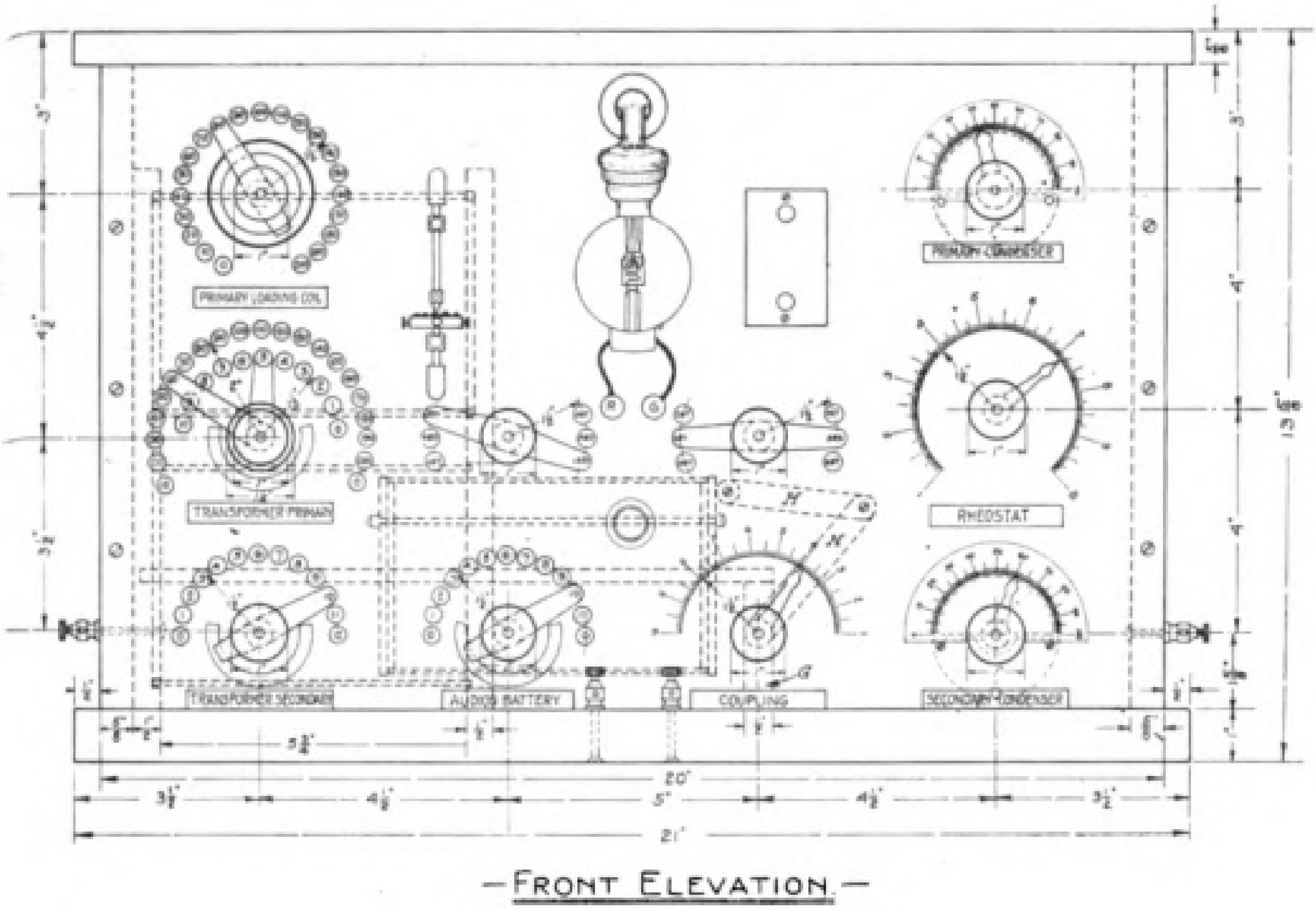


Fig. 1, First Prize Article

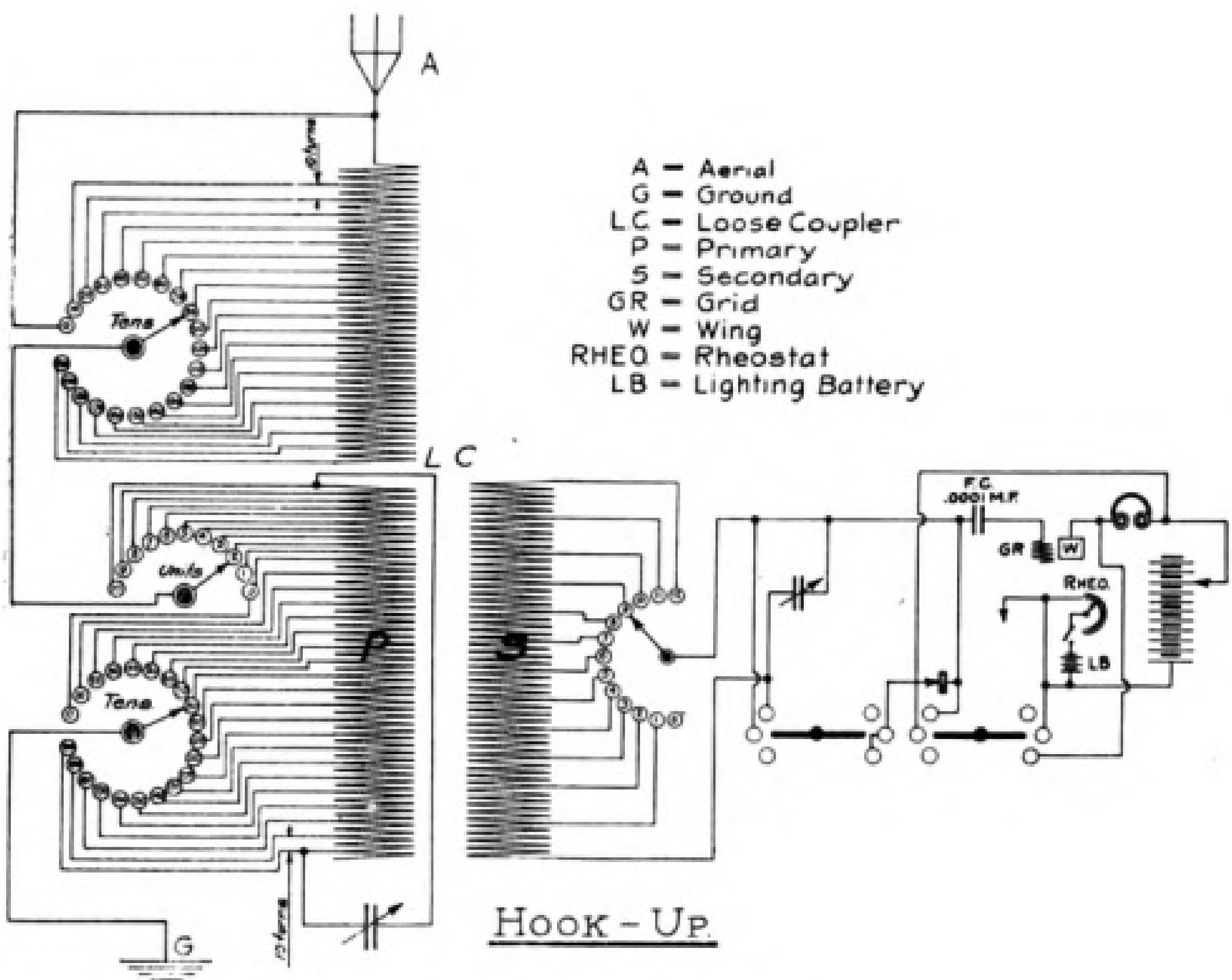


Fig. 2, First Prize Article

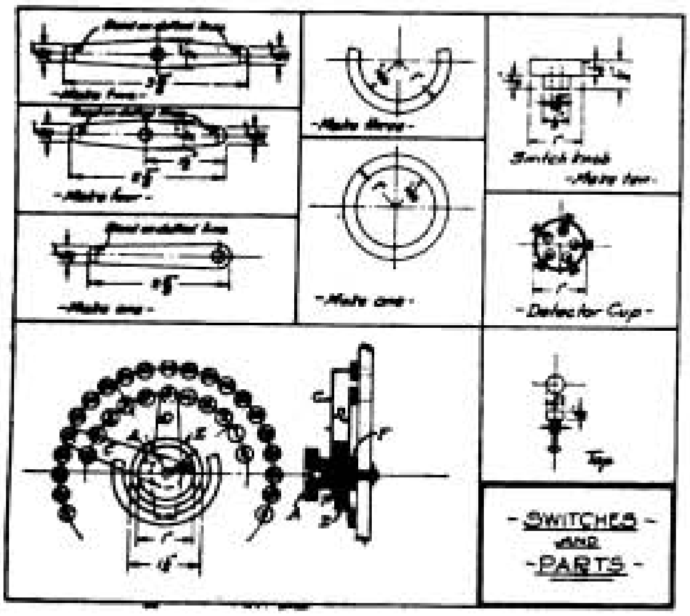


Fig. 3, First Prize Article

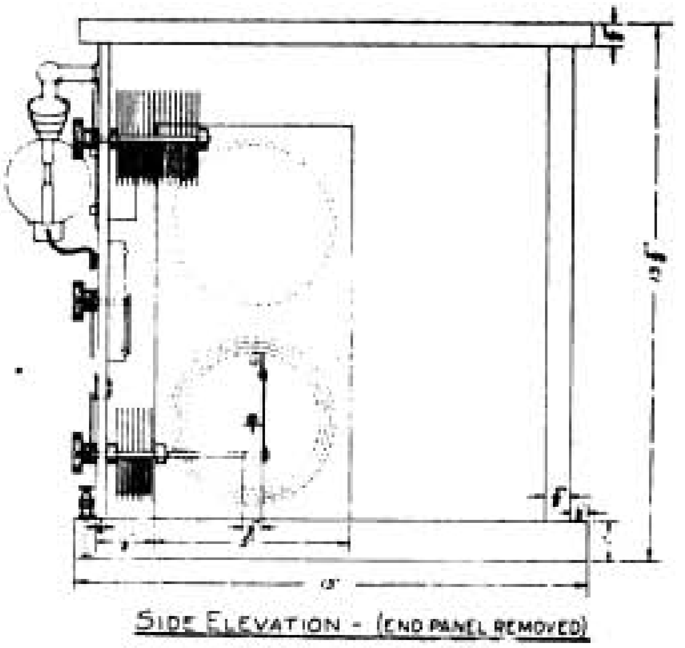


Fig. 4, First Prize Article

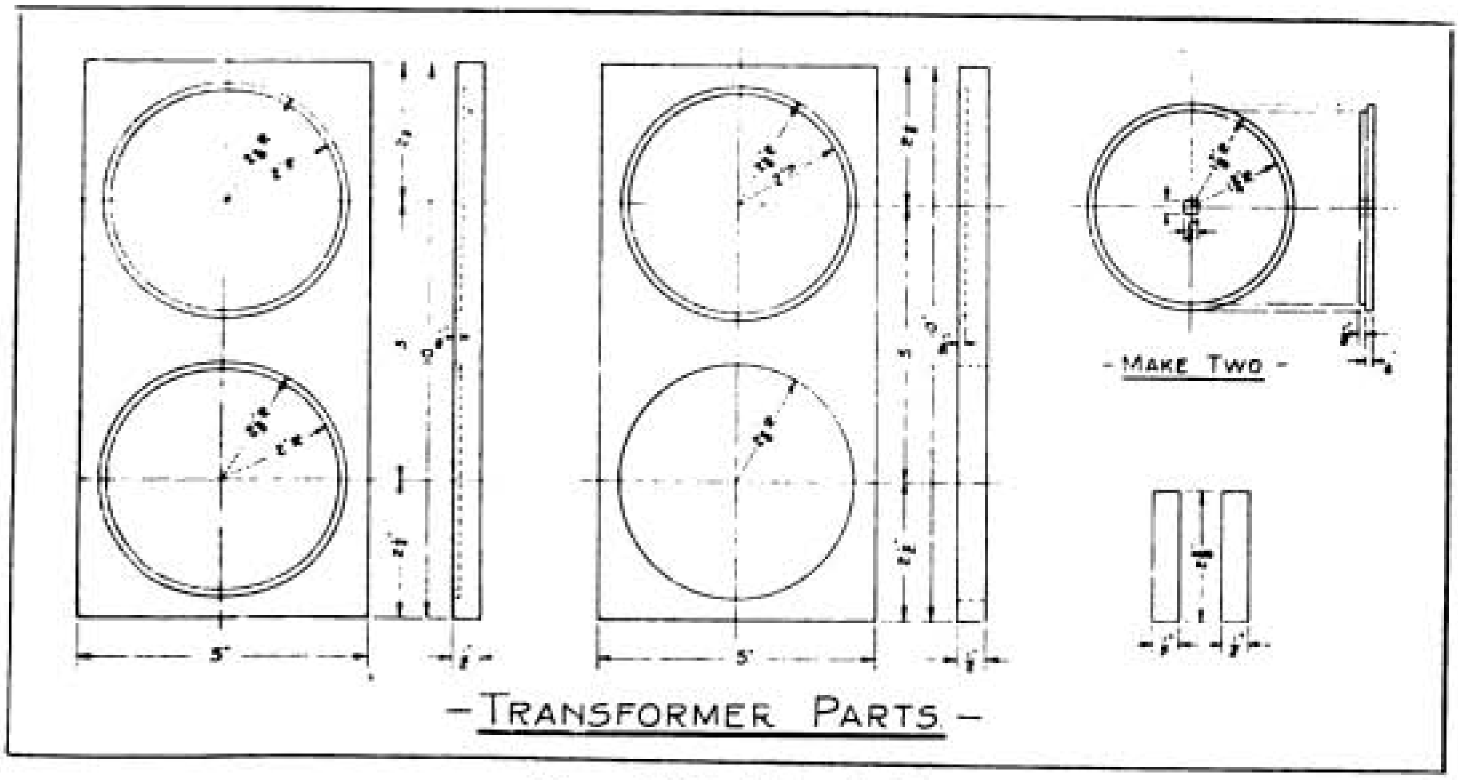


Fig. 5, First Prize Article

centers of all switches and screws. An oblong large enough for the insertion of a small push button switch is cut at the right of the audion at the right elevation, as shown in the drawing. The panel is now ready for the mounting of the fixtures, but it is a good plan to put the cabinet together in order to insure that all pieces fit properly. It is recommended that brass screws be used throughout.

The switches employed in this set are especially constructed. As will be observed from the drawing, the arms are bent over at the ends, insuring a perfect self-cleaning contact at all times. Connections to all switches are made by the use of brass sectors, thereby eliminating all possibility of the wires working loose. The construction of the switch parts is shown in Fig. 3. The switch plates are made of No. 20 gauge brass stock, while the switch knobs may be turned from pieces of hard rubber 1-inch in diameter by 8 or 10 inches in length. This material can generally be purchased from an electrical supply house. If a suitable lathe is not available the rods should be taken to a machine shop for turning. The construction should be clear from an examination of Fig. 3.

The switch taps are preferably of the following dimensions: Diameter of head, 5-16 of an inch; height of head, 3-16 of an inch; diameter of shank, 3-16 of an inch; height of shank, 5-16 of an inch. These taps should be fitted with machine screws. The numerals for the taps should be stamped on, as shown in the drawing of the front elevation.

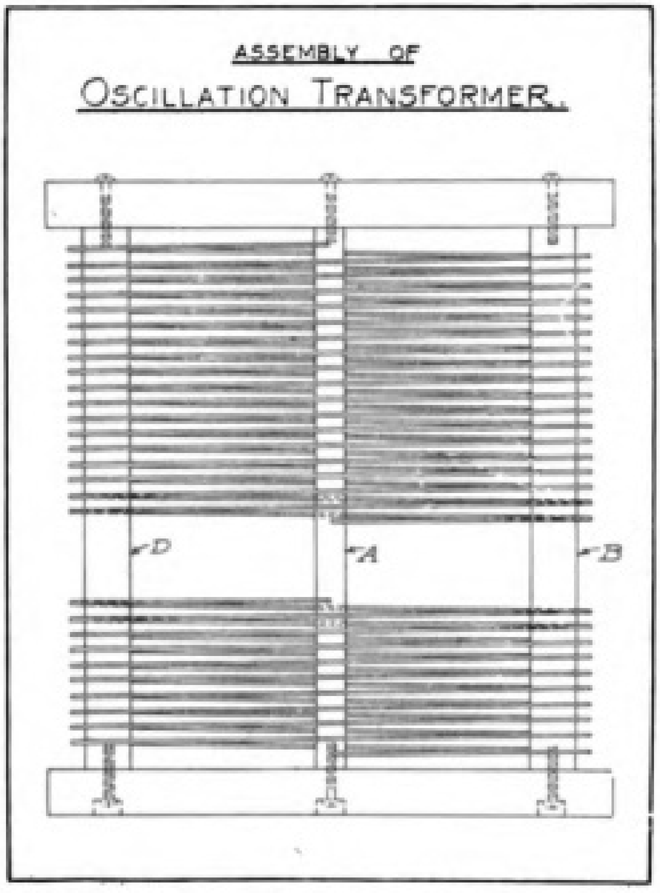


Fig. 1, Second Prize Article

The construction of the transformer primary switch will probably present the greatest difficulty to the builder. By reference to the diagram of parts (Fig. 3) it will be seen that A is the common switch knob mounted on the shaft, B. C and D are switch arms, while E is a large knob insulated from the shaft, B, and free to revolve around it. FF are brass washers. In this switch one connection is made to the shaft, B, and the other to the secondary.

The variable condenser should be mounted in the cabinet with the knobs, pointers, and scales protruding. The primary condenser is mounted in the upper right hand corner. To be effective it should have a fairly high value of capacity and should be connected in shunt to the primary winding of the receiving transformer. The secondary condenser, located in the right hand corner, is so arranged that by a rotary movement of the knob it can be connected either in series or in shunt with the secondary inductance (see diagram of connections, Fig. 2).

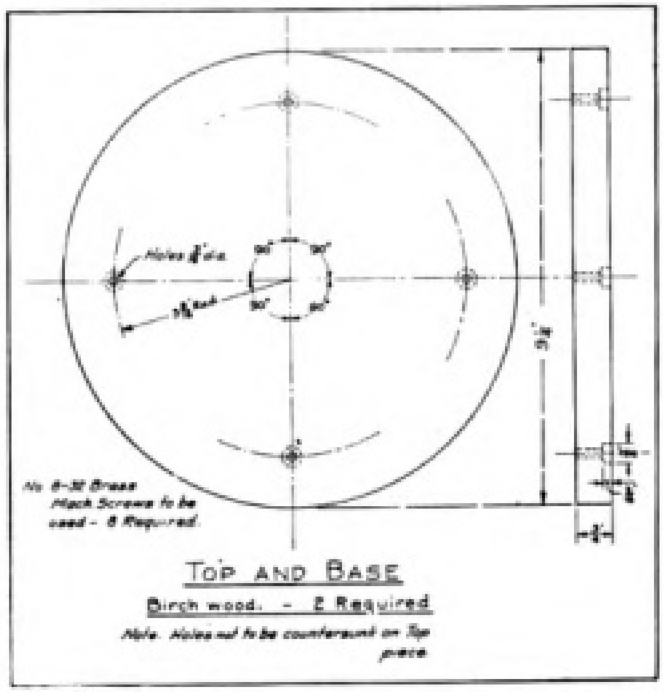
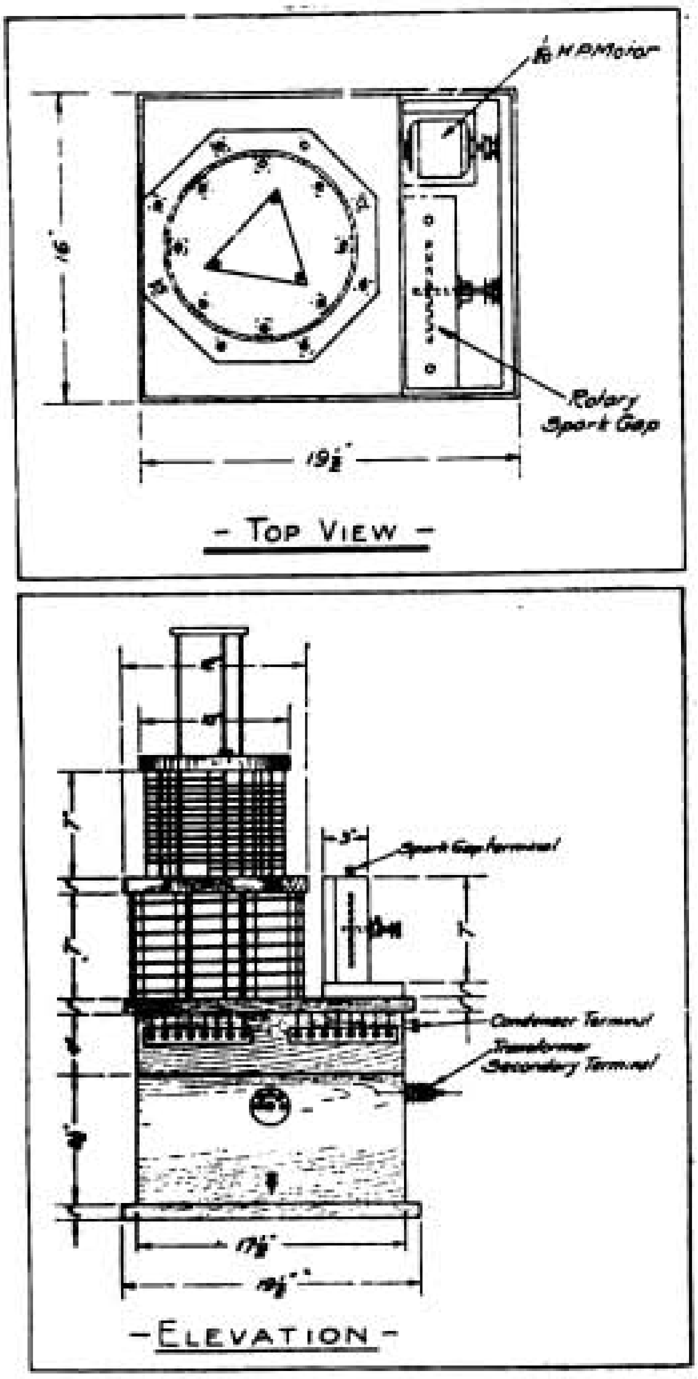


Fig. 2, Second Prize Article

Fig. 3, Second Prize Article

It is preferable to purchase condensers of this type from supply houses.

The receiving transformer and the aerial tuning inductance will now be



Figs. 1 and 2, Third Prize Article

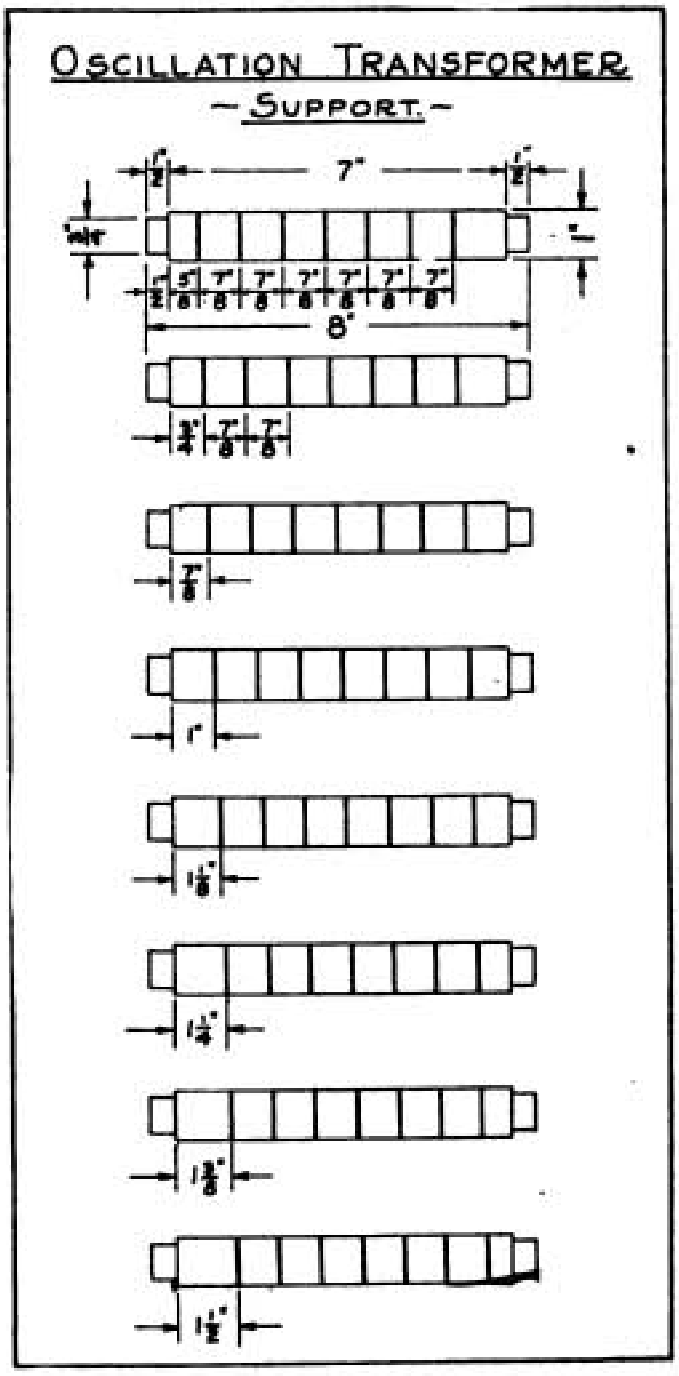


Fig. 3, Third Prize Article

considered. The distinctive feature of this instrument is that the entire primary circuit inductance can be varied by a single turn at a time; in fact any number between 1 and 410 turns can be instantly thrown into the circuit by the switches mounted on the front. This arrangement of connections insures very accurate and sharp tuning. It will be seen from the diagram of connections that by adding the numbers upon which the switch arms rest the total number of turns in the circuit can be easily found at any time. This enables the operator to memorize the position of the switches for a certain transmitting station.

The aerial tuning inductance tube has the following dimensions: Length, 6 inches; outside diameter, $4\frac{1}{8}$ inches; inside diameter, 4 inches. It is wound with 200 turns of No. 26 B. & S. gauged enameled copper wire; a tap is taken off every tenth turn and connected to the aerial tuning inductance switch, as shown in the diagram of connections. It is mounted in the upper slot of the pieces for the support of the primary inductance.

The primary tube is of the same dimensions as the loading coil and is wound with 210 turns of No. 26 B. & S. enameled copper wire. For the first ten turns a tap is taken off every turn and for the remaining distance a tap is taken off every ten turns. This tube is mounted in the lower slot.

The secondary winding consists of

No. 30 B. & S. gauged enameled copper wire on a tube 6 inches in length, 3¾ inches outside diameter and 3⅝ inches inside diameter; a tap is taken off every half inch and connected, as shown in the diagram of connections. The secondary coil heads, previously described, should fit snugly into the end of the coil. These heads are tied together by a 3-16 inch tie rod capped with a cap nut at each end. The completed secondary slides in and out of the primary winding on a ¼-inch square brass rod, the end of which rests on a hard wood or hard rubber pillar, G. The variation of coupling is produced by the rotary movement of the knob to which are attached two arms, HH. No dimensions are given for these arms, as it is expected that the maker will experiment until the right lengths are obtained. These two pieces are bolted together by a small machine screw.

It will probably be difficult for the average amateur to obtain a vacuum valve detector and if a bulb cannot be purchased outright it is recommended that a complete RJ-4 or RJ-5 detector be removed from the case and mounted on the front of the panel. The rheostat is mounted on the inside of the case, the shaft extended and a knob and pointer with suitable scale attached on the outside. The case containing the vacuum valve battery is screwed down on the inside of the cabinet and the cells connected in single sets to the vacuum valve battery switch.

The posts for the lighting battery are mounted on the right hand end of the case, the current being turned on and off by the push button switch at the right of the bulb. The degree of incandescence of the filament is varied by means of the rheostat.

A perikon detector has been included in this set for use when the audion is out of commission or when it is desired to receive nearby high power stations. This detector consists of a 5-hole detector cup mounted in a vertical position with a smaller cup fitted with a receptacle to hold one crystal to bear against it. Perikon crystals can be purchased from supply houses.

A buzzer testing set for obtaining a sensitive adjustment on the crystal detector is also contained in this cabinet and is operated by a small pearl centered push button on the front panel below the vacuum valve. Binding posts for the aerial and earth connections are mounted on the left hand end of the cabinet, while the posts for the telephones are in the front. The maker should have name plates for the various switches made to order.

Arthur C. Burroway, *Ohio.*

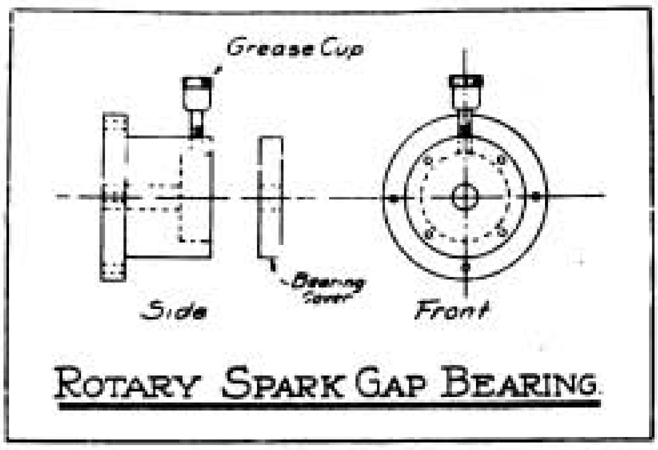


Fig. 4, Third Prize Article

SECOND PRIZE, FIVE DOLLARS

A Transmitting Oscillation Transformer Suitable for Amateurs

The From and For Those Who Help Themselves department of the The Wireless Age has published only a few descriptions of transmitting oscillation transformers. I notice from the photographs of amateur stations that this valuable and necessary piece of equipment presents a haphazard appearance, lacking the attention to mechanical and electrical details that is given to other instruments of a complete radio set.

The design I present is suitable for the use of amateurs, allowing the emitted wave-length to comply with all United States restrictions. While the coupling between the primary and secondary winding is mechanically fixed, it can be electrically altered by the use of two clips at the secondary winding. In this manner the used turns of the secondary winding can be placed at any desired distance from the primary winding, thereby lessening the mutual inductance and, hence, the coupling.

It will be observed that use is made of a copper strip wound edgewise which works for compactness and at the same time gives a considerable degree of conductivity for a given value of inductance. This strip was purchased from the Clapp-Eastham Company at a nominal price.

The material required for the construction of the oscillation transformer is listed as follows:

Twenty-eight turns edgewise copper strip, 7½ inches inside diameter, ½ inch in width and 1-16 of an inch in thickness; two sections are required, one of 10 turns and one of 18 turns respectively; four hard rubber or fibre uprights, 8¾ inches by ¼ of an inch by ½ inch; eight round head brass machine screws, 1 inch in length; one top of birch, 9¼ inches in diameter by ¾ of an inch in thickness; one base of birch, 9¼ inches in diameter by ¾ of an inch in thickness. I have taken pains in Fig. 3 to measure as near as possible the exact position of each slot on each strip. These slots are 1-16 of an inch in width and ¼ of an inch in depth. Notice that the upright A slots begin ¼ of an inch from the bottom, the upright B 5-16 of an inch from the bottom, the upright C ⅜ of an inch from the bottom, and the upright D 7-16 of an inch from the bottom. It is advisable to cut the slots at a slight slant, similar to the slant of the copper strip. This will make a snugger fit.

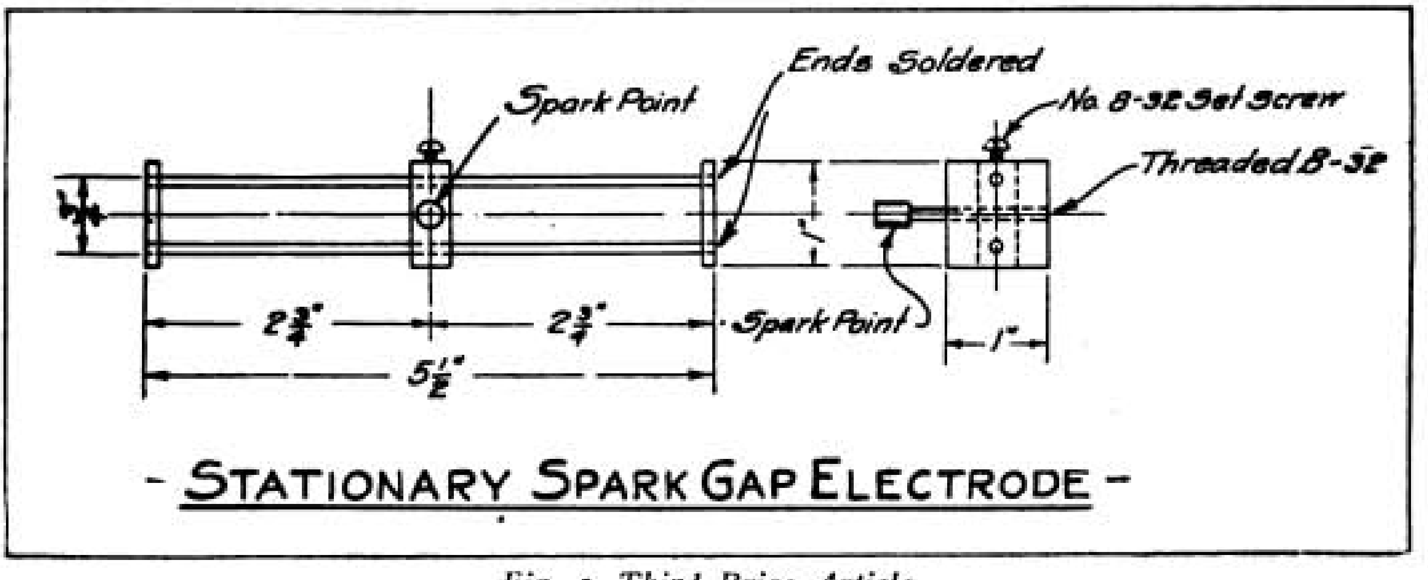


Fig. 5, Third Prize Article

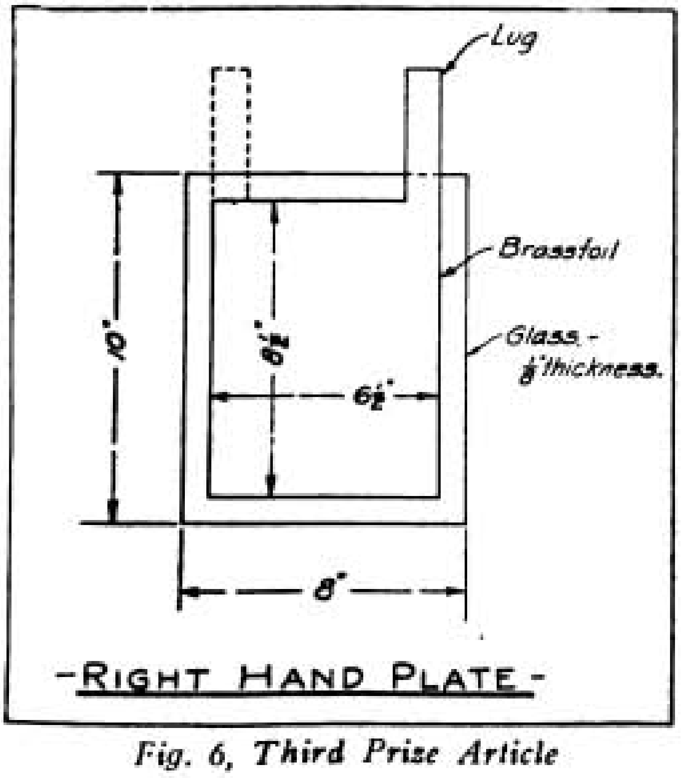


Fig. 6, Third Prize Article

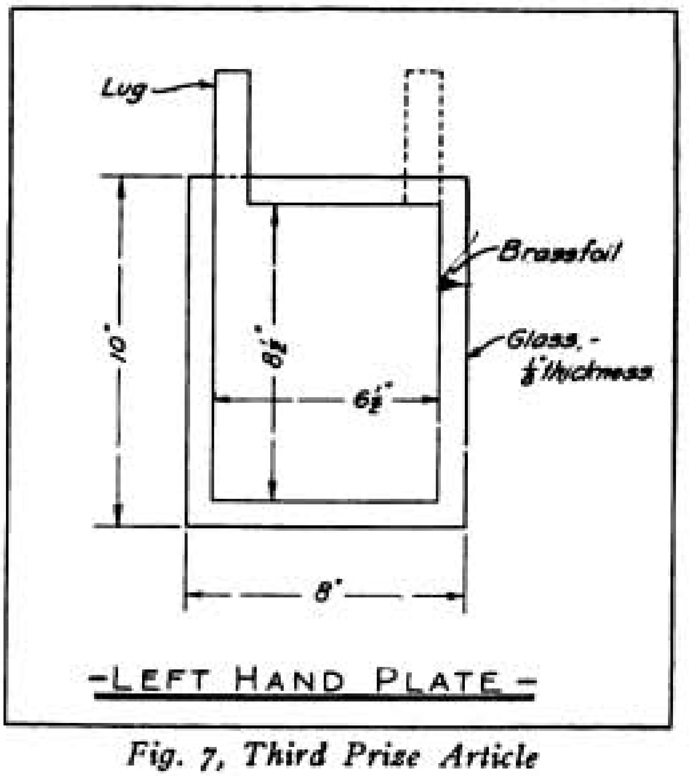


Fig. 7, Third Prize Article

The base and top are turned from birch to the size stated and stained mahogany. The holes are spaced evenly,

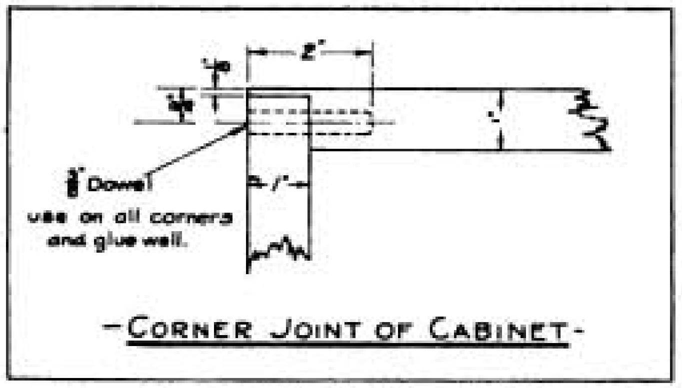


Fig. 8, Third Prize Article

as per Fig. 2. These holes should not be countersunk. In the assembly it would be better to fit the uprights first and place the top and bottom on afterwards.

The drawing for the assembled apparatus (Fig. 1) is largely self-explanatory and, if followed in detail, a

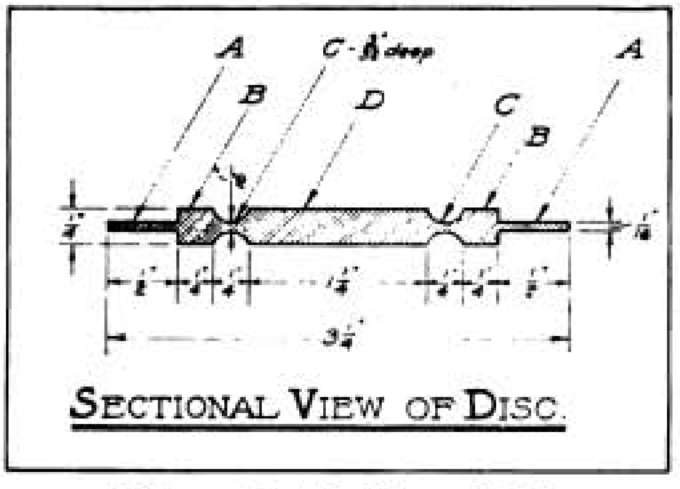


Fig. 1, Fourth Prize Article

very efficient and compact transformer will result.

The ten turns are intended to be employed as the secondary winding. If desired an aerial tuning inductance can be constructed along the same lines.

R. Hoaglund, *Massachusetts.*

THIRD PRIZE, THREE DOLLARS

A Cabinet Transmitting Set Which Is Compact and Durable

Like the cabinet receiving set, the cabinet transmitting set is characterized by compactness and neatness; this, coupled with the fact that very short leads are obtainable in the oscillatory circuits, renders the apparatus ideal for the use of amateurs. The set I am about to describe, which has been in use for a number of years in my station, has not met with a single breakdown; for this reason I believe that the details of construction may be of interest to the amateur field.

A general top view of the set is shown in Fig. 1 and a front elevation in Fig. 2. Note that the transmitting oscillation transformer, the rotary spark gap, and the driving motor are mounted on the top of the cabinet, the gap being driven by a small belt. The inside of the cabinet is fitted with a tin lining so that the transformer and transmitting condenser can be immersed in insulating oil. Other details are shown in Figs. 3, 4 and 5.

The transformer is of the usual

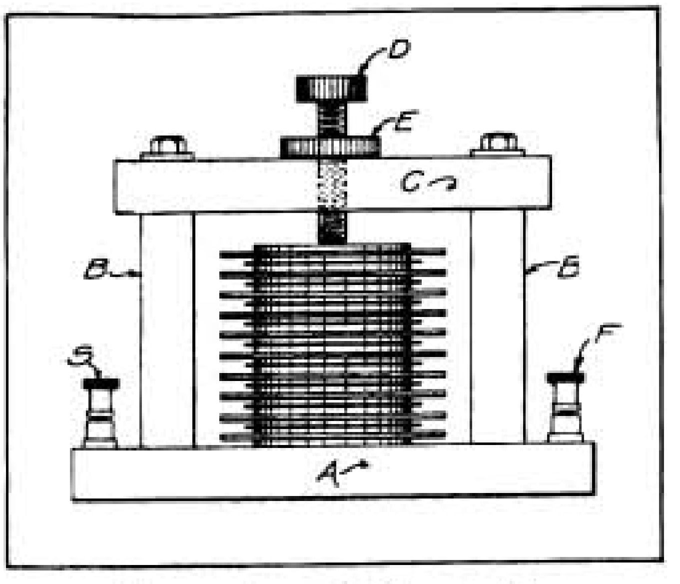


Fig. 2, Fourth Prize Article

closed core type being assembled in the regular manner. The complete materials required are as follows:

Eleven pounds of No. 10 B. & S. D. C. C. magnet wire; eleven pounds of No. 32 B. & S. D. C. C. magnet wire; forty-five pounds of soft transformer core iron; three yards of empire cloth.

The core is of the standard rectangular design, being made up of a number of iron strips 2 inches by 15 inches and 2 inches by 8¼ inches. These are piled up in the usual manner, forming legs upon which the primary and secondary windings are mounted. The core should be wrapped with several layers of empire cloth until a thickness of ¼ of an inch is obtained. The primary winding comprises four layers of No. 10 wire with a tap-off at the second, third and fourth layers. The taps

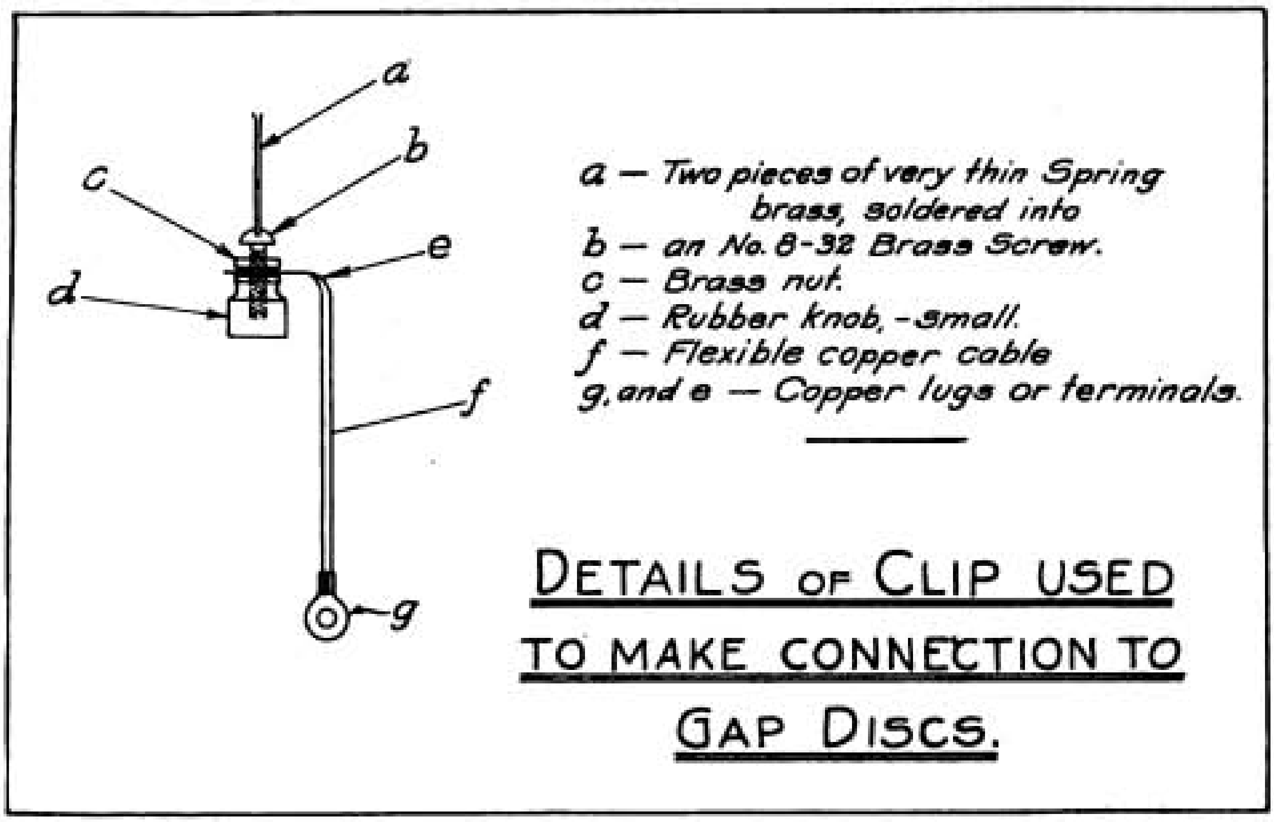


Fig. 3, Fourth Prize Article

for the primary winding are brought out to the front of the cabinet and connected to the multiple-point switch as shown.

The secondary sections are ¼ of an inch in thickness and are wound on a mandrel 2½ inches square. When completed the secondary winding will contain twenty-four of the "pies." Each of the secondary sections are separated by three discs of empire cloth. Care should be taken to see that the wire runs in the same direction when the various pies are being connected together. It will facilitate the insulation of the secondary winding if the wire is run through melted paraffin during the winding process. In fact this is absolutely necessary if it is desired that the transformer withstand continued service. The secondary terminals are attached to two porcelain insulators on the side of the cabinet as indicated in the drawing. When complete the transformer is placed in the bottom of the cabinet as shown and filled with boiled linseed or transformer oil.

The condenser requires forty plates of glass 8 inches by 10 inches and four pounds of 6-inch extra thin brass foil. The latter can generally be obtained in any machinery supply store. There should also be purchased two metal containers to fit the inside of the condenser's compartments. As stated previously the complete condenser is made up of two units; that is to say, twenty plates are connected in parallel and the two units of twenty connected in series. The plates of each unit should be stacked in a pile and a connecting lug brought up from each plate, as shown in Fig. 6. These are known as left hand and right hand plates accordingly as the lug from the brass foil nearest to the observer issues from the left or right hand side of the foil. The lugs at one end of each unit should be soldered together and connected to the lugs at one end of the second unit, while the two remaining sets of lugs should be brought out to the binding post on the front of the cabinet.

Of course, if the entire condenser unit is not required, a number of the plates can remain in the container, but they must be disconnected from the other plates. When assembled, the two units are placed in the metal container and immersed in transformer or boiled linseed oil.

In my design of the rotary spark gap I have shown a disc 5¼ inches in diameter, suitably mounted and enclosed in a muffling drum, the disc being driven by a 1-20 horsepower motor having a speed of 1,800 R.P.M. Generally each amateur has his own idea of the ideal rotary spark gap and for this reason I have omitted a detailed description. The disc I employ has 12 points, the complete circuit for the spark gap being made between 2 stationary electrodes.

In order to construct the oscillation transformer shown in the drawing there are required for the secondary winding 25 feet of No. 18 B. & S. aluminum wire, 20 feet of No. 6 B. & S. aluminum wire, and 6 feet of ¼-inch round brass rod. The lid of the container for the condensers is used as the bottom support for the drum of the primary winding, while the octangular shaped piece is formed for the top support. The uprights supporting the coil are shown in detail in Fig. 3. There are eight of these for the primary and secondary drum. The secondary upright has twelve slots instead of seven. For supporting the secondary drum three 2-foot brass rods are arranged in a triangle, as shown in the drawing. The various instruments comprising the oscillatory circuit are connected with ½-inch copper strip, for which about four feet will be required.

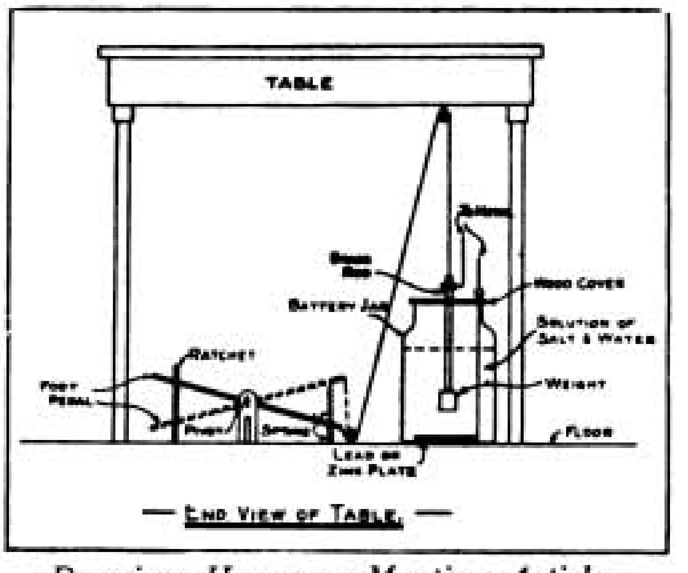
When this apparatus is completed the transformer will draw about 1 k.w., but in order that the set may comply with the United States restrictions, it will be necessary to reduce the size of the condenser, which may be accomplished as previously explained.

A. D. Horn, *Ohio.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

How to Construct a Quenched Spark Gap at Comparatively Small Cost

Many amateurs have been prevented from using the so-called quenched gap because they believe that the construction of it is expensive. While it is impossible to construct the discs for the gap without a lathe, the writer overcame the difficulty of paying for a considerable amount of machine work by making the discs in the following manner: In the sectional view (Fig. 1) the disc, D, is turned from a piece of sheet brass 3¼ inches in diameter. The actual sparking surface ,D, is an inch and a quarter in diameter, and the insulating groove, C, is ¼ of an inch in width by 3-32 of an inch in depth. The radiating flange is ½ inch in width by 1-16 of an inch in thickness. A small hole ⅛ of an inch in diameter is drilled through the disc in the center. This is to enable the disc to be lifted out of the



Drawing, Honorary Mention Article, Robert C. Bishop

sand when having a mould made. Any machine shop will turn out a disc of this construction for fifty cents at the most.

It is next in order to inquire from the machine shop where copper castings can be made. The disc can then be taken to the proper foundry and about a dozen cast in copper from the very finest sand, as this will eliminate further lathe work. Each disc upon completion will weigh about 3½ ounces. The cost may be readily reckoned, as copper castings are now rated at from twenty-eight to thirty cents per pound. The discs when cast will be slightly rough, but this is only of consequence at the parts B and D (Fig. 1). The discs can be made smooth by placing a piece of very fine emery cloth on a perfectly flat surface—a piece of marble will serve the purpose. Now lay the disc on the emery cloth and grind down the face of the former until the parts, B and D, are perfectly smooth and true. It should be noted that this operation cannot be performed with a file or on an emery wheel.

The insulating washers to be placed between the discs come next in the order of construction. Mica is used by certain commercial companies, but it is difficult to cut without breaking and at the same time rather expensive. However, a good grade of empire cloth will do as well, being much less expensive and easier to handle. Washers of this type should be as efficient as mica because they are used on commercial quenched spark sets. The washer is 2¼ inches, outside diameter, with a 1½-inch hole. If cut to this size the washers will project slightly over B on the radiating flanges and half way over the insulating groove, C. This is an important consideration because it prevents the washers from burning and short-circuiting the disc. Two, or perhaps three, thicknesses of empire cloth will be required for each washer, as the distance between sparking surfaces when the plates are pressed together should not be more than 1-50 or 1-100 of an inch.

Many methods of mounting the discs will suggest themselves. The writer set his up as per the sketch, which is largely self-explanatory. A black fibre base, A, 7½ by 4½ inches, has two brass pillars, B, the height of which are to be regulated by the maximum number of discs to be used. A strip of black fibre, C, ¾ of an inch in thickness by one inch in width, drilled and tapped in the center to take the brass thumbscrew, D, compresses the discs so that the spaces between the latter are air-tight. The thumb screw is locked by the brass nut, E.

Two binding posts are placed in the base, F and F. To make connection to the disc two very small clips are made, as per the sketch, and connected to the binding posts, F and F, by means of two short pieces of heavy flexible cable. By this method any number of discs may be used without dismounting the gap, connection being made to the radiating flange at the number of gaps desired.

The complete gap as described cost the writer about $2.50, but it is the equal of anything that can be purchased for four or five times that amount. The gap is particularly suitable for use in connection with amateurs' small transmitting sets and if the power employed exceeds ½ k.w. the gap should be cooled by means of an electric fan.

J. Furlong, *Massachusetts.*

HONORARY MENTION

A Rheostat That Can Be Operated by Foot and the Advantages of the Apparatus

There are times in the experience of every wireless amateur when he wishes he had three hands or perhaps could call upon his feet to make some of the necessary adjustments of a wireless telegraph transmitting or receiving apparatus. It occurred to the writer that the rheostat for the rotary spark gap might be operated by the foot, as this would give a free hand for working additional equipment, besides leaving more room on the switchboard.

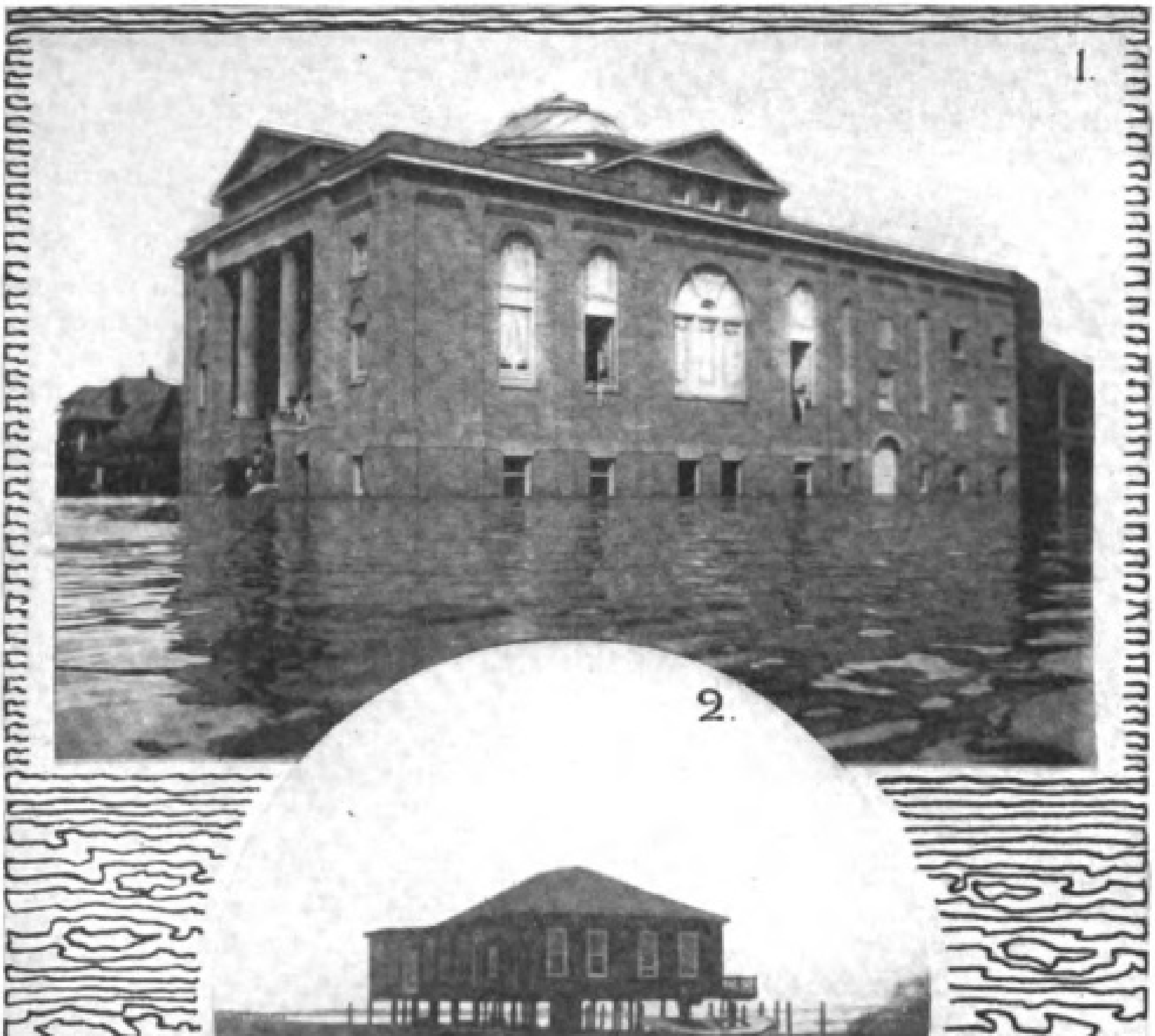
As will be observed from the accompanying diagram, my starting rheostat is home-made. It consists of a battery jar which is filled about three-quarters full of water, to which a pinch of salt is added. The brass rod slides up and down through the hole in the middle of the cover. The nearer the rod gets to the zinc (or lead) plate in the bottom of the jar, the faster the motor runs, or vice-versa. This movement is accomplished by attaching a string to the rod and foot pedal, as shown in the diagram.

A ratchet to hold the pedal is held in different positions by a piece of tin about two inches in length, nailed to the pedal which catches in the notched upright shown to the left of the drawing. This upright, as well as the pivot on which the pedal rests, should be securely supported, as it undoubtedly will get hard usage, particularly when you are in a hurry to "break in" upon some offender. One of the holes in the uprights of the pivot should be made slightly oblong to allow for side-motion caused by the ratchet.

I believe the average amateur will find this scheme far superior to the ordinary hand rheostat.

Robert C. Bishop, *New York.*

The Story of the Texas Tornado Told in

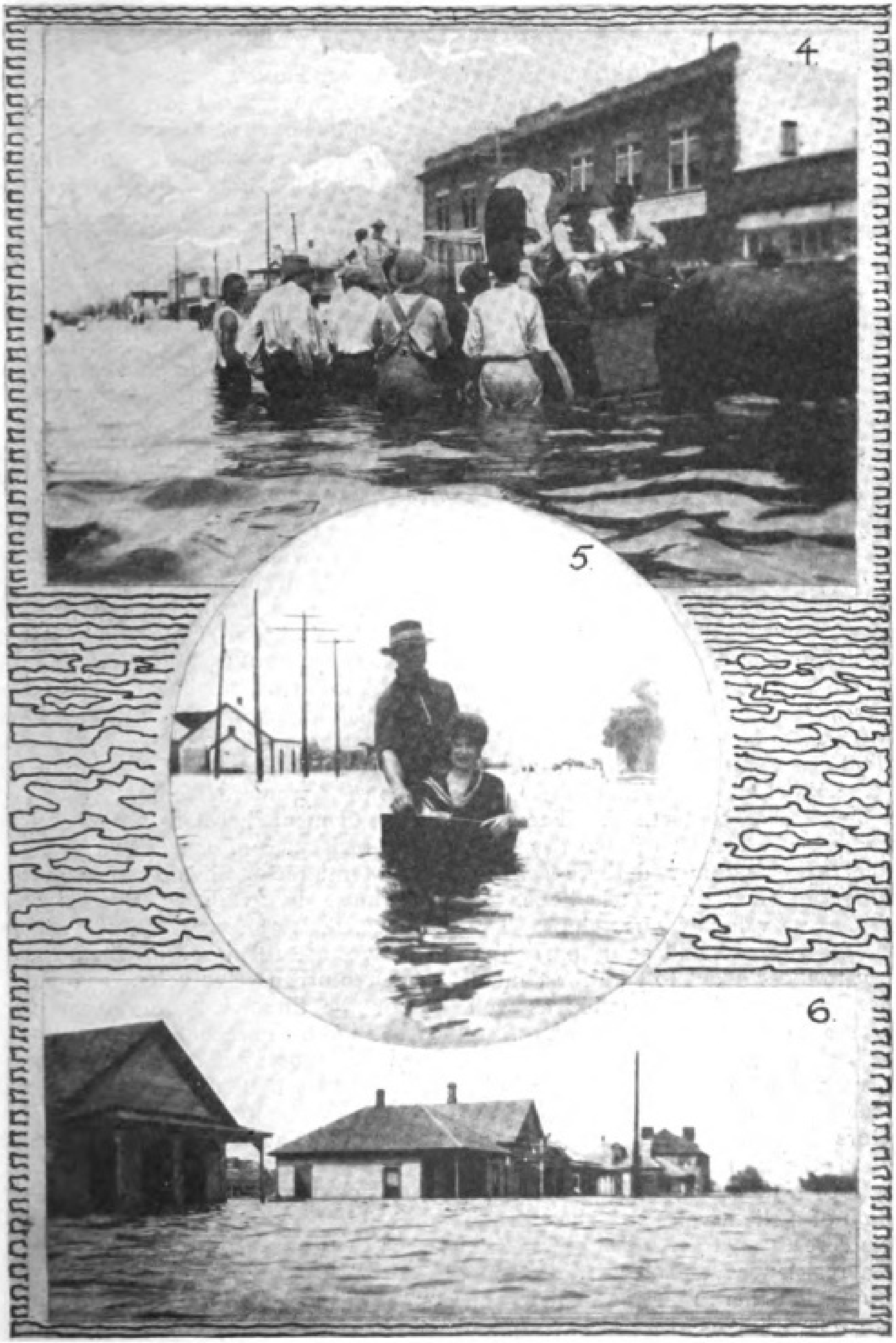


(1) *A view of the new Christian Science Church in tornado-swept Galveston when the flood held full sway*

(2) *The Marconi station in Galveston. The structure escaped damage, but the mast and some of the guy anchors were carried away by the waters*

(3) *Horses and wagons were employed to excellent advantage in transporting victims of the flood and their possessions from the inundated sections of the city*

Photographs Taken By a Wireless Man



(4) *Distributing bread among the hungry folk in a water-filled street in Galveston*

(5) *Means of transportation by water were not always available. This photograph shows that washtubs can be advantageously employed for other uses than those to which they are put by housewives*

(6) *Port Arthur also sustained considerable damage as a result of the tornado. This is a view of a section of Shreveport avenue*

How to Conduct a Radio Club

By Elmer E. Bucher

Article XVII

MEMBERS of radio clubs frequently disagree regarding the choice of a circuit affording the highest degree of efficiency for the various types of receiving detectors. An inductively-coupled receiving tuner of one design is not always applicable to the various types of rectifiers and "trigger" devices now available; therefore a few words of explanation in reference to tried and tested circuits may be of value.

The preferred method of connection for the carborundum and electrolytic detectors is presented in Fig. 1. The secondary circuits of the receiving tuner are indicated by the inductance, L-2, the condenser, C-2, etc.

Within the range of wave-lengths it is desired to work, the secondary winding, L-2, should have such values of inductance that no more than .001 microfarad is required at the condenser, C-2. The fixed condenser, C-1, generally has a value of .003 microfarad, although it may vary from .0025 microfarad to .005 microfarad. The potentiometer, P-2, should have a total resistance value of 300 to 400 ohms and should be fitted with the sliding contact, N. The battery, B, should consist of two dry cells for the carborundum and three for the electrolytic. The head telephone, P, should have a value of 2,000 ohms. The circuit described should be of particular interest to those about to take the United States Government examination as well as to the members of radio organizations.

A method of connection particularly applicable to the silicon and perikon detectors is shown in Fig. 2. Contrary to the general belief, increased strength of signals is obtained by the application of a slight voltage to the crystal. In this case the potentiometer, P-2, may have a resistance value of from 300 to 400 ohms, but there must be included in series therewith a fixed resistance, R, of about 1,800 ohms. The added resistance permits the voltage of a single cell to be reduced to a very low value, an extremely important consideration in the case of these detectors.

The condenser, C-2, should never exceed .002 microfarad in value, while C-1 may, in this case, be as large as .04 microfarad. This method of connection has been largely employed in tuners supplied to the United States Navy. It will be observed that the local battery circuit to the crystal flows through the secondary winding of the receiving tuner so that an open circuit or imperfect contact can be quickly observed.

A receiving tuner designed for crystalline detectors does not in many cases represent the proper proportions of inductance and capacity for use with the vacuum valve detector. A circuit suitable for the two-element valve is shown in Fig. 3. For a given wave-length the secondary winding, L-2, should have a high value of inductance, and the condenser, C-2, a small value of capacity. To be more explicit, C-2 should never exceed .0001 microfarad. Therefore it may consist of two small concentric brass tubes sliding over each other, allowing the capacity value to be closely adjusted. The fixed condenser, C-1, may have a value of .005 microfarad.

The filament rheostat, P-3, has a maximum resistance of ten ohms, while P-2, the potentiometer, should represent about 400 ohms. In certain types of valves, the battery, B, is of four volts. Other types of valves are furnished in which the filament requires twelve volts.

For the three-element vacuum valve, as in Fig. 4, the secondary circuit of the receiving tuner must possess characteristics similar to that of the two-element valve, that is to say, inductance must predominate at the secondary winding, L-2, and the condenser, C-2, should be at a minimum value. The maximum value allowable for a particular wave-length is .0005 microfarad, but is preferably not more than .0001 microfarad. The condenser, C-1, should be variable in capacity and have no more than .0001 microfarad. The lighting battery, B-1, is of four volts; B-2 should have from twenty-five to seventy-five volts, dependent upon the degree to which the bulb has been exhausted. The rheostat, R, has a

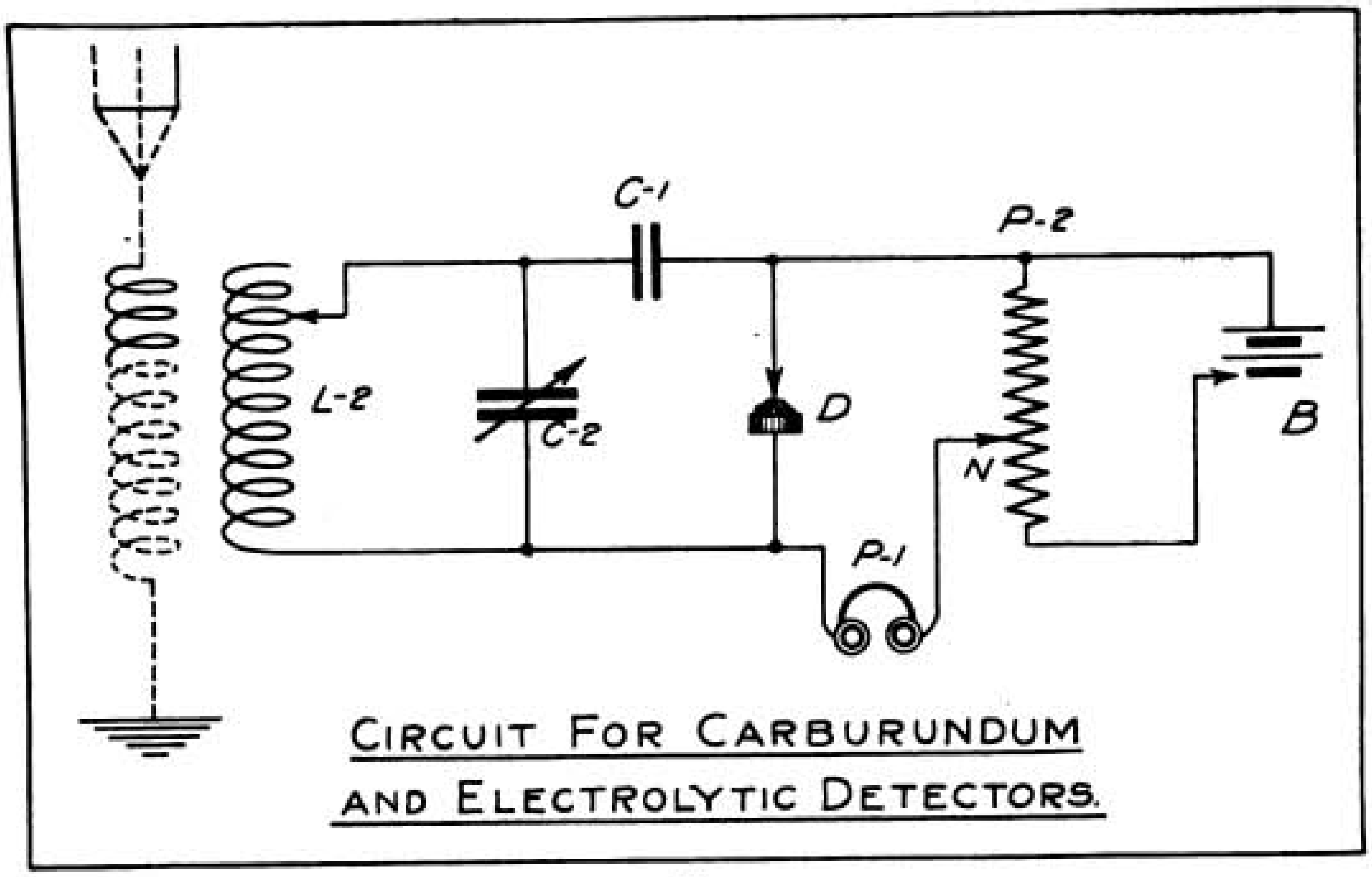


Fig. 1

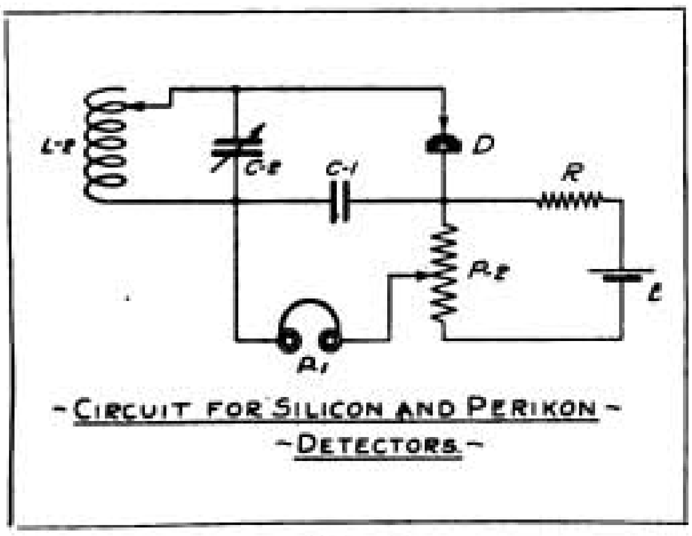


Fig. 2

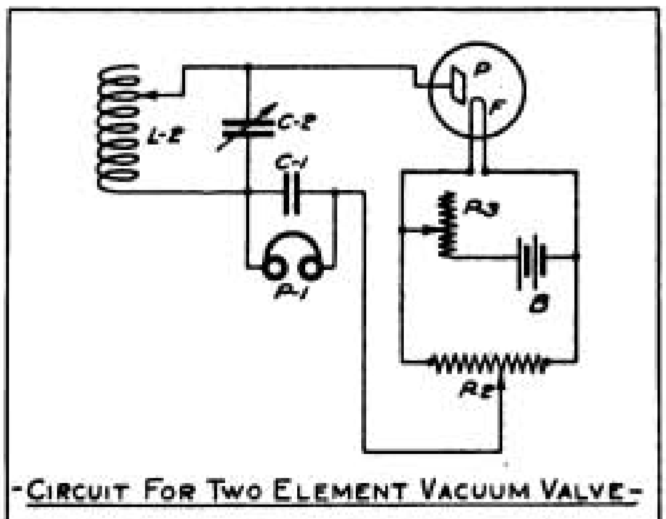


Fig. 3

resistance of 100 ohms and the head telephone from seventy-five to 3,000 ohms.

It is important for the maximum strength of signals that the diagram of connections and the polarity of the battery given in Fig. 4 should be duplicated. The positive pole of the high potential battery, B-2, must be connected to the plate of the valve, P, and the negative end of B-2 connected to the positive end of B-1.

The signals from spark stations can be increased in intensity by placing the condenser, C-3, in the local battery circuit, as shown in Fig. 4. This condenser should have a value of .005 microfarad.

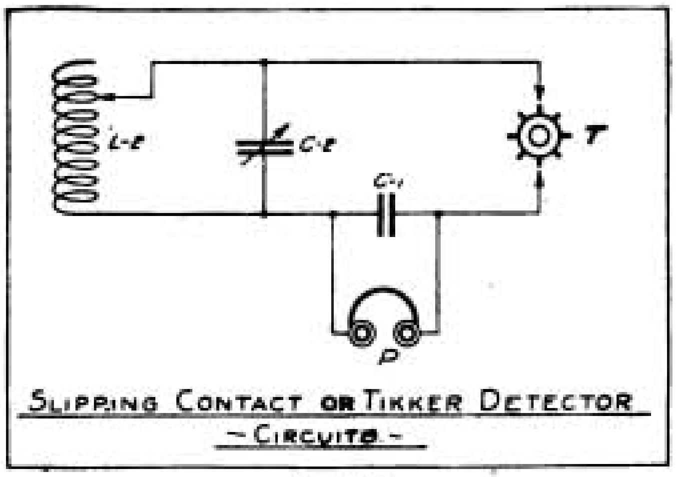
The circuits of a receiver suitable for undamped oscillations are indicated in Fig. 5. Herein T is a tikker of the slipping contact type described in a previous issue of The Wireless Age. In this case the condenser, C-1, may have a high value of capacity, good results having been obtained with a condenser of the order of 1 microfarad. The head telephone, P, should have a resistance of about seventy-five ohms.

It has been found by experiment that the secondary circuit, L-2, C-2, can be loosely coupled to the antenna system and also, owing to the fact that the tikker, T, is of low resistance, the secondary winding, L-2, can have a smaller value of inductance than that ordinarily supplied for a similar range of wave-lengths in connection with crystalline detectors. Generally speaking, the winding, L-2, has a low value of resistance, being made of "Litzendraht" or similar stranded wire.

In order that the received note may have a more agreeable tone, a crystal rectifier, D, is often connected in series with the tikker, T. In this case the condenser, C-1, the inductance, L-2, and the condenser, C-2, may have values throughout similar to that employed with regular crystalline detectors. The telephone, P, should have a high value of resistance, somewhere in the vicinity of 2,000 ohms. This circuit is fully shown in Fig. 6.

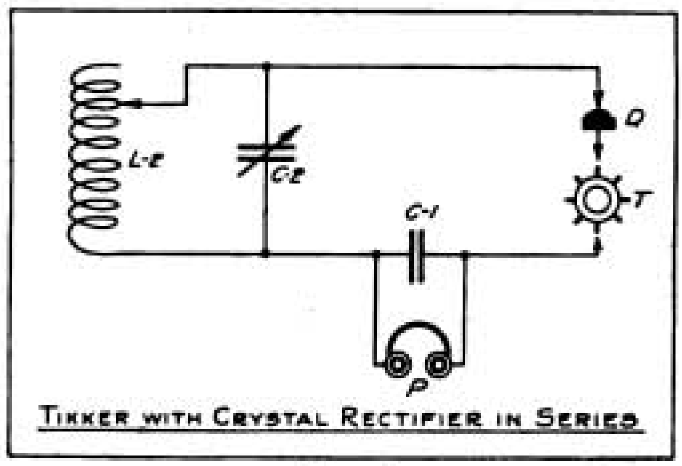
The United States Patent Office recently issued a patent covering a unique method for the detection of undamped oscillations. The writer made experiments with a circuit of this type many months ago and has been enabled thereby to receive radio signals from a considerable distance. A qualifying condition of this system is that the wave-length of the transmitting station must lie between 7,000 and 12,000 meters.

Referring to Fig. 7, the coil, L-1, varies in length, according to the frequency of the received wave, that is to



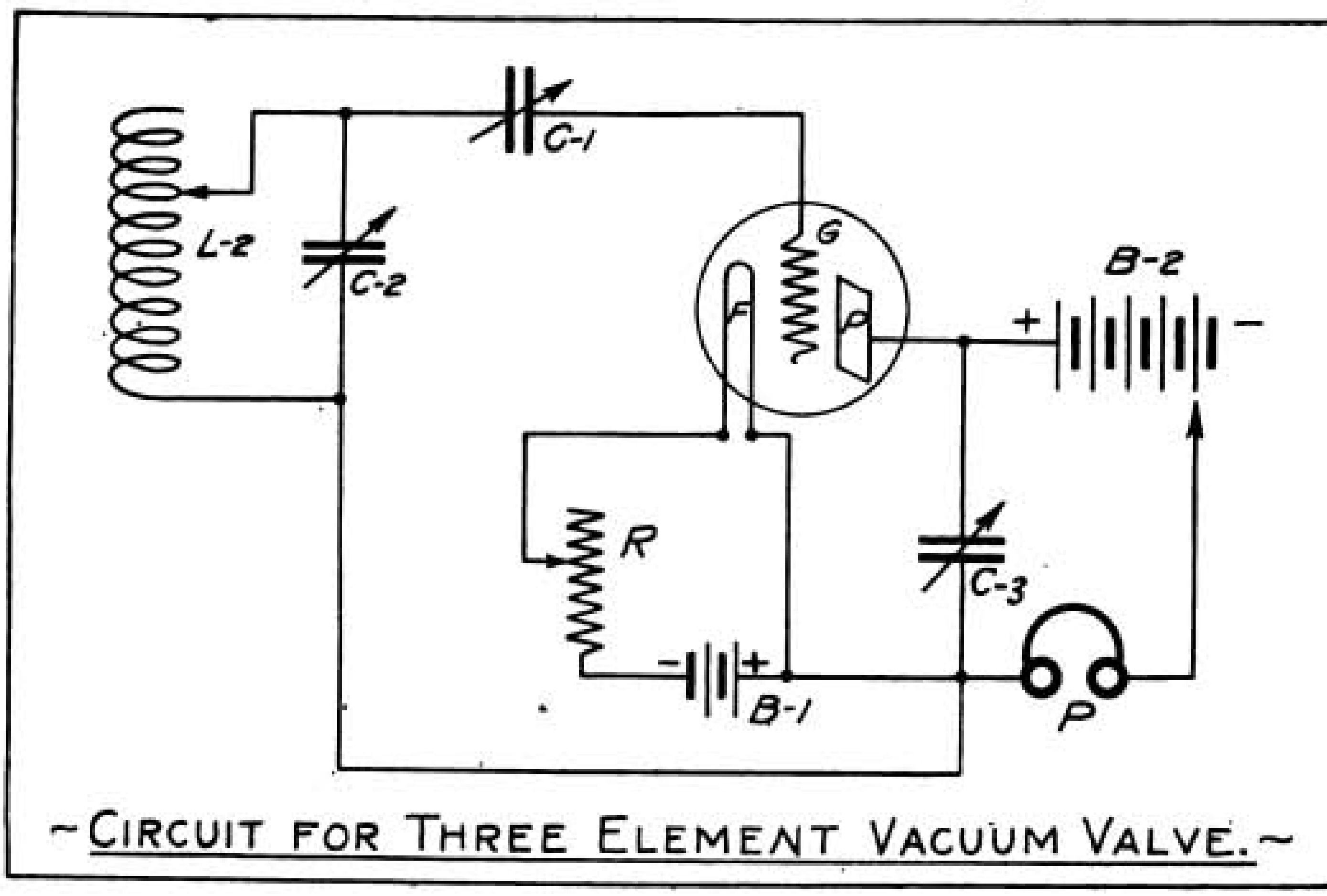
Slipping Contact or Tikker Detector
— Circuits —

Fig. 5



Tikker with Crystal Rectifier in Series

Fig. 6



~Circuit for Three Element Vacuum Valve.~

Fig. 4

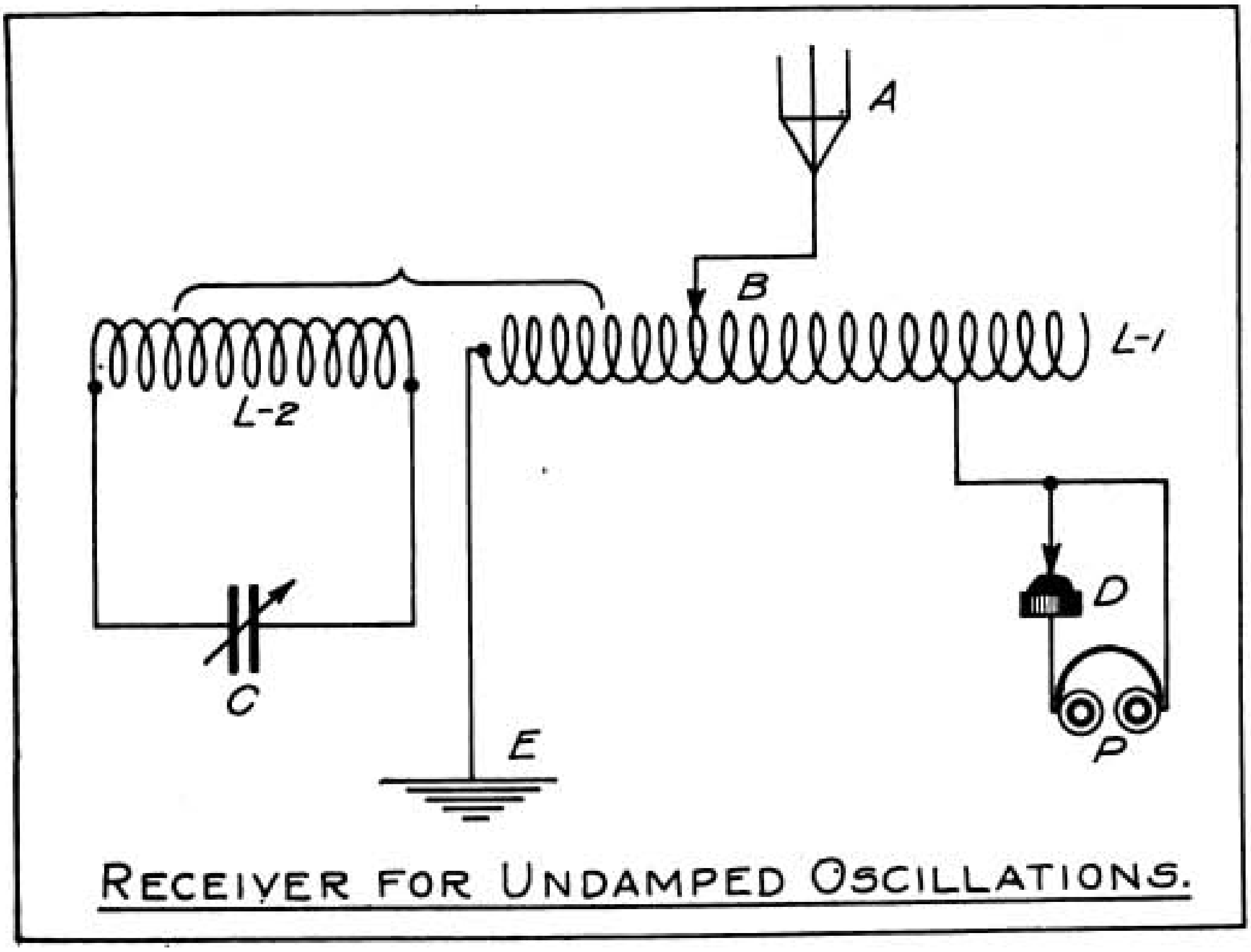


Fig. 7

say, it must have a natural time period of oscillations suitable to the received energy. A variable tap-off, B, from the antenna, A, allows the antenna to be placed in resonance with the coil, L-1. The crystal detector, D, preferably of the cerusite or silicon type, is shunted by the head telephone, P, and connected unilaterally to L-1.

The circuit comprising the coil of inductance, L-2, and the condenser, C, has such values that it can be placed in resonance with the coil L-1. With a slight degree of coupling between L-1 and L-2 the reaction of L-2 upon L-1 will cause the received energy in the antenna system to set up oscillations of two frequencies in the complete circuit. If these frequencies differ by a certain amount, "beats" suitable for maximum response in the head telephones are produced. The writer found it difficult with this apparatus to produce a resultant note having musical characteristics such as may be obtained by the circuits of the vacuum valve detector. The tone usually resembles that of escaping steam from a radiator, but is of sufficient clearness and intensity to allow the reception of energy from undamped stations for a distance of several hundred miles. To cover wave-lengths in the vicinity of 8,000 meters the coil, L-1, should be 32 inches in length, by 5½ inches in diameter, wound closely with No. 30 S. S. C. wire. The coil, L-2, should be 22 inches in length by 5 inches in diameter, wound closely with No. 30 wire.

The condenser, C-2, should have a value of .001 microfarad and is, of course, variable in capacity.

To insure resonance between the coil, L-1, and the antenna system, it is preferable to employ a wave-meter, set into excitation by a buzzer and battery. The inductance coil of the wave-meter is placed in inductive relation to the earth lead of the coil, L-1, and the crystal detector, D, tapped off at various points on L-1, until the maximum response is secured. It would, of course, be preferable for the coil, L-1, to have a different length for each change of wave-length; dead-ends are to be avoided.

(To be continued)

Vessels Recently Equipped With Marconi Apparatus

Names	Owners	Call Letters
s. s. Atlanta	Cuba Improvement & Steamship Co.	KGR
s. s. Yoro	Vacarro Brothers	VY
s. s. Toyohashi Maru	Nippon Yusen Kaisha Steamship Co.	YSS
s. s. Wyvisbrook	Brook Steamship Co., Ltd.	MCT
S. Y. Roamer	Shellfish Commission of the State of Florida	KZN
s. s. Silver Shell	Silver Shell Steamship Co.	WIA
s. s. Mongolian	Indian & Peninsula Steamship Co.	YTD
s. s. Trinidad (re-equipped)	Quebec Steamship Co.	GBH
s. s. Retlaw	Standard Oil Co. of New Jersey	YTF
s. s. Palacine	Standard Oil Co. of New Jersey	YTG

THE SHARE MARKET

New York, September 21.

What slight changes appear in the market quotations reflect the general feeling reported in the September issue. Contrary to the usual rules of investment English Marconi common, with a ten per cent. dividend paid and a million and a half dollar earned surplus, is bid for today at a still further fractional decline. Industrial securities of countries engaged in war apparently are still unattractive to the American investor.

The effect of the lowered pound sterling rate is not expected to remain a bearish factor much longer, for it now seems assured that the billion dollar Anglo-French loan will go through when interest questions shall have been settled. On their showing as going concerns the shares of the Marconi companies should be at a higher general level, say the brokers. The reaction, slight though it is, seems to point toward unwelcome speculative activities. In the opinion of one prominent trader, the investing public's unresponsiveness has caught the professionals long of the market and this element is endeavoring to release Marconis purchased abroad so they may direct their efforts toward the widely fluctuating "war stocks." This situation, it is maintained, accounts for the effect on American Marconi prices. Yesterday's trading in the latter issue totaled 2,000 shares, the market remaining firm at the established figures. Canadian Marconi reflects the slight off change and is weak. Spanish and Wireless Trust appeared this morning for the first time in months at the asked price of 3½.

Bid and asked prices today:

American, 3⅞-4⅛; Canadian, 1⅜-1⅝; English, common, 9-12½; English, preferred, 8½-12.

POULSEN RIGHTS ACQUIRED BY MARCONI

Under date of September 15, New York newspapers printed cable dispatches from the London Daily Chronicle stating that:

"A syndicate representing Marconi interests has acquired the Poulsen-Padna rights, and in due course the Poulsen system will become part of the Marconi organization."

According to this authority, an important option in connection with the British Poulsen wireless rights lapsed recently, though fresh arrangements would quite possibly have been made. In the meanwhile, however, the syndicate representing the Marconi interests, made an offer.

For the present, owing to Treasury restrictions, formation of a subsidiary company and other financial arrangements for the completion of the deal can not be put through, but after the conclusion of peace it may be looked upon as certain that Poulsen will be under the Marconi banner.

My Mental Picture of the Death of the Santa Rosa

By Walter Burnett

IN these active days of invention and discovery, startling scientific achievements and new industrial activities, few persons may be expected to remember that eventful night, several years ago, when the good ship Santa Rosa heard the call of fate, fought valiantly through tragic hours and, defeated and subdued, finally sank to oblivion. Nevertheless, her memory is cherished by many a former passenger who knew the stanch, reliable steam vessel that plowed the coastwise waters of the Pacific for a quarter of a century; for these good people and those amateurs who may have played, as I did, a silent part in the drama, let me tell the incidents bearing upon her destruction. My viewpoint may be a new one, for I was one hundred miles away in the hour of her doom; with her pleading wireless calls pounding into the sensitive receivers pressed tightly against my ears, I sat alone, helpless to aid.

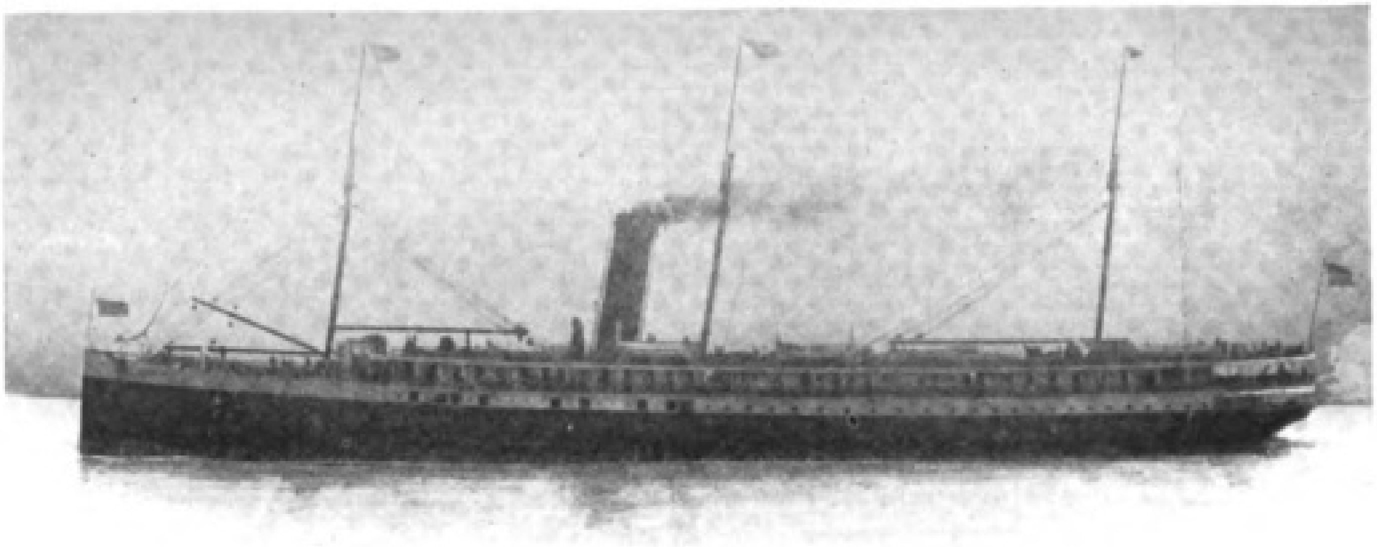
BEFORE the advent of the modern, turbined palaces which gradually forced her to second place, the Santa Rosa was the aristocrat of all vessels in the passenger service between San Francisco, Los Angeles and San Diego. Her spacious decks and cabins gave footing and shelter to happy bridal pairs and aged couples venturing upon the sometime choppy sea of matrimony unafraid, even as the Santa Rosa trod the waters of the Pacific. One pictures a young couple of two decades ago, on their honeymoon, occupying a sheltered nook on the deck, their love-notes mingling with the music of the throbbing steel heart below. A score of years later the son of that happy union crouches shivering in his scanty night attire, listening to the death cry of the very ship on which the couple had voyaged. Memory has given the first picture; wireless telegraphy (in those days just beginning to evolve from a dream) brought to me the second harrowing tableau.

Years had made little change in the sturdy Santa Rosa; she paced the sea lanes unaffected by time until an early morning in July, 1911.

I was a wireless amateur then, emerging triumphant from a struggle for mastery of scientific formulas and Continental Morse. Searching in the dimly lighted labyrinth of ether wave phenomena, wireless had become my very life-work. Or so it seemed. Late at night wireless comes into its own, and it was when the sun had sunk to rest and the peace-destroying clamor of industry was stilled, when darkness had displaced daylight and the potential energy sleeping in the magnetic heart of powerful radio generators crashed forth through spark-gaps and set the elastic ether in vibratory motion—then I was happy. Nothing approached the wonder of caging these ether waves in sensitive head-phones and transforming them into readable script through the medium of that wonder of all wonders: the human mind.

As with all successful wireless amateurs my dominating ambition was to receive "long distance," a feat then possible only some time near midnight.

That it should not be necessary to remain up so late, I had, before retiring, been carefully tuning my sensitive instruments to the wave-length generally utilized by commercial companies, disconnecting the head-phones from the instrument table and connecting them to specially arranged binding posts at the side of my bed. The instruments of my mentality were tuned to produce wakefulness in the hours shortly after 1 a. m., and to this day they seldom fail me, provided they have been energized by a self-created thought just before retiring at night.



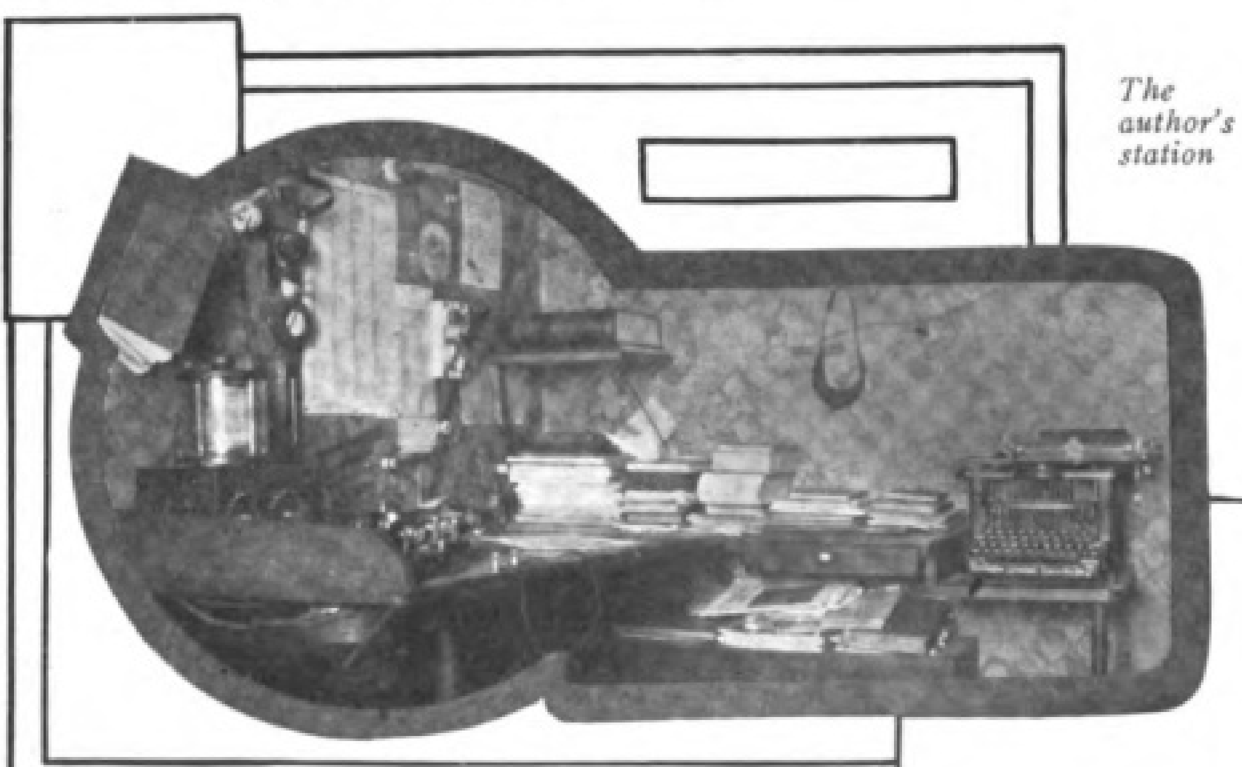
The Santa Rosa, stanch and reliable Pacific coaster, whose death cries were heard in the amateur set

True to the rousing power contained in the thought, early on that July morning in 1911 the mental switch was automatically thrown from sleep to consciousness.

Reaching for my head-phones I placed them in position and listened. Save for a few intermittent splashes of ever-active static, the ether was silent. Not a sound broke the stillness of the night; the whole world lay sleeping. Waiting thus for the far away sparks that must break the silence sooner or later, I dozed. Suddenly the clear, high tremolo of a wireless transmitter brought me to full consciousness. For a moment or two I listened, half protesting at the rude disturbance.

Then a stabbing nerve tremor shot through my frame! My mind had translated those alternating dots and dashes into the universal distress call. S O S! S O S! It seemed literally to ***scream!*** I sat erect, thrilled, appalled! Somewhere out there in the black night a fellow creature—and perhaps hundreds of other humans—was in peril, was appealing to his brother man for aid.

With my pounding heart keeping time to the high, mournful tattoo of the S O S, I waited for the "sign." Cuttingly clear it came: G I. My anxiety gave way to a gripping fear. G I—the call letters of the Santa Rosa! The Santa Rosa that had time and again bucked the mightiest storms of the Pacific unafraid, was begging for assistance!



The author's station

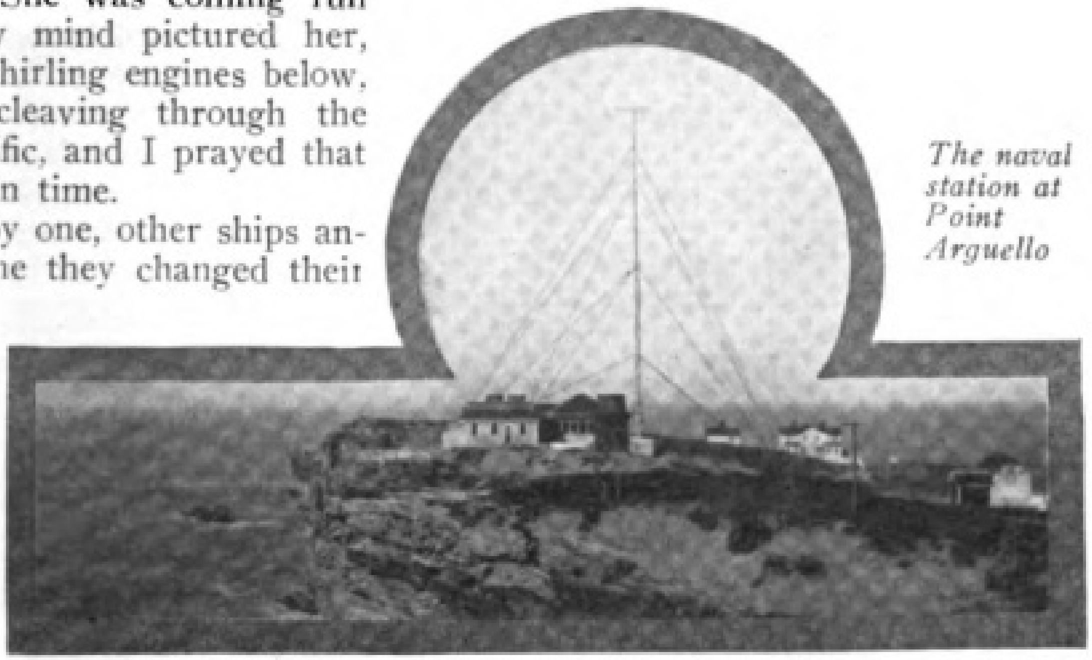
little through the interference; only the words "assist . . . off Pt. Arguello" were clear.

Then, after many torturous minutes of waiting, we heard the good old Centralia, and it seemed as if a sigh of relief went up from all who were on wireless watch that morning. The steamship had heard and answered. Eagerly we drank in her message. She was coming full speed ahead. My mind pictured her, urged on by the whirling engines below, the sharp prow cleaving through the waters of the Pacific, and I prayed that she would arrive in time.

Gradually, one by one, other ships answered; one by one they changed their courses and rushed on "full speed ahead," all bound for a common destination. Bending to the will of man, the ether had carried an appeal for help and whispered back the answer: We have heard and we are coming.

Time dragged heavily.

At last came a joyful message: The Centralia had arrived on the scene! Daringly she nosed close in, and soon a mighty hawser was run between the two ships, one so utterly helpless, the other free and powerful. Kept taut and straining by the restless engines of the rescue ship, the heavy line prevented the Santa Rosa from pounding. Then another vessel arrived on the scene, and there were two straining cables instead of one. Other succoring vessels were advised that those at hand could handle the situation, and turned back to their original courses.



The naval station at Point Arguello

All that was left when the ship broke up

With all going smoothly at the scene of the disaster, the voice of the wireless, its purpose accomplished, gradually ceased. Succeeding events did not become known until later in the day. Wireless press and the graphic accounts in the daily newspapers gave us the details.

We learned that with the aid of the rescue ships the Santa Rosa was resting so easily that her captain deemed it advisable to keep the passengers aboard, although the sea was sufficiently smooth to allow their removal in small boats.

Fatal mistake! In an incredibly short period of time a heavy sea came up and, in spite of the steadying lines, the vessel

Mingled with the S O S were the letters N P K, a call to the Naval station at Point Arguello, 110 miles to the north of my station!

I listened for perhaps a minute; maybe it was two; it seemed, however, that a dozen heart-rending hours dragged by before the clear, high treble of N P K came pounding into the phones. Instantly the rigidness of my body relaxed. I sprang from bed, disconnected my phones and bounded to the instrument table. The Santa Rosa was now giving her position:

"On the rocks two miles west* Point Arguello!"

here and there a cool-headed one assisting the officers to restore order; the crew working valiantly at the boats—and high up in the little wireless cabin, the calm, drawn-faced operator, unafraid, unfaltering . . . alone.

I knew he was calm for I, 100 miles away, was getting his every word. He sent fast but temerity and coolness could be read in his touch.

It all seemed so near! I looked through the open window out into the darkness, half expecting to see the wave-washed ship, grinding to destruction on the rocks. But no! She was 100 miles away! All I had to bring the picture before me was

A view of the treacherous coast upon which the Santa Rosa grounded

The scene stood out in my mind:

An irregular stretch of great, jagged, wave-swept rocks. The long, majestic Santa Rosa hopelessly entangled, rising slowly on the crest of every incoming swell and then falling helplessly back with a crash upon the treacherous reef, struggling like some great leviathan wounded unto death.

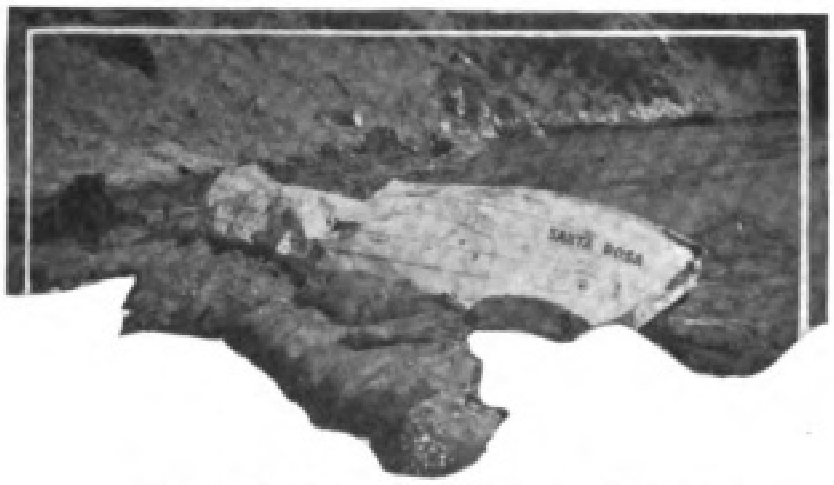
And then the mirror of my imagination reflected the scene upon the doomed vessel's deck: A tangled mass of sea-wrecked superstructure; hundreds of terrified, madly stampeding passengers; the penetrating scream of that wonderful voice of science. Marconi, it breathed, Marconi—God's Man!

The steady notes of N P K (Pt. Arguello) systematically calling other ships, brought me back from my imaginative wanderings. A dozen ships he called. We had no laws in 1911 requiring a constant, skilled watch, and the answering silence was maddening. All other operators off duty, and the Santa Rosa sinking with her precious human freight!

Suddenly the tone of the station at Mare Island Navy Yard, near San Francisco, 400 miles away, came purring into the phones. His dots and dashes mingled with those of N P K and I could read

*The position was north rather than "west," but the first message gave it as "west." The coast at this point runs northwest.

began pounding. Too late the officers realized their error. No small boat could live in that seething expanse of waters now. Then came untiring lifesavers to the shore; a breeches buoy was rigged to the ship; but only through the sacrifice of four human lives. Four death-disdaining men attempted to take a line ashore in a frail little boat—and perished.



Some of the wreckage of the Santa Rosa

Slowly the passengers, drenched and shivering, were pulled ashore over the lifesavers' cable. Even before the last person left the doomed vessel, one of the great lines to the rescue ship, unable to stand the continual strain, snapped in two. Then the other line went, and a great foaming wave lifted the helpless Santa Rosa high in the air, and jammed her down again with a shuddering crash.

The vessel broke completely in two and the victorious, mocking sea rushed in between. The two sections did not sink entirely, but the waves broke over them where they lay fast aground. Miraculously, no more lives were lost.

The officers, heart-broken and silent, were the last to be taken ashore. Sadly the huddled group of survivors stood on shore and watched the cruel waters pull and tug at the ruins of the one-time queen of the sea. And as they watched, monarchial Nature ever triumphant over the works of man, called the shattered Santa Rosa to rest beneath the waters of the pitiless Pacific, there to join the bodies of those four heroes who perished that others might live.

WIRELESS RATES LOWER THAN CABLE

In a recent issue of the Liverpool Journal of Commerce attention is called to what the Marconi Company is doing for commercial messages and a comparison is made with the cable companies. The article continues:

"The company has now taken up another enterprise, with a cheaper service to the West Indies, Bermuda, and British Guiana. The energy displayed by the company and its effects are far-reaching, and in this instance benefits are conferred on a part of the Empire which in the past has suffered more than any other owing to abnormal rates for telegrams. They may now be accepted between Great Britain and Ireland and Bermuda, Turk's Island, Jamaica, Antigua, St. Kitts, Dominica, St. Lucia, St. Vincent, Barbadoes, Grenada, Tobago, Trinidad, and British Guiana at 2s. 2d. per word for full rate and 1s. 1d. per word for deferred plain language telegrams, or 4d. and 2d. per word cheaper respectively than the rates charged by the cable companies. The above rates apply to messages in both directions, whether to or from the United Kingdom. St. Croix, St. Thomas, and Porto Rico can also be reached via the Marconi service at a reduction of 4d. per word, but messages at the deferred rate are not accepted for foreign islands as their respective Governments do not yet recognize this class of message. The Bahamas—Nassau—also benefits in this general reduction.

"The British and West Indian public will no doubt fully appreciate the possibility of effecting a further saving in their telegrams account, and will not fail to recognize the importance of the advantages secured to them by a concern endeavoring wherever its influence extends to introduce the lowest charges possible."

Echoing Our Advertising Man's "Are You a Subscriber?"

The members of our wireless club after due investigation of this and other publications label it our "official" magazine.

As a wireless magazine it contains more information than a half dozen of its contemporaries and information that is invaluable to the amateur and experimenter as well as the professional.

A. H., *Missouri.*

THE WIRELESS AGE is "different." I have obtained more real information from it than from all the other wireless magazines combined. "Queries Answered" column has answered all of my questions for me by answering questions of others, and I have never voiced a question. H. D. S., *Connecticut.*

I find in THE WIRELESS AGE much instruction and more pleasure than in any other magazine.

C. J. B., *Pennsylvania.*

I find your magazine a very interesting one. It is smaller than others, but it contains many more useful articles.

L. E. K., *New York.*

I have read many magazines, all of which have new inventions, but none are as up to date as THE WIRELESS AGE.

J. R., *California.*

Considering the benefit derived from this magazine, four months would be worth a year's subscription to any other. You have the best radio magazine published. E. G., *Ohio.*

THE WIRELESS AGE can't be beat. I am making a complete sending set from directions I have found in the last five issues. K. C., *Ohio.*

Your magazine is a pippin and has the other would-be wireless magazines skinned a mile.

J. M. H., *U. S. Govt. Service.*

I have been interested in wireless for several years and in that time have subscribed to all the radio magazines that have come under my notice; one of them used to be a fairly good magazine, but success must have gone to its head, for it changed its character and left out the very thing that made it a success. It is now in oblivion as far as radio matters are concerned. I have secured more information from THE WIRELESS AGE than from any other source and would not part with my back numbers for anything.

F. C. M., *Louisiana.*

I will say right here that I am well pleased with THE WIRELESS AGE, not as a plaything, but as a useful instructor.

C. W. C., *Texas.*

I had four months' trial subscription to THE WIRELESS AGE and was so pleased with it that I am lost without the magazine. F. C., *New York.*

THE WIRELESS AGE has proved itself worthy of a large circulation, and it remains for its readers to show their appreciation of it by subscribing for it.

H. J. H., *California.*

I have been reading a friend's WIRELESS AGE, and simply cannot do without it. It is excellent, and I am sure of renewing my subscription four months from now.—R. S. B., *New York.*

My subscription to THE WIRELESS AGE expired with the July issue. I have been taking it for one year and wish to say right here that I think it is the most up-to-date and covers the wireless subject the most thoroughly of any magazine published to-day. Of course the above does not amount to much with you people, as you get many letters such as this every day, but nevertheless I think that there are many over the country that will back up this statement of mine.—L. K., *Oregon.*

RADIO RAVINGS

Conducted by D. Phectiff Inslater

A brand new and suitably inscribed Government license certificate rustled expectantly against three clean collars and a handkerchief reposing lonesomely in the grip he carried. Fresh from the Marconi School, the new operator dashed up the gang plank. It was early, but the Old Man was on board. The new op. reported at his cabin.

"So you are my new wireless, eh?" began the captain, kindly. "What's your name?"

The abashed young man murmured incoherently.

"What's that?" said the Supreme Being. "I didn't catch that name. Spell it."

Young Hopeful began: "O, double T, I, double U, E, double L, double——"

"Wait!" gasped the captain. "Begin again!"

He repeated: "O, double T, I, double U, E, double L, double U, double O——"

"Whoa!" bellowed the captain. He glowered uncertainly; then: "What do you think you're doing, kidding me? Cut the comedy. What is your name?"

"My name," spluttered the abashed one, "is Ottiwell Wood, and I spell it O, double T, I, double U, E, double L, double U, double O, D."

It's one of those well-worn bromidic murmurs, of course, but there's a lot in that what's-in-a-name thing.

Down in South America, so an operator has told me, the populace became greatly excited over Caruso's visit and the higher opera. They tried to make a national hero out of him, but he wouldn't have it. He ducked the idol proposition all along the line and kept out of sight as much as possible.

One afternoon he was riding with a companion along an unfrequented beach road and came upon a wireless station. It reminded him that one of his dear friends was approaching over the ocean and he stopped to send a message of greeting. As he wrote out the blank the native operator gazed at him curiously; for it was quite evident from his companion's manner that the stout, jolly visitor was a very great personage, indeed.

When the writer had finished the operator took up the blank, glanced through it and remarked: "You have omitted the signature. What name shall I sign?"

"Oh," said the opera star, "my name's Caruso."

The operator stared. "Great heavens!" he gasped. "Robinson Caruso, the great traveler! Little did I ever expect——"

But a huge guffaw from the million dollar throat interrupted the effusion right there.

Feministically Speaking

Cape of Good Hope—Sweet sixteen.
Cape Flattery—Twenty.
Cape Lookout—Twenty-five.
Cape Fear—Thirty.
Cape Farewell—Forty.

Identification lacking in this case:

"How do you like your new junior?"

"Fine! He's a good kid; don't know no more about grammar, spellin' and punctuation than I do; he's just out 'er college."

Upon glimpsing which, Harold reiterates that life holds more joyous pastimes than reading P Vs.

What a nice, peaceful world this would be if it wasn't for the movements of the human under-jaw.

To put it acrostically, our unfortunate brethern across the seas need some one individual who measures up in:

Watchfulness
Independence
Learning
Sagacity
Optimism
Nerve.

That's all.

Marconi Men

The Gossip of the Divisions

Eastern Division

H. E. Cohen has relieved C. B. Darcy on the Bantu.

C. R. Underhill has relieved Charles Murray as junior on the Mexico. Murray is on leave.

O. M. Eddey is junior on the San Jacinto.

R. Voelker is junior on the El Occidente.

The cable ship Relay is again in commission. O. C. Temple and George Kavanagh are acting as first and second, respectively.

L. Brundage and Charles Heinline have been detailed to the Toyahashi Maru, a Japanese vessel. They expect to visit Japan and several European countries. Both anticipate an adventurous trip.

Irving Vermilya, formerly of the Sagaponack station, is at present detailed at Sea Gate.

M. Mendelsohn and J. F. Rodenbach are acting as senior and junior, respectively, on the Coamo.

Fred Klingenschmidt is attached to the Montgomery. Giles is junior.

F. Lumea has been promoted, being senior on the Algonquin.

Louis Michael is first on the Northland.

C. L. Whitney has been re-engaged. He is at present attached to the El Norte.

L. S. White, operator at Sagaponack, has been detailed to the Construction Department in New York.

P. H. Krieger has been detailed as junior on the Arapahoe, relieving J. Maresea.

A. I. Yuter and G. I. Martin have been detailed to the Esperanza which went recently into commission.

A. Schweider and C. E. Stevens are on the Proteus as senior and junior.

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

P. H. Nisley recently returned from leave of absence. He is on the John D. Rockefeller.

Walter Tylar has been appointed senior on the Matura.

C. D. Riley is on the Buenaventura, a one-man ship.

J. P. Eckhardt has been re-assigned to the S. Y. Cassandra.

V. H. Rand, formerly of the Honolulan, is attached to the Saratoga as second. L. C. Driver is senior.

H. V. Griffing has returned from leave and is attached to the Brabant.

W. Stengle has relieved A. H. Randow on the Dakotan.

L. R. Schmitt has gone home on leave. K. H. See is on the Morro Castle as senior in his place.

W. Travers and Percy Harrison were assigned to the Comal when she went into commission recently.

C. C. Levin, of the Marconi School of Instruction, has been detailed as second on the Maracaibo.

A. Darlington and A. M. Currie are on the Parima.

M. E. Fultz succeeded J. K. Noble on the Seguranca when the latter resigned.

W. T. Little, a graduate of the Marconi School of Instruction, is junior on the Madison.

A. C. Olsen of the Y. M. C. A. School has been placed on the El Sol as second.

H. W. Blackstone is first on the Siberia.

F. J. Doherty is senior on the Jamestown. A. Armstrong, a tyro, is second.

P. S. Berryman, of the Marconi School of Instruction, is second on the City of Columbus.

Stanley Russell, who spent two months in jail at Newcastle-on-Tyne, for taking a photograph of a British warship within a restricted area, is returning on the Gulflight, which has been undergoing repairs at Shields, England. The Gulflight, it is expected, will soon return to the United States.

R. J. Green and D. A. Kell, the latter a graduate of the Marconi School of Instruction, have been assigned to the Mongolian, a newly-equipped vessel.

J. E. Doyle is now second on the Olinda.

E. A. Bernstein, a new man, has been assigned as junior on the Northland.

S. J. Wright has returned from sick leave. He has been attached to the Iroquois.

E. Marschall is now senior on the Huron. H. E. Siegman is junior.

J. F. Rodenbach is junior on the Creole.

T. R. Bunting has resigned. P. Grasser takes the post vacated by him on the Princess Anne.

Harold Sachs has been re-engaged at San Francisco and is now junior on the Finland.

C. B. Darcy has been placed on the Alamo.

Matt Bergin, who served on the Camino of the Pacific Coast Division for a year, has been detached from that vessel and assigned to the El Occidente as senior.

D. Dudley has replaced W. S. Wilson on the Gulfcoast.

G. E. Entwistle is second operator on the Massachusetts. A. W. Mayer is on the Bay State.

N. W. Filson has been detailed on the Bunker Hill in place of F. C. Justice.

H. E. West, formerly of the Calvin Austin, has been detailed to the Governor Cobb.

G. S. Saunders has been detailed on the Nacoochee.

C. R. Crosby is at present attached to the J. M. Guffey.

Great Lakes Divison

A. E. Jackson, superintendent of construction, has just completed a trip of inspection, including all the coast stations on the Great Lakes Division.

The season of wireless and navigation is slowly coming to an end on the Great Lakes for 1915. The older men on vessels which suspend navigation during the winter months are replacing these younger in the service on ships that have a longer schedule.

C. J. Hiller, relief operator of the State of Ohio, and R. Sidnell, of the Seeandbee, have replaced H. P. Roberts and D. Smith on the City of Detroit III as senior and junior, respectively. The State of Ohio and the Seeandbee have docked for the season.

C. D. Heinlen has been transferred from the Cleveland station to the steamship Juniata as senior, vice F. C. Goulding, who takes the City of Buffalo, a one-man ship.

H. C. Rodd, senior on the Octorara, has been transferred to the S. Y. Nokomis, vice C. Beals, who has resigned. G. M. Commerford has been assigned to the Octorara as senior.

The Northland has docked for the season. G. P. Aldridge, senior, is at school again, while E. Leonard, junior, has relieved James Coolidge as junior on the Octorara. Coolidge requested the relief as he became ill on the trip down from the upper lakes.

G. S. Mackwiz has been assigned to night duty at the Detroit station.

Operators C. K. Little and B. B. Minium, seniors on the North and South Americans, have resumed their studies at school, the vessels on which they were detailed having docked for the winter.

R. Mathews has replaced G. P. Derry on the Arizona. Mathews comes from the Chicago.

J. F. Weiss is now on the Puritan.

M. F. Kliepera, formerly on the Minnesota, is now on the Harvester, a one-man ship.

W. A. Hutchins, who was on the Wrecker Favorite, at the time she assisted in the raising of the Eastland, has again reported as fit for duty and has been assigned to the Indiana. Hutchins has been on sick leave.

A. F. Moranty, who was on night duty at Mackinac Island, has been assigned to the wrecker Favorite. E. A. Johnson, of Chicago, has been detailed at Mackinac Island in place of Moranty.

R. Mathews has been detailed to the Arizona in place of G. P. Derry.

Southern Division

E. P. Diggins has been assigned to the Ontario as junior operator, Kelland having been transferred to the Baltimore station for several weeks. Junior Operator J. H. McCauley was appointed senior operator on the Ontario.

Assistant Operator Graf of the Baltimore station was recently assigned to the Howard as senior operator for one trip to Boston in place of L. E. Bell.

W. E. Neumann recently joined the

Gloucester as junior operator, relieving Operator F. H. Crone, who is on sick leave.

Operator V. Zito has been assigned to the Somerset as junior operator, in place of C. H. Warner, who has been assigned to the Christian Knudson at Newport News, Va.

L. W. McKee, who has been on relief duty at the Baltimore station, has been assigned to the Nantucket as senior operator, vice Operator Vogel, the latter being temporarily absent from duty.

J. F. Larrimore was recently assigned to the Nantucket as junior operator in place of Operator Simons.

R. P. Linderborn of the Merrimack is the proud father of a baby girl.

Pacific Coast Division

C. M. Jackson has been promoted to wireless operator in charge and purser of the Aroline.

J. G. Kelly, who has been absent from duty because of illness, has been assigned as assistant on the Aroline.

The following Marconi men have returned from the Alaska Packers' Canneries: S. Gaskey, P. M. Proudfoot, W. J. Erich, L. W. Sturdivant and C. A. R. Lindh.

S. A. Hodges has joined the Bear as assistant.

F. M. Gill was recently assigned to the Cabrillo at East San Pedro.

H. W. Dickow and E. K. Hawkins are now acting as first and assistant on the Congress.

William Jefferson Slattery, formerly of the San Francisco messenger force, has been assigned as assistant on the Celino.

L. D. Payne has been detailed on the Coronado.

T. I. Atwood and L. Winser are acting first and assistant on the City of Topeka.

M. W. Michael and J. L. Slater are on the City of Puebla as first and assistant.

E. R. Riddle has joined the Grace Dollar.

P. E. Riese and W. R. Lindsay have been assigned as first and assistant on the Governor.

D. W. Kennedy has joined the Great Northern as assistant.

W. R. Barsby was recently assigned as operator of the Honolulan at New York. He will be transferred to the high power circuit on his arrival in San Francisco.

C. Bentley has been assigned to the Hilonian as assistant, relieving F. Deckard, resigned.

C. H. Rogatsky and S. J. Richardson are now acting first and assistant of the Klamath.

H. A. Fowler has been assigned to the F. A. Kilburn as assistant.

N. McGovern and J. E. Echlin have joined the Lurline as first and assistant.

T. A. Churchill has been transferred to the Mongolia as assistant.

F. A. Lafferty and R. F. Harvey are now first and assistant, respectively, on the Matsonia.

H. G. Austin has been assigned as assistant on the Manoa.

G. B. Ferguson recently relieved R. P. Woodford as operator of the Navajo. Operator Woodford was transferred to the high power circuit.

E. M. Sutton has relieved O. Mock as operator in charge of the Northland.

J. M. Chapple has been transferred to the Pennsylvania.

C. A. R. Lindh has been assigned to the President as assistant.

P. M. Proudfoot was recently assigned as operator in charge of the Queen.

B. H. Linden recently joined the Rose City, having been assigned temporarily as assistant.

J. A. Wilson and P. D. Allen are first and assistant on the Roanoke.

A. W. Peterson has relieved F. W. Shaw as station manager for a period of two weeks. R. Johnstone and E. T. Jorgensen are employed on the second and third tricks respectively.

I. W. Hubbard and H. Grundell have been detailed as acting first and assistant on the San Juan.

J. E. Johnson and H. W. Kelley were recently assigned as first and assistant on the Umatilla.

P. E. White has joined the Willamette as operator in charge.

E. D. Bryant was recently assigned in charge of the Wilhelmina.

A. H. Doty recently joined the Wapama as assistant.

F. W. Brown has been assigned to the Yucatan.

Seattle Staff Changes

William Christenson, who has been on leave, has returned to duty at the Seattle station.

L. A. Lovejoy of the Astoria Marine station, has been assigned to the new high power station at Astoria.

R. S. Powell of the Seattle Shop Construction Department has been assigned to the new high power station at Ketchikan, Alaska.

W. J. Manahan of the Seattle Shop Construction Department has been assigned to the Juneau high power station.

H. W. Barker, who has been acting as assistant engineer at the Astoria high power station, has been transferred to the Seattle Construction Department.

H. L. Edling has been assigned to the Astoria marine station.

W. B. Wilson has been assigned to the Seattle station.

J. A. Marriott, who has been first operator on the Congress, has been assigned to the Juneau station.

E. K. Hawkins, a new man, has been assigned as second operator on the Congress.

A. P. Nielson, second operator on the City of Seattle, has been appointed first on the Humboldt.

J. R. Moore has been assigned to the City of Seattle.

R. E. Cowden, first on the Humboldt, has been assigned to the new high power station at Ketchikan.

R. V. Harris of the Seattle station has been transferred to the Seattle office.

F. M. Roy, first on the Senator, has been transferred to the new high power station at Astoria.

R. A. Billadeau has been assigned as assistant operator on the Senator.

E. Lee of the Mills has been transferred to the Alliance. A. G. Simson of the Alliance has been transferred to the tanker Mills.

N. C. Kumler of the Alki has been transferred to the Humboldt as assistant operator.

G. C. Hallet has been assigned as assistant operator on the Alki.

J. N. MacGowan of the Pavlof has been transferred to the City of Seattle.

W. J. Sunderland, a former member of the force here, has been appointed city manager at Juneau.

J. A. Stirling, formerly of the President, took up G. A. Meade's duties at the Y. M. C. A. School while the latter was on a vacation.

B. C. Springer, formerly of the Windber, has been transferred to the Spokane as first operator.

I. F. Julien has been appointed manager of the Astoria high power station.

RELIEF BY WIRELESS

A wireless call for a surgeon sent out by a Marconi operator on the steamship John A. Hooper, in the Caribbean Sea, brought medical aid to Miss Annie Christiansen, a passenger, who, during a severe storm fell to the floor of her stateroom, sustaining a fractured leg. Aid was rendered by the surgeon on the steamship Alliancia, which, although thirty-five miles away, responded and the sufferer was given attention.

The doctor, however, recommended that the patient be sent to the nearest hospital which was at Kingston, Jamaica, where Miss Christiansen was taken. She is a sister of one of the owners of the vessel.

HAMMOND TALKS ABOUT SUBMARINE WIRELESS

John Hays Hammond, Jr., inventor of the wireless controlled torpedo, fired from shore and recommended for purchase by the government, recently discussed with Secretary of the Navy Daniels a plan for a similar device for torpedoes fired from submarines. Many torpedoes fired by submarines or destroyers never reach their mark. Mr. Hammond told Secretary Daniels he believed he had found a means by which the deadly missiles would be guided to their mark unfailingly.

The Marconi Company has placed a phonograph and a large supply of records in the Cape Hatteras station for the use of the operators at that station.

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

E. O. K., Lebanon, Pa., writes:

Ques.—(1) What is the natural wave-length of my aerial which consists of four aluminum wires spaced 3 feet apart, length 125 feet, height 60 feet at one end and 35 feet at the other end?

Ans.—(1) The natural wave-length of this antenna is about 310 meters.

Ques.—(2) Please give a diagram of connections for a buzzer tester to be used in connection with a galena detector.

Ans.—(2) Note the diagram of connections (Fig. 1). A buzzer is connected in series with an inductance coil, L, and a battery, B, the coil, L, being placed in inductive relation to the coil, L', of the antenna system. In this manner the antenna is set into excitation by impulses from the buzzer circuit and will be excited at its own time period of vibration. If the secondary circuit of the receiving tuner is in resonance with the antenna system the maximum strength of signals will be received when the crystalline detector is properly adjusted.

Ques.—(3) What advantage is gained in receiving by having a variable condenser connected in series with the earth lead?

Ans.—(3) A series condenser in the antenna system is sometimes necessary when the natural wave-length of the antenna is greater than the emitted wave of a distant transmitting station. In this case it has the effect of decreasing the natural period. By judicious use of a variable condenser in the antenna circuit the decrement of damping of the antenna system may be decreased, the energy from interfering stations being eliminated as a consequence. Generally, however, decreased strength of signals is experienced when the variable condenser is not required for purposes of resonance.

Ans.—(4) A series condenser in the receiving antenna system generally does not have a paper dielectric. A variable air condenser should be employed. Its maximum value of capacity need not be more than .001 microfarad.

Ques.—(5) In the construction of a loading coil what is the best method for removing the insulation from the wires for a slider?

Ans.—(5) The best method is to remove the wire by means of a sharp pointed knife.

* * *

J. M., Philadelphia, Pa., inquires:

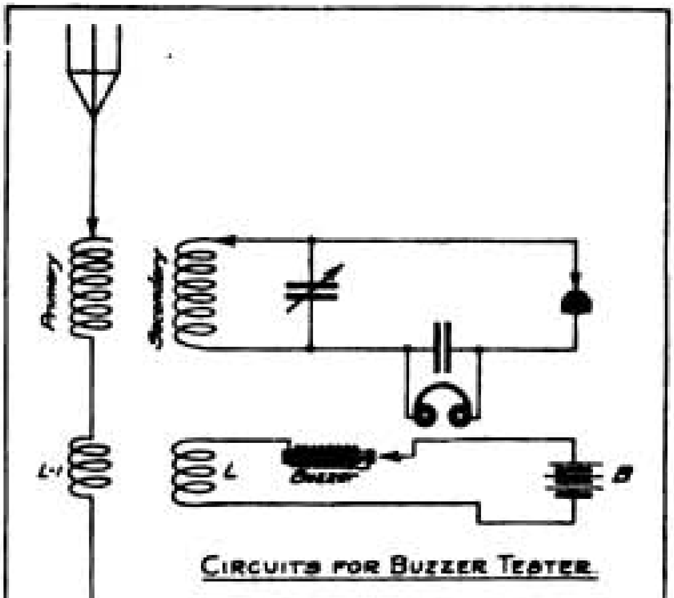
Ques.—(1) What is the interpretation of the following Arlington signals sent immediately after the baseball scores and the time signals, such as:

—— . —— . ——

. —— . . . ——. . ——

. . . —— . ——

Ans.—(1) The first signal, KA, is the international attention call. The following signal, ASTA, means "all stations attention," and the third signal, SK, is the international signal



CIRCUITS FOR BUZZER TESTER.

Fig. 1

for the complete termination of business.

Ques.—(2) Please tell me how many sections of Murdock molded condensers (.0017 microfarad per section) connected in parallel should be used in connection with the following transmitter: ¼ k.w. transformer, secondary voltage 5,000 volts; helix consisting of 12 turns of No. 8 brass wire on a form 8 inches in diameter; rotary spark gap giving 240 sparks per second, and an aerial 40 feet in length by 56 feet in height at one end; wire spaced 1¼ feet.

Ans.—(2) The voltage of this transformer is rather low for satisfactory operation at a wave-length of 200 meters. The maximum value of capacity which you can employ is .01 microfarau. This will allow, if short connections are used, one turn of wire at the primary winding of the oscillation transformer. A condenser of this size is not exactly suited for the secondary voltage of your transformer, but it is the best that can be done in the circumstances. You will secure increased results by purchase of a high voltage transformer giving 15,000 volts. You require six Murdock condensers in parallel for the designated capacity.

Ques.—(3) What is the wave-length of the aerial?

Ans.—(3) The natural wave-length of this antenna is between 160 and 170 meters.

Ques.—(4) Do you think a ground wire consisting of twenty-one strands of No. 22 B. & S. copper wire twisted together and having a length of about 25 feet will have any effect on the sending radius.

Ans.—(4) Offhand, we should say that this cable will have sufficient current-carrying capacity for the output of your set.

Ques.—(5) Please give dimensions for a quenched gap, such as the size of the plates, number of plates and the material of which they are made for use in connection with above transmitter. Where can I purchase plates for a quenched gap and what is the approximate cost?

Ans.—(5) We cannot give the complete mechanical details in this department for the construction of a satisfactory quenched gap. You can purchase plates of this type from the Cost and Sales Department of the Marconi Wireless Telegraph Company of America, 233 Broadway, New York. These plates are made of copper, carefully ground, so as to have absolutely even surfaces. For use in connection with the transformer of the voltage described you would require no more than five plates. These plates should be separated by micanite or fibre washers having a thickness of about 1/50 of an inch so that when pressed together the plates will not be separated by more than 1/100 of an inch. For your purpose the over-all dimensions of a plate for the quenched gap should be four inches, that is to say, 4 inches in diameter. One-half inch from the outer edge there should be a groove cut in the plate ¼ of an inch in width and about 3/16 of an inch in depth. There remains consequently a sparking surface in the center of 2½ inches. The plate should be ¼ of an inch in thickness, made of cast copper and, if possible, silver plated. The fibre washers for use between the plates should be 4¼ inches in diameter on the outside with a hole in the center of 2⅝ inches. The plates for the gap should then be piled up in a vertical or horizontal position and tightly pressed together by means of a set screw. See Fig. 2.

* * *

J. B. R., Albany, N. Y., inquires for information regarding the aluminum valve rectifier. He wishes to know the solutions used and asks for a diagram of connections for converting alternating current into direct current to charge a bank of storage cells.

Ans.—The aluminum valve rectifier contains an aluminum electrode and an iron electrode immersed in a neutral solution of ammonium phosphate. Occasionally sodium phosphate is employed. A diagram of connections for the use of this rectifier on alternating current for charging storage cells is shown in Fig. 3. A second diagram (Fig. 4) shows the connections for a two-way rectifier so that both halves of the alternating cycle may flow through the storage cell. In this type of rectifier the current is prevented from flowing in one direction on account of the production of a film of aluminum oxide at the aluminum terminal. However, if the pressure of the line is above 150 volts this rectifier will not function. Its practical limit in current carrying capacity is about twenty-five amperes.

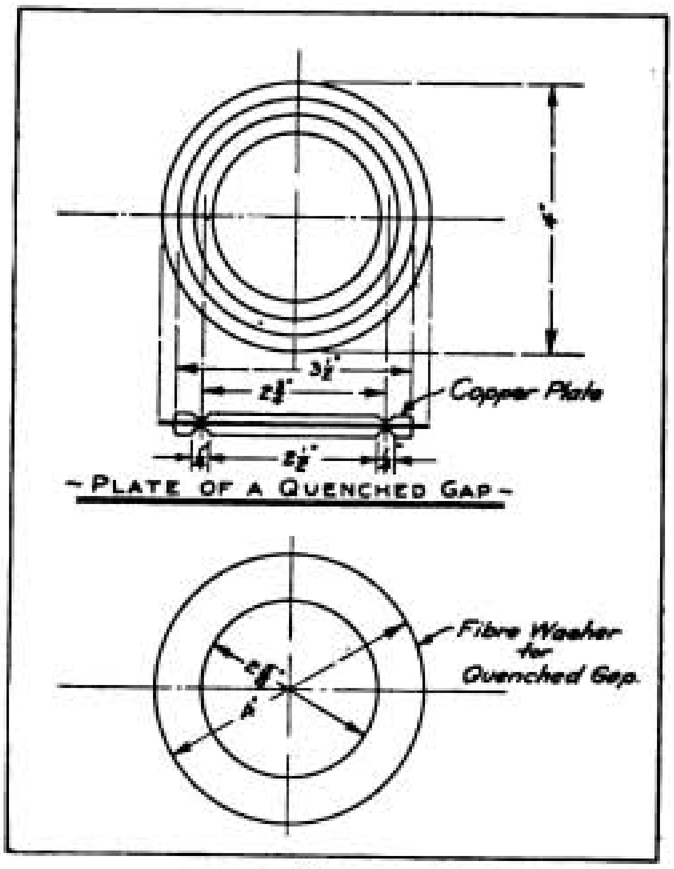


Fig. 2

In Fig. 4, L-1 and L-2 are impedance coils. The direction of current flow is indicated by the arrows.

* * *

J. E. D., Fort Aransas, Texas, inquires:

Ques.—(1) I have a number of pieces of hard rubber that I wish to remelt and mould into a form for a little experiment I am about to try out. I have tried various methods, but so far without success. I would be obliged if you would supply me with the necessary information, stating the materials required to accomplish the desired result.

Ans.—(1) The desired results may be obtained by crushing the hard rubber to a fine powdered state and mixing it with one-third of its weight of sulphur. Heat for several hours in a mould. The temperature at the start should be that of the room and should finally reach 300 degrees Fahrenheit. The sulphur is commonly added in a ground state,

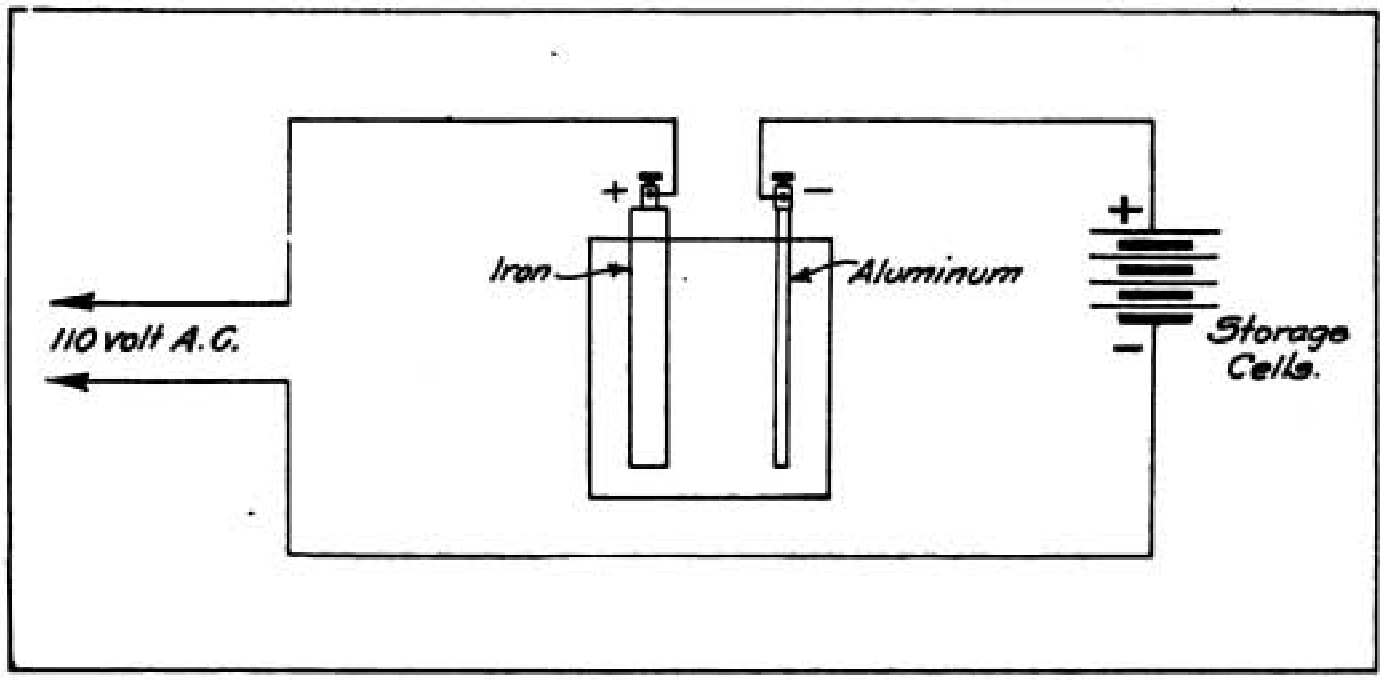


Fig. 3

but sometimes the India rubber is treated with some solution containing an element such as bisulphate of carbon. The inside of the mould should be dusted with pumice stone of lime so that the mixture will not adhere.

* * *

J. C. R., East Orange, N. J., writes that contrary to the opinion expressed on page 862 of the August issue of The Wireless Age in reply to E. M. T.'s inquiry concerning the reception of signals from Arlington with an indoor aerial, he has been able for a number of months to receive these signals with a flat top aerial consisting of seven wires, 21 feet in length, with a connection to the instrument 81 feet in length. He then describes the apparatus used which is of the ordinary construction and of about the proper dimensions for this work. The statement in the August issue was made because we considered E. M. T.'s aerial too small for adjustment to the emitted wave-length of the Arlington station. We did not wish to convey the impression that it was impossible to receive signals from Arlington under such conditions; in fact we believed it quite possible, as we stated, if the aerial had sufficient dimensions. It is at once evident that J. C. R.'s aerial has greater overall dimensions than that described by E. M. T. and consequently the signals are received.

It should be taken into account that it is possible to receive long distance signals with short aerials not entirely on account of the fact that the energy is being absorbed directly from the passing electro-magnetic wave by the small aerial, but also because this aerial may be in inductive relation to telephone or telegraph wires, or even power wires, which may pick up considerable energy from the Arlington station and re-radiate it into the smaller indoor aerial.

The strength of signals can be increased by using a triple vacuum valve amplifier. There is no doubt but that four wires, 100 feet in length, will give greater strength of signals than the present arrangement employed by J. C. R.

R. W. G., Oringsburg, Pa., inquires:

Ques.—(1) Please give directions for making a transmitting buzzer suitable for sending ten miles under poor weather and mountainous conditions?

Ans.—(1) It is very doubtful whether you will be able to cover ten miles with a transmitting buzzer unless a supersensitive receiving set, such as is obtained by use of the vacuum valve detector, is employed. The connections for a transmitting buzzer system are shown in full on page 862 of the August issue of The Wireless Age.

* * *

W. C. T., Scranton, Pa., inquires:

Ques.—(1) I have had considerable trouble with "kick backs" in the fixtures of our house when operating a ¼ k.w. transmitting set. I use a Murdock line protector connected across the primary circuit which is also grounded at the middle point, but whenever I transmit, a spark will jump in one or more of the fixtures. My transmitting set contains a 14,000 volt ¼ k.w. transformer, rotary gap, condensers and oscillation transformer. How can I remedy this trouble?

Ans.—(1) If the lighting wiring of your house is placed in iron conduit particular care should be taken to see that this conduit is properly connected to the earth. It may be possible that you have a poor earth connection for the transmitting apparatus proper and consequently considerable potentials are induced in the lighting circuits. If your transmitting aerial is so disposed that it is in close inductive relation to the power leads entering your house, there is no remedy for the difficulty except to place the antenna at right angles or, at a considerable expense, the incoming power leads may be placed in conduit under the earth.

Ques.—(2) I have heard that shellacking the coils of a receiving transformer affects its working. Is this correct?

Ans.—(2) Shellac applied to the coils of receiving apparatus has the effect of increasing the distributed capacity of the coils and, therefore, at certain wave-length adjustments may cause considerable loss of energy. However, in the average amateur apparatus this effect need not be taken into consideration. It is also well known that shellac has the property of absorbing considerable moisture and, consequently, may not afford the insulation expected.

The maximum wave-length of the antenna described in your third query is about 285 meters.

* * *

J. C. M., Bound Brook, N. J., inquires:

Ques.—(1) In the receiving transformer are the windings wound in the same or opposite direction?

Ans.—(1) It makes no difference. They may be wound in either direction.

with the difference between a spark coil and a transformer. This device cannot be used as a step down transformer.

Ans.—(3) The secondary condenser for this coil should have a capacity of about .0025 microfarad. It may consist, therefore, of five glass plates 8 inches by 8 inches, covered with tin-foil, 6 inches by 6 inches. The plates should be connected in parallel.

Ans.—(4) With an aerial 50 feet in length by 40 feet in height you should be able to send a distance of from eight to fifteen miles, provided the receiving apparatus has sensitive apparatus.

Ans.—(5) We have no data regarding the new naval station at Lake Bluff, Ill.

* * *

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

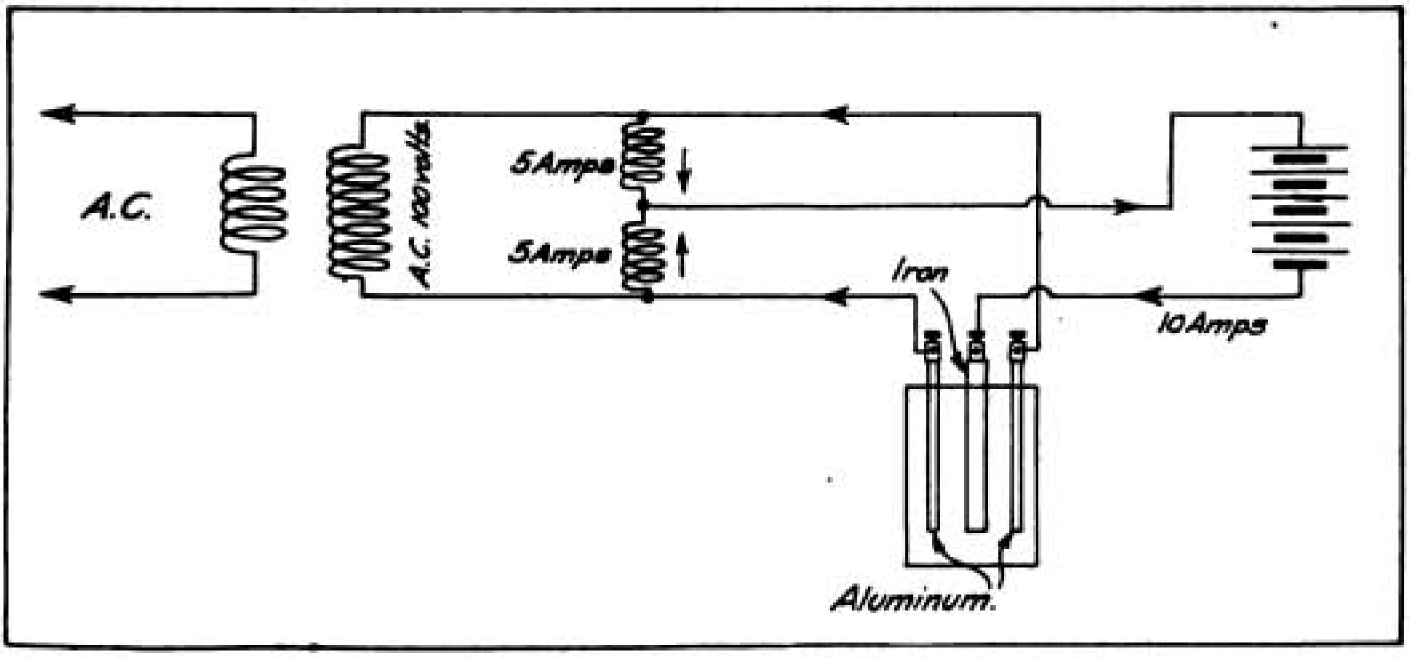


Fig. 4

Ques.—(2) When using a secondary loading coil, wound with No. 30 wire, in the receiving circuit is there any loss due to dead-ends when not using the complete coil?

Ans.—(2) Yes, the losses are considerable. They are greater than without the use of a secondary loading coil because of the increased value of inductance.

* * *

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

Ques.—(1) What are the dimensions for a 4-inch spark coil?

Ans.—(1) The primary coil should be 8¼ inches in length by 1 inch in diameter, composed of a bundle of fine iron wires. It should then be covered with three layers of empire cloth. The primary winding has 230 turns of No. 16 wire which is then covered with several layers of empire cloth or a small insulating tube. The secondary winding requires two pounds of No. 36 enameled wire made up into three sections, each having an approximate diameter of 4 inches. The condenser in shunt to the vibrator should have about 2,600 square inches of tin-foil.

Ans.—(2) You are apparently not familiar

Ques.—(1) By what formula can the approximate wave-length of an antenna be calculated?

Ans.—(1) See The Electrician for February, 1913. The matter is fully covered in an article by Dr. Cohen.

Ques.—(2) When constructing the secondary winding of a receiving transformer please tell me in what manner the approximate wave-length to which it will respond may be calculated, the size of the tube, the number of turns, etc., being known?

Ans.—(2) We cannot treat the subject exhaustively in this department. You should first decide the type of detector with which this apparatus is to be employed. If it is to be used with a vacuum valve detector, which requires a maximum value of potential for the best results, the capacity in shunt to the secondary winding should be very small, not over .0002 microfarad. Having decided upon the capacity of this condenser and the range of wave-lengehs to which the receiving transformer is to respond, we can use the following formula to calculate the value of inductance for the secondary coil, namely:

$$L = \frac{\lambda^2}{3552\ C}$$

Where L = the inductance value in centimeters.
λ = the wave length in meters.
C = the capacity of the condenser in microfarads.

When the value of inductance has thus been determined you can refer to the article appearing on page 843 of the August issue of The Wireless Age in which full instructions are given for the rapid calculation of the inductance of a single layered coil and also for calculating the number of turns required to obtain a given value of inductance.

Ans.—(3) By use of the circuits described beats will be produced in the local circuit of the vacuum valve, provided the inductance coil connected in series with the plate of the valve has sufficient value. Secure a copy of United States Patent No. 1,113,149.

Ques.—(4) Where can cardboard tubes be secured?

Ans.(4) Communicate with Ware & Company, Watt street, New York City.

Ans.—(5) We have no record of the call letters referred to. We believe they have not been assigned, with the exception of those for the Santa Maria, which are KLG.

Ans.—(3) A variable condenser is not absolutely necessary, provided the receiving apparatus has sufficient inductance value to allow resonance to be maintained with a distant transmitting station. It is quite desirable for tuning purposes to have one in shunt to the secondary winding and another in series with the antenna system for obtaining short wave-lengths. But for the average amateur work about the city receiving apparatus which will do away with the necessity for a variable condenser can be designed.

* * *

E. H. G., Lenark, Ill., inquires:

Ques.—(1) I have two aerial wires, one consisting of two No. 14 copper wires 114 feet in length, spaced 2 feet apart, and another of 4 aluminum wires, 48 feet in length, spaced 2 feet apart. Each aerial is 50 feet in height at one end and 30 feet at the other, with a lead-in of 10 feet. What is the wave-length of each aerial?

Ans.—(1) The natural wave-length of the first described aerial is 275 meters, while that of the second is about 160 meters.

Ques.—(2) Should I use both aerials in sending for a distance of twenty miles, or would it be preferable to use only one?

Ans.—(2) For covering a distance of twenty miles, we should prefer the antenna having a wave-length of 275 meters.

Ques.—(3) The nearest station to me is nineteen miles. What size spark coil should I use with dry cells to work with this station under the most favorable conditions?

Ans.—(3) We recommend that a 10-inch spark coil be used for this distance in order to insure sufficient strength of signals to be read under all conditions. Coils of this type may be purchased from the Cost and Sales Department of the Marconi Wireless Telegraph Company of America. It is more satisfactory to operate a spark coil from storage cells than from dry cells. A 10-inch spark coil generally requires about twenty volts in a primary winding and if you insist on using dry cells, we recommend that you connect twenty cells in series and another set of twenty cells in series, and then connect the two sets in parallel.

Ans.—(4) With the apparatus you describe you will not be able to receive the signals from Arlington in daylight unless you employ a triple vacuum valve amplifier, as described in the January, 1914, issue of The Wireless Age. We have examined the diagram of connections which accompanied your communication and advise that you eliminate one of the fixed condensers. You virtually have two fixed condensers connected in series, one being connected in series with one terminal of the secondary winding and the other in shunt to the head telephones. Eliminate the first named condenser and you will receive better signals. Note the diagram of connections on page 743 of the July issue of The Wireless Age. This is the most efficient method of connection which can be devised.

* * *

R. E. R., Seattle, Wash.:

Your communication is too long to be published in full in these columns. The natural wave-length of your antenna is 200 meters and the capacity about .00026 microfarad. The receiving apparatus you describe will allow adjustment to wave-lengths of about 2,400 meters.

We cannot give you the dimensions of an oscillation transformer for this set to operate at a wave-length of 200 meters, as you request in your fourth query, because we do not know the capacity of the condenser employed in the spark gap circuit. Inasmuch as the antenna has a natural wave-length of 200 meters you require a series condenser in the antenna circuit in order that the wave-length may be reduced sufficiently to allow a few turns to be inserted in series with the antenna system at the secondary winding of the oscillation transformer. Such a condenser should have a capacity value of about .005 microfarad. A single plate of glass, 8 inches by 8 inches, covered with tin-foil, 6 inches by 6 inches, the glass having a thickness of about 1/8 of an inch, will give a condenser this capacity. We advise, however, that you avoid the use of a short wave condenser and reduce the size of your transmitting aerial so that it will have a natural wave-length of about 170 meters. This will allow a few turns of wire to be inserted at the secondary winding of the oscillation transformer until a wave-length of 200 meters is obtained. An antenna, 60 feet in length by 30 feet in height, will have a natural wave-length of about 162 meters, or an aerial, 40 feet in height by 50 feet in length, will have a similar wave-length.

W. E. R., St. Louis, Mo., inquires:

Ques.—(1) I have observed in some of the larger manufactured receiving sets, a single pole, double throw switch which throws the primary condenser either in the ground circuit or across the primary winding of the receiving transformer. I should like to know in what manner this is connected up.

Ans.—(1) On investigation it will probably be found that while this switch may apparently be a single pole, double throw, it is fitted with auxiliary contacts which permit such connections to be made. It is impossible to throw the condenser in series with the antenna system or in shunt to the primary winding by means of a simple single pole, double throw switch.

Ques.—(2) I have heard that pieces of carbon are often connected across the 110-volt A. C. line and grounded at the middle point, being employed for the purpose of eliminating electrostatic induction. Can this be done and if so, what should be the resistance of the rod?

Ans.—(2) You are quite correct in your belief that they are so employed. Generally these rods consist of graphite about 6 inches in length by ½ inch to ¾ of an inch in diameter. The resistance value is between 5,000 and 15,000 ohms. Rods of this type may be purchased from the Cost and Sales Department of the Marconi Wireless Telegraph Company of America.

* * *

C. N. R., Lowell, Mass., inquires:

Ques.—(1) Please tell me through your valuable magazine the wave-length and capacity of my aerial. It is of the inverted L type, 50 feet in length and 35 feet in height, comprising 8 wires of No. 16 B & S gauge copper. The ground wire is 40 feet in length and the lead-in 50 feet.

Ans.—(1) The natural wave-length of this antenna is about 175 meters and the capacity .00031 microfarad.

* * *

J. J. H., Philadelphia, apparently has taken the Government license examination, or at least intends to do so. He inquires:

Ques.—(1) How would you test for an open circuit or a short circuit between the primary and the core of an induction coil?

Ans.—(1) A 16 c.p. lamp should be connected in series with 110-volt, direct or alternating current circuit. One terminal of this test circuit should be connected to the core and the other to the primary winding. If there is a short circuit between the primary winding and the coil the lamp will, of course, glow at practically full brilliancy. If there is no short circuit, the light will not glow.

* * *

Ques.—(2) Please tell me the correct answer to the question, Why do we plot a resonance curve?

Ans.—(2) A resonance curve shows in a general way the distribution of energy in a wireless telegraph transmitting system and allows an approximate calculation of the amount of interference to be expected from a given wireless telegraph transmitter. Properly plotted, a resonance curve allows the logarithmic decrement of damping to be calculated. It also shows whether the emitted wave is pure and in compliance with the United States restrictions.

Ques.—(3) Would the inability to draw a spark where the ground lead is sodded or bolted to the hull deck or water pipes be sufficient proof that the antenna system is properly grounded

Ans.—(3) A better test could not be devised.

Ques.—(4) If all the leyden jars in a transmitting set were broken would the arrangement shown in the diagram enclosed be practical, or would better results be obtained by using a plain aerial hook-up?

Ans.—(4) If all the leyden jars were broken the plain aerial connection is by all means preferable. The temporary condenser shown in your drawing is feasible and will give results, provided you can locate a jar aboard a vessel which is water tight. Questions of this nature are fully answered in the book "How to Pass the U. S. Government Wireless License Examination" on sale by the Marconi Publishing Corporation, 450 Fourth Avenue, New York.

* * *

E. W. D., New York City:

The receiving aerial, having dimensions of 50 by 55 feet, will allow the adjustment of wave-lengths up to and including 1,500 meters. We do not recommend that the secondary winding of the receiving tuner be wound with No. 40 enameled wire. It is too fine. Your daylight receiving range is about 150 miles and your night range probably 500 or 600.

* * *

G. D. C., Bessemer, Ala.:

As previously stated in the columns of this department, call bell apparatus for wireless telegraph systems have been devised, but the apparatus is exceedingly complicated and expensive, being far beyond the average amateur's pocketbook. Apparatus of this type is not entirely practicable for the reason that the bell will ring constantly when atmospheric electricity is severe. Apparatus of this type generally includes a vacuum valve amplifier and a sensitive polarized relay or a microphonic relay in connection with a sensitive polarized relay. We cannot devote space in these columns to a complete description of such equipment.

* * *

A. T. D., Clyde, N. Y.:

We cannot answer questions in this department by mail. Replies must appear in these columns. We cannot give you definite advice as to efficiency of various amateur apparatus supplied by manufacturers, particularly in this instance, because we are sure from your communication that you are not certain from which stations you desire to receive. You refer to certain high power stations, but unless we know definitely the range of wave-lengths over which you expect to work, we cannot give advice. It is not practical to construct a receiving tuner which will have a range of wave-length from 200 to 10,000 meters. It is preferable that the receiving apparatus be divided up into separate units, each one of which has a lower range of wave-lengths. For example: It is practical to construct a receiving tuner which will have a range of from 200 to 1,800 meters and also a second one which will have a range of, say, from 1,500 to 5,000 meters. A third tuner having a range of from 5,000 to 10,000 meters should then be constructed. In previous issues of The Wireless Age, particularly in the series "How to Conduct a Radio Club," apparatus of this kind has been described. Make sure of the stations from which you desire to receive, ascertain their wave-length and you will be able to decide for yourself what type of apparatus should be used.

* * *

H. M. R., Jasper, Mo.:

Ans.—(1) In reference to fastening a phonograph horn to a telephone receiver: unscrew the cap and have it threaded; then fit to it a small brass tube securely held in place by threading it. A small rubber hose should connect the tube to the phonograph horn.

Questions concerning wire telephony will not be answered in this department.

* * *

R. M. A., Chicago, Ill., inquires:

Ques.—(1) I should like to have a formula for changing microhenries to centimeters in the inductance of a single-layered coil.

Ans.—(1) One thousand centimeters of inductance is the equivalent of 1 microhenry.

Ques.—(2) Please give me a formula for changing the capacity of a condenser in centimeters to the capacity of microfarads.

Ans.—(2) Divide the capacity in centimeters by 900,000.

Ques.—(3) Should the wires in the secondary of a loading coil be of the same size as those in the primary winding of a loading coil in order to obtain resonance?

Ans.—(3) Not necessarily. Generally a loading coil in the secondary winding has the same sized wire as is used at the secondary winding itself.

Ques.—(4) Will the Marconi Company sell one of its standard variable condensers? What would be the price?

Ans.—(4) Communicate with the Cost and Sales Department of the Marconi Wireless Telegraph Company of America, 233 Broadway, New York.

Ques.—(5) Where can I get a wave-meter calibrated and what would be the cost?

Ans.—(5) Communicate with the Engineering Department of the Marconi Wireless Telegraph Company of America, 233 Broadway, New York.

* * *

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

Ques.—(1) How many batteries are required to send 10 miles on a 1½-inch spark coil? Will a condenser assist in covering this distance, and what should be its dimensions?

Ans.—(1) The average 1½-inch spark coil requires about eight volts of potential. You therefore need six dry cells connected in series. It is preferable to use two sets of six each in series and then connected in parallel in order that the life of the batteries may be prolonged. With coils of this size we have found by experiment that better distances are covered when the spark gap is connected directly in series with the antenna system, eliminating the oscillation transformer and condenser. But if your station is located within the zone of commercial or naval interference you will not be allowed to use this arrangement. A condenser for a 1½-inch spark coil must have a very small value of capacity, not more than .0005 microfarad. A single plate of glass, 8 inches by 8 inches, covered with tin-foil, 6 inches by 6 inches, the glass being ⅛ of an inch in thickness, will give a capacity of about this value.

Ques.—(2) I have a receiving transformer with a primary 8 inches in length by 4½ inches in diameter, wound with No. 24 S. S. C. wire. The secondary winding is 8 inches in length by 3¼ inches in diameter, wound with No. 30 S. S. C wire. To what wave-length can I adjust?

Ans.—(2) The secondary winding of this coil has an inductance of about 4,236 microhenries. If the secondary winding is shunted by a variable condenser of .001 microfarad the wave-length of that circuit will be adjustable to about 4,000 meters. Without the use of a variable condenser in shunt to the secondary winding, wave-lengths of between 2,000 and 2,400 meters will be received.

* * *

J. A. M., Yonkers, N. Y., inquires:

Ques.—(1) Please give me a formula for the calculation of inductance of a multi-layered coil.

Ans.—(1)

$$L = 4 \pi^2 n^2 m \left\{ \frac{2 a_0^4 + a_0^2 l^2}{\sqrt{a_0^2 + l^2}} \right\} + 8 \pi^2 N^2 \left\{ \left[(m-1) a^2 + (m-2) a_2^2 + \ldots\ldots \right] \left[\sqrt{a_1^2 + l^2} - \frac{7}{8} a_1 \right] + \frac{1}{2} \left[m (m-1) a_1^2 + (m-1)(m-2) a_2^2 + (m-2)(m-3) a_3^2 + \ldots\ldots\ldots\ldots \right] \left[\frac{a_1 r_1}{\sqrt{a_1^2 + l^2}} - r \right] \right\}$$

where m = the number of layers.

a = the mean radius of the solenoid.

a-1, a-2 and a-3 = the mean radius of the various layers.

l = the length of the solenoid.

r = the radial distance between two consecutive layers.

n = the number of turns per unit length.

All of these dimensions are in centimeters. This formula was given by Cohen and is said to be accurate within ½ of 1 per cent., the accuracy increasing as the length of the coil in relation to its diameter increases.

* * *

G. W. M., Fulton, N. Y.:

There appeared on page 743 of the July, 1915, issue of THE WIRELESS AGE, a diagram of connections for use in connection with crystalline detectors. This diagram is the most efficient yet devised and is recommended for your use.

We cannot calculate the range of wave-lengths for a receiving tuner by merely knowing the number of turns in the primary and secondary windings. We must have the size of the wire, the length and diameter of the coils, etc.

The galena detector is far more sensitive than the electrotlytic, that is, when its operation and adjustment is properly understood and it is employed in the correct circuits. The diagram of connections given on page 743 of the July, 1915, issue of THE WIRELESS AGE is applicable to the galena detector with the exception that the potentiometer and battery should be eliminated.

* * *

J. D., Mars, Pa.:

If you desire to purchase a magnetic detector, communicate with the Cost and Sales Department of the Marconi Wireless Telegraph Company of America, 233 Broadway, New York. While this detector requires no adjustment whatsoever, it is not sensitive on the lower range of wave-lengths. The best results are obtained on wave-lengths of between 2,000 and 3,000 meters. The magnetic detector cannot be used in the type of receiving tuner ordinarily employed by amateurs. It requires a special secondary winding of lower inductance value and also of lower resistance. The magnetic detector is used in connection with a 75-ohm head telephone. Data for the construction of the magnetic detector is not available for publication at this time.

* * *

C. H. S., St. Louis, Mo., asks for the best dimensions of a receiving tuner to be adjustable to a wave-length of 2,400 meters, to be employed in connection with a vacuum valve amplifier or crystalline detector. He also wishes to know the best size of wire to be used in both the primary and secondary winding.

Ans.—The primary winding of the transformer should be 4¾ inches in length by 4 inches in diameter, wound closely with No. 24 S. S. C. wire; the secondary winding should be 3⅛ inches in diameter by 5 inches in length, wound closely with No. 30 S. S. C. wire. The secondary winding may be shunted by a very small variable condenser. The turns of this winding should be divided between the points of a 10-point switch, while the primary winding should have a sliding contact or a multiple-point switch, as described in previous issues of THE WIRELESS AGE. The diagram of connections shown on page 743 of the July issue of THE WIRELESS AGE should be used.

* * *

C. B., Louisville, Ill., writes:

Ques.—(1) How far can I send under favorable conditions with a 12-inch spark coil, a fixed gap, condenser and oscillation transformer? This coil is to be operated on a 60 watt step down transformer with a wave-length of 600 meters.

Ans.—(1) If the receiving station is fitted with the proper apparatus you should be able to cover distances of from ten to fifteen miles.

Ans.—(2) The natural wave-length of the antenna described is about 490 meters. It is too long to be operated at a wave-length of 300 meters and requires a short wave condenser to be inserted in series for a wave-length of 450 meters. A few turns of inductance in the antenna circuit will raise the wave-length to 600 meters. We suggest that for operation on 300 meters you either decrease the length of this antenna or erect a second aerial of decreased dimensions. To be more explicit, for operation at a wave-length of 300 meters the natural wave-length of this second aerial may be less, say, about 250 meters. An aerial 40 feet in height by about 98 feet in length, consisting of four wires spaced 2 feet apart, will have a natural wave-length of 250 meters. A few turns of inductance connected in series will raise the wave-length to 300 meters.

The wave-length of the aerial described (490 meters) can be reduced to 450 meters by a condenser having a capacity of .0005 microfarad. Twelve plates of glass, 14 inches by 14 inches, covered with foil, 12 inches by 12 inches, and connected in series, will give a condenser of this capacity. The plates should be ⅛ of an inch in thickness.

Ques.—(3) Please tell me which of the following detectors is the most sensitive: Crystaloi, galena or silicon, and antimony.

Ans.—(3) The galena detector is said to be the most sensitive.

Ques.—(4) Please advise from what Government wireless stations the time signals and weather forecast are sent out. Last summer and autumn, and also during a part of the winter, I could hear Key West sending out the time signals at the same time as they were sent from Arlington, but for some months I have not been able to get the time signals from any station other than N A A and 9-ZS. Have some of these stations stopped sending time?

Ans.—(4) The following stations of the United States Naval Radio Service send out time signals daily:

Stations.	Wave-Lengths in Meters.	When Sent.
Arlington...	2,500	Every day at 11:55 A. M. to noon and 9:55 to 10:00 P. M. standard time; 75th meridian.
Key West...	1,000	Daily at 11:55 A. M. to noon, standard time, 75th meridian.
New Orleans	1,000	Daily at 11:55 A. M. to

		noon, standard time, 75th meridian.
North Head.	2,000	Daily except Sundays and holidays at 11:55 A. M. to noon, standard time, 120th meridian.
Eureka	1,400	Ditto.
San Diego ..	2,000	Ditto.
Mare Island.	2,500	Every day at 11:55 A. M. to noon and 9:55 to 10:00 P. M., standard time, 120th meridian.

If, for any reason, the Arlington station is out of commission the time signal will be sent daily at noon, Sundays and holidays excepted, by the naval radio stations at Newport, New York, Norfolk and Charleston. The time is sent from the Naval Observatory, Washington, for the Atlantic Coast, and from the Observatory at the Mare Island Navv Yard for the Pacific Coast. A relay key in each station is connected to the Western Union lines by a relay at about ten minutes to twelve o'clock in the morning and the signals are made automatically direct from Washington and Mare Island.

Time signals from each of the observatories mentioned continue for the five minutes preceding noon and ten o'clock in the evening. During this interval every tick of the clock is transmitted except the 29th second of each minute, the last five seconds of each of the first four minutes, and finally the last ten seconds of the last minute. The noon and ten o'clock signal is a longer contact after this longer break.

Ques.—(5) For some reason I am unable to get many amateurs or commercial stations on 300 to 600 meters, although I am able to hear the high power stations at wave-lengths of from 1,000 to 3,000 meters whose signals come in loud and clear.

How can I arrange so that the short as well as the longer wave-length stations may be tuned in? Please give a diagram of connections.

Ans.—(5) Taking into account the aerial described, it is quite easy to understand why you do not receive the signals from amateur stations. The natural wave-length of this antenna is too great; in fact it is too long to be reduced to a wave-length of 200 meters by means of a series condenser. We advise that you erect a smaller aerial for receiving from commercial and amateur stations. An antenna 60 feet in length by 50 feet in height will allow the reception of amateur signals.

* * *

G. F. T., New York, inquires:

Ques.—(1) By employing an electric spark from a spark coil is it possible to eliminate all oxygen (leaving other gases present) from a small glass enclosure filled with air?

Ans.—(1) High potential current supplied through sealed-in electrodes will effect what you purpose.

Ques.—(2) Will the filament of an electric light bulb glow in a space from which all oxygen has been removed, other gases remaining present?

Ans.—(2) Yes.

Ques.—(3) What are the advantages of a compressed air condenser?

Ans.—(3) Self-restoring qualities of the dielectric in case an abnormal voltage is applied. Also the absence of dielectric losses.

Ques.—(4) Can you give me the address, street and number of W. N. T., listed as being located in New York?

Ans.—(4) This station is located at 90 West street, New York City.

Ques.—(5) Are the wing and grid of the vacuum valve all nickel or heavily plated?

Ans.—(5) They are made of solid nickel.

* * *

S. S., Stamford, Conn., asks for full data in reference to the construction of a magnetic detector. This information is not available at present.

Ques.—(2) At what time do Arlington and Sayville transmit with undamped oscillations?

Ans.—(2) The Arlington station may be heard between nine and half past nine o'clock at night, also at one o'clock in the morning. The undamped oscillation set is also used at other times of the day. The Sayville station can be heard directly after fifteen minutes after nine o'clock every evening. It operates on a wave-length of about 9,000 meters.

We cannot give the receiving range of your apparatus accurately, but offhand we should say that you will be able to hear signals from commercial stations at a distance of 1,200 miles at night and 200 miles in the day time.

* * *

J. L. R., Buffalo, N. Y., like many other amateurs at this season of the year, is having difficulty with long distance receiving. He says that he was able to hear the signals from the Arlington station during the winter months by the use of a vacuum valve detector, but during the summer months the signals completely disappeared, although they can still be read at other amateur stations in his vicinity on the ordinary mineral detectors. He encloses a diagram of connections, but fails to furnish us with complete data regarding the windings of the receiving tuner, the value of capacity of the condensers used in the various circuits, etc.

First, the variable condenser, in series with the secondary winding, should also be connected in series with the grid of the vacuum valve detector. The secondary winding should be so designed that for a given wave-length a very small value of capacity is used in shunt to the secondary winding. If the connections of the vacuum valve detector are correct and, furthermore, the bulb is at all sensitive, there should be no difficulty in receiving the signals from Arlington at Buffalo during the summer months. It may be that some of the batteries in a high potential set have become weakened or perhaps the vacuum valve is not sensitive. The data given is so incomplete we cannot reply further.