THE WIRELESS AGE

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WARTIME WIRELESS

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EUROPEAN
HOSTILITIES

IN THIS ISSUE

FIFTEEN CENTS

THE WIRELESS AGE

OCTOBER, 1914

THE RADIO REVIEW

ONE of the changes which the wireless has wrought in warfare has been to restrict very greatly the effectiveness of the commerce destroyer as a weapon in the hands of a nation which has not control of the sea. In the War of 1812 the United States was able to inflict great damage upon British commerce in spite of the fact that the great war fleets of the British had command of the oceans. The Americans did not attempt to defeat those war fleets, but they built swifter ships than those of the British and sent them out all over the oceans to destroy British merchantmen and any British warships of their own size which they encountered. Similarly, in the War between the States, the Confederacy never had an oceanic navy which could contend in battle with that of the Federal Government. It built swift cruisers, however, like the Alabama and the Shenandoah which eluded the more powerful Federal ships and played havoc with the Federal commerce.

Wireless a Protection to Commerce

It is the wireless which has been chiefly responsible for the failure of the swift German cruisers to play the role which the American frigates and privateers played in 1812 and which the Confederate cruisers played in the sixties. The wireless has enabled the British cruisers to keep pretty close tab on the movements of the German cruisers and the latter have been followed up so closely by their enemies that they have been able to do little or nothing in the way of inflicting injury upon British commerce. By means of the wireless, also, the British war vessels have kept British merchant ships advised as to the movements of the German war vessels and in consequence the merchantmen have been able to avoid dangers to which they would otherwise have exposed themselves.

The failure of the German cruiser Karlsruhe to capture a single British merchantman is striking evidence that the time has passed when a nation which is outclassed in fighting ships by another nation may nevertheless inflict severe injury upon that other nation by making inroads on its commerce. The Karlsruhe is faster than any of the British cruisers which are patrolling the western Atlantic, but the wireless has enabled the British to keep such close track of her that she failed utterly in her attempt to raid the British commerce. In spite of her superior speed, she had one narrow escape from capture and had to fight a long range action with a British cruiser which had been apprised of her position by wireless.

IN the present war the two allies against Germany and Austro-Hungary, France and Russia, are probably in touch every hour of the day and night. By means of wireless telegraphy they can talk right over Germany, thereby bringing about perfect co-operation. Probably General Joffre and Grand Duke Nicholaievitch each know what the other's forces are doing from hour to hour.

Useless Attempts at Interference

The history of wars in years previous to the time when the world was without wireless shows that armies spent much time in attempting to cut an enemy's telephone and telegraph wires. To-day it is practically impossible to break the transmission of dispatches when sent by wireless. While a number of German vessels were being detained in the harbor at Bombay the authorities discovered that their wireless apparatus had been disturbed. The trouble originated, according to the reports from Bombay, with the Hansa liner Rheinfels, one of the vessels which was being held. As a result the installation on board was immediately destroyed and the captain and crew of thirteen were imprisoned. There is no doubt, an account of the incident says, that the aim of the Hansa's crew was to forward, if possible, information through one of these colonial stations to Berlin. As a matter of fact, an English writer declares, their efforts, even if unchallenged, would have been doomed to failure, for, notwithstanding persistent efforts to interfere with wireless messages which have been proceeding incessantly between Whitehall, Paris and the British fleet, not one of these attempts has proved successful. Endeavors to "jam" wireless messages have failed entirely, and the British Cabinet, as well as the Admiralty and War Office, have been kept in uninterrupted touch with the entire theatre of war. A number of misleading messages have been received with the obvious intention of deceiving the responsible officials, but these have been detected.

Thus, while the possibility of interference with wireless messages in war time has been speculated upon, the art has stood successfully the severest tests.

MISSTATEMENTS of fact are quite the regular order of things in wireless articles published in the lay press, but it is something of a shock to find a leading electrical journal offending, as witness the following from the Wireless World:

Fact and Fancy Again

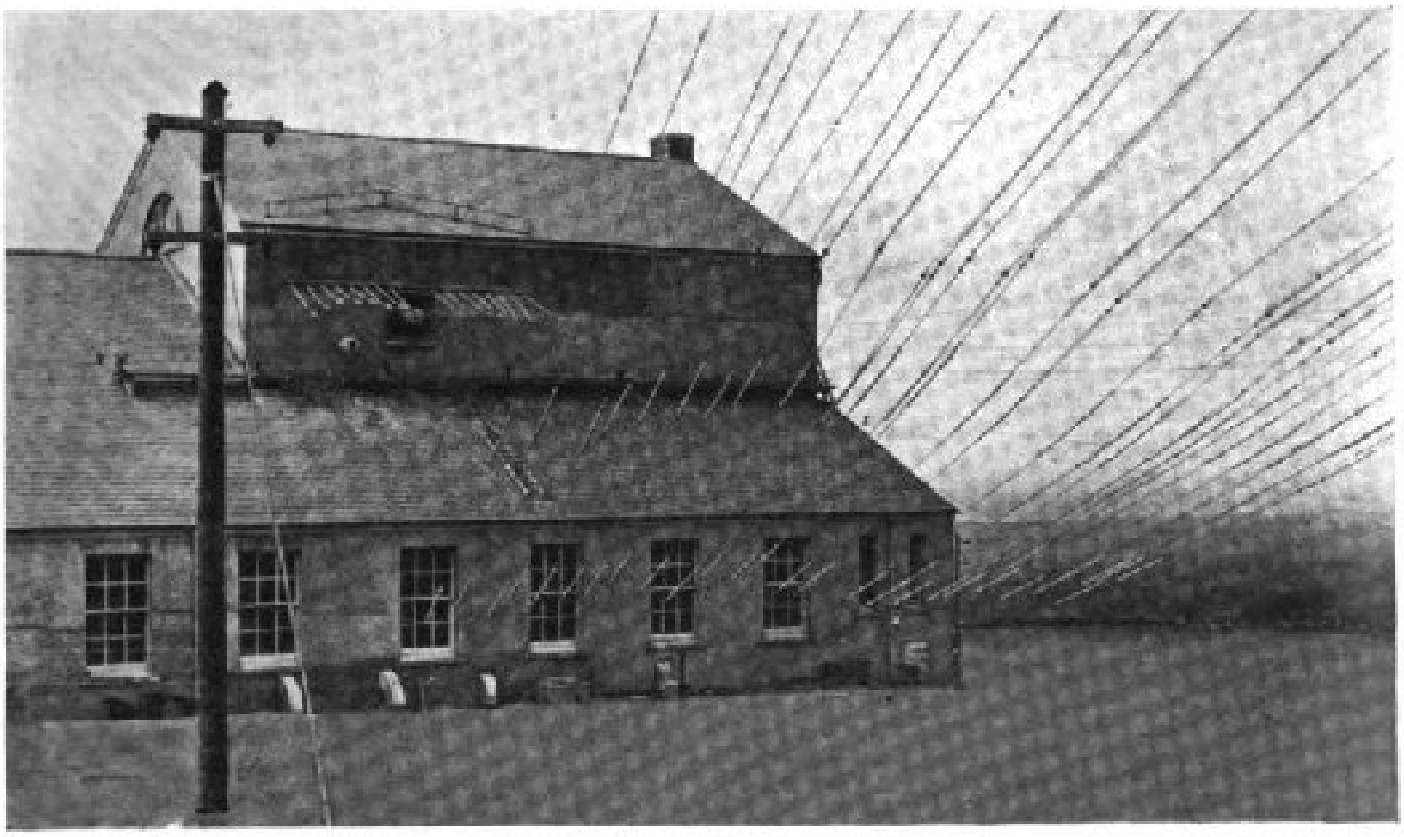
The Electrical World of New York has an article entitled "A New Marconi Trans-Atlantic Service" in its issue for August 29. This article is based upon the account of the proposed additional trans-Atlantic service and the description of the Welsh stations which appeared in the July number of the Wireless World. In commenting editorially upon the proposed service, our contemporary draws attention to some of the troubles experienced in the early days of long-distance wireless telegraphy, but we think it does less than justice to the achievements since 1908, and underrates the permanent commercial value of the results which have rewarded the patience, courage and foresight of Mr. Marconi and his company. The Electrical World speaks of the present trans-Atlantic wireless telegraph service as the "first regular *night-time* wireless between the United States and Great Britain." The words which we have italicised entirely misrepresent the character of the service which, as the whole world knows, has for years past carried on regular commercial day and night wireless communication between the United Kingdom and North America.

This service has had a potent influence upon trans-Atlantic telegraph rates, and its success is justification for the larger service which would have been in commercial operation by this time had not the European War intervened.

So glaring, indeed, is this misstatement that it discounts the further "striking fact" which our contemporary discloses, namely, that eight years after the establishment of the service "no commercial day and night service has been opened in competition with the Atlantic cables."

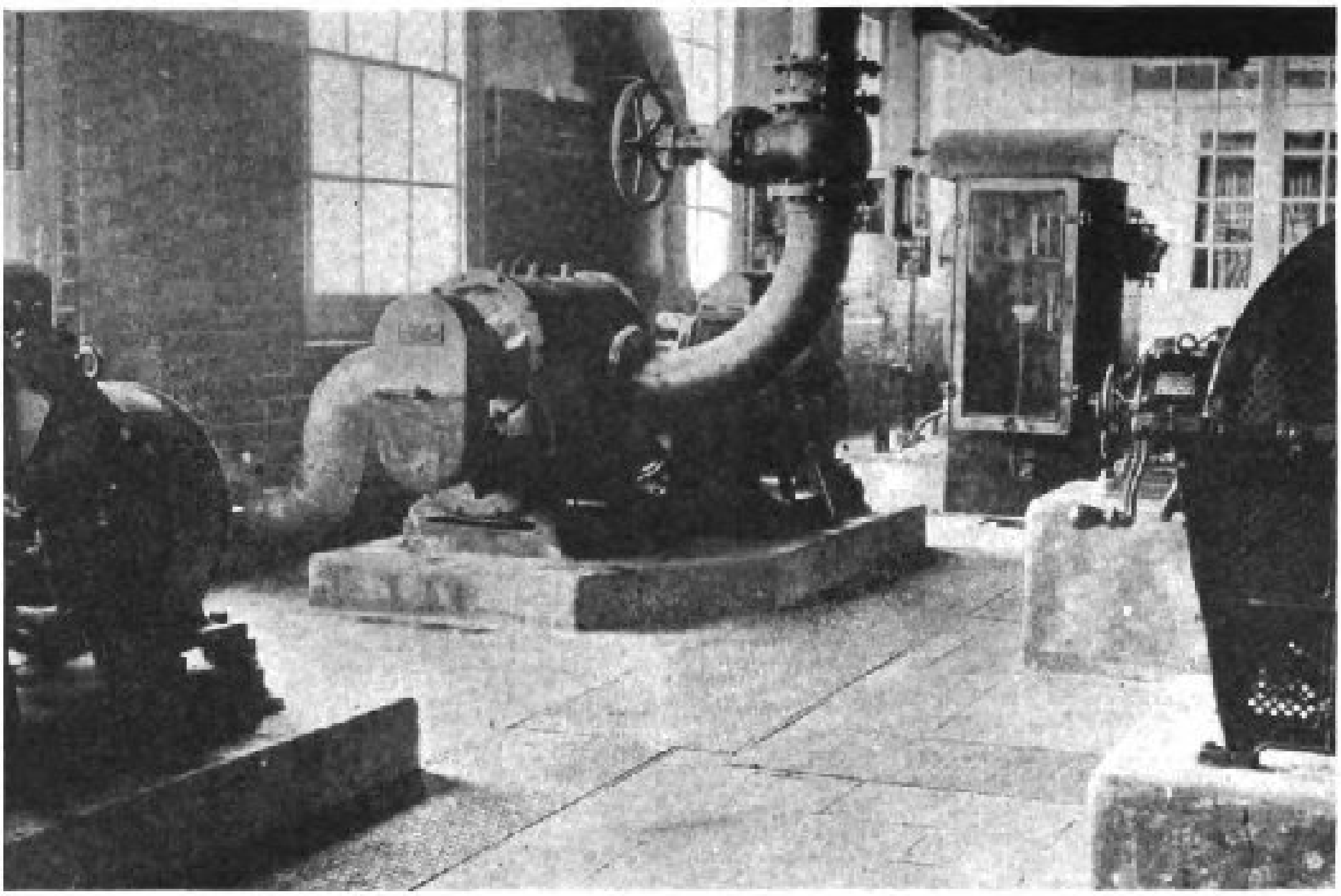
If that is so, it would be interesting to know why Atlantic cable rates have been reduced from time to time in the endeavor to bring them within reach of the trans-Atlantic wireless rate.

THE EDITOR.

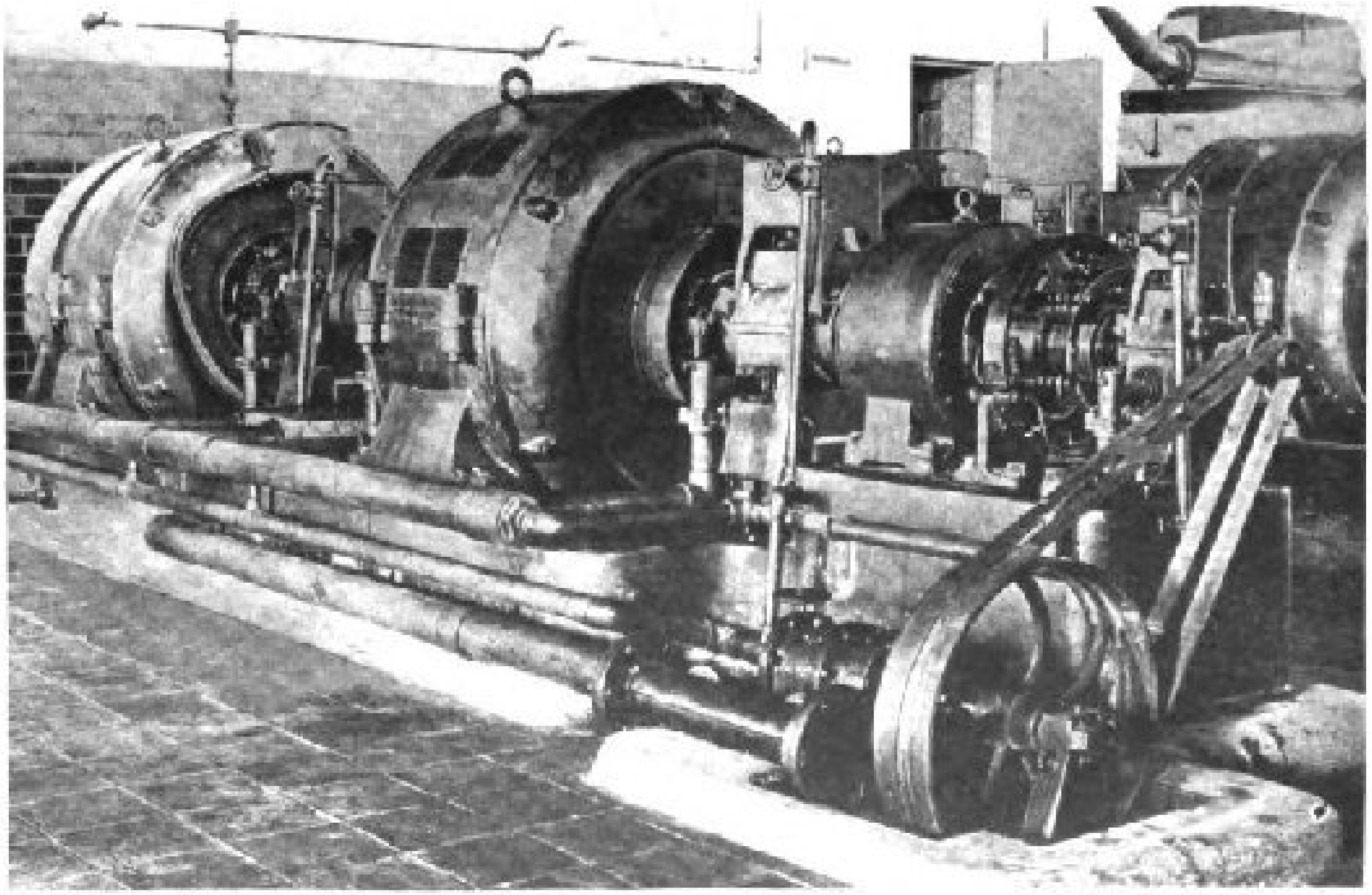


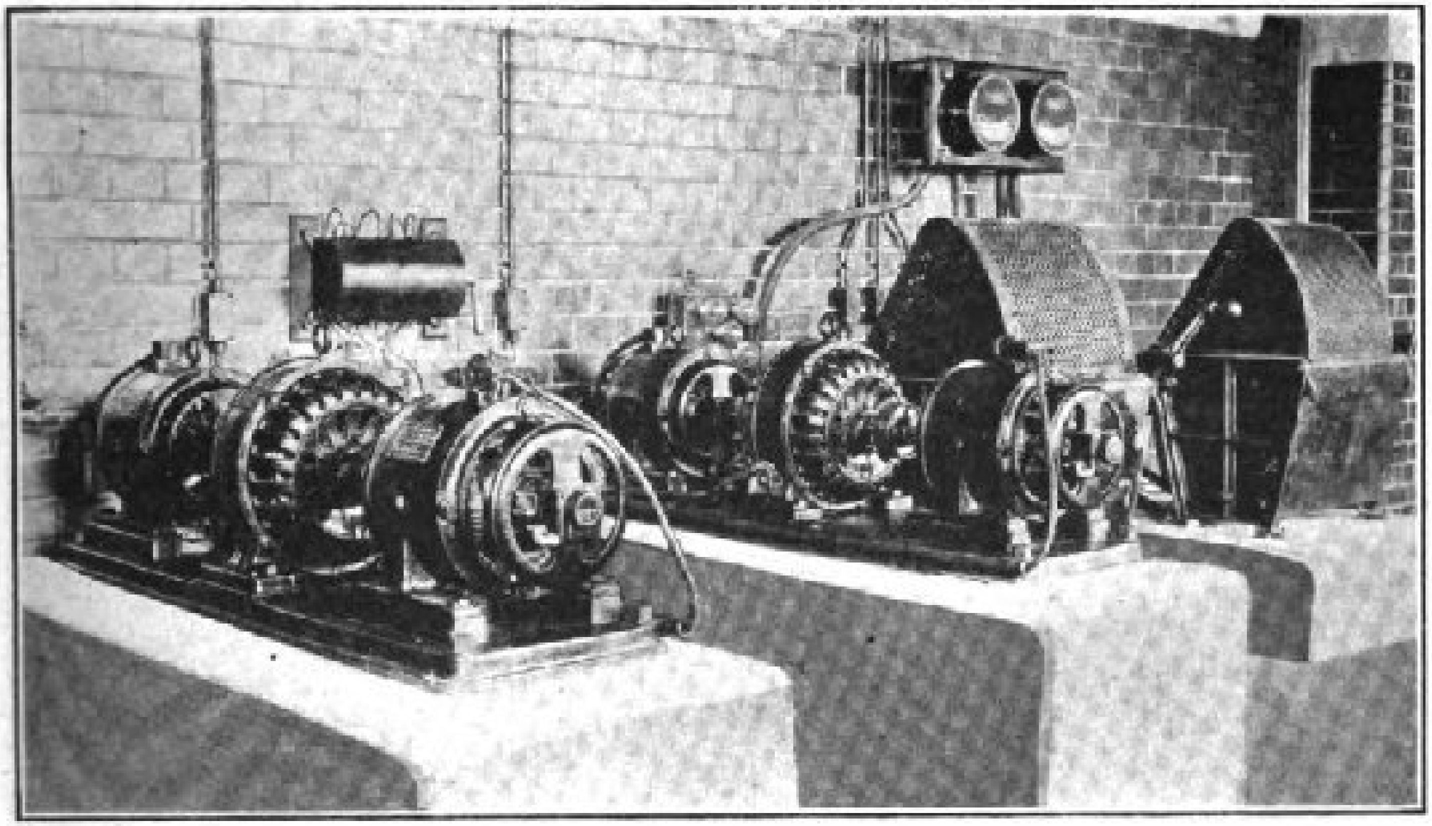
The Wales Station

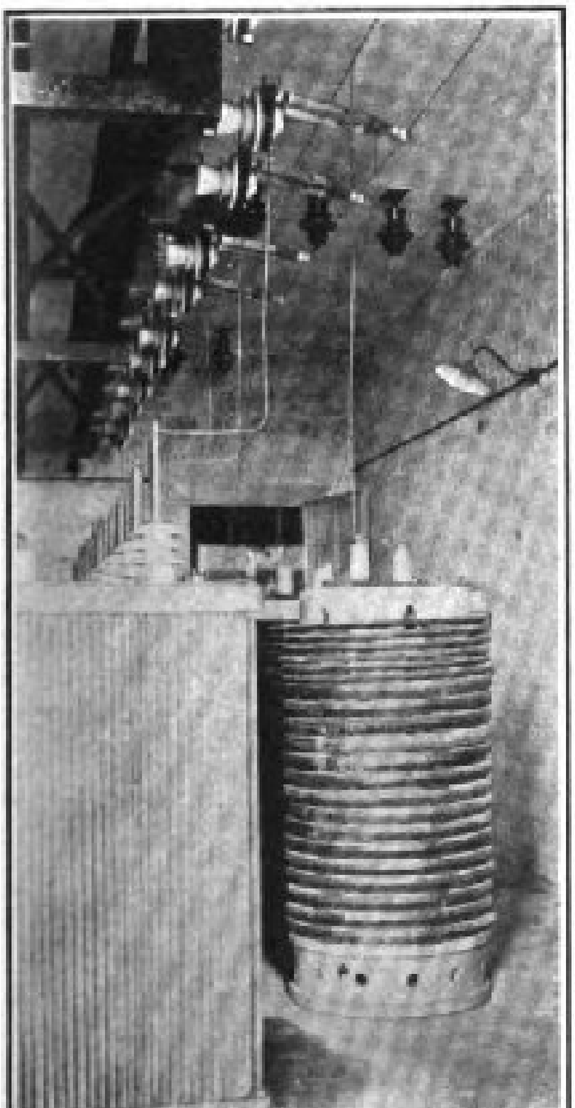
The power house of the transmitting section of the Wales trans-oceanic station located at Carnarvon is shown in the illustration above. The aerial and ground leads of the great antenna from which will leap the marconigrams received at the Belmar, N. J., station appear prominently in the foreground. This building measures approximately 100 feet by 83 feet and is divided into three sections, known as the main machinery hall, the annex, and the extension. The transmitting sets, switchboard, transformer room, stores, offices and emergency operating room are located in the main machinery hall. The auxiliary plant is placed in the annex, consisting essentially of D. C. generators, electrically driven blowers and ventilating fans, and some small motor generator sets used in the signaling circuit. An office for the engineers and a fitting shop are also provided for in the annex. The extension is devoted entirely to experimental apparatus. All trans-Atlantic wireless messages transmitted from this station will be handled automatically from London, through the receiving section at Towyn, sixty-two miles away, and received at Belmar for automatic transmission to New York. This station is therefore of great interest to Americans as the communicating link with the New Jersey stations in the Marconi globe girdling chain.



Above are shown the blowers which furnish air under considerable pressure to blow out the spark at the disc discharger and keep the disc elements cool. These are also used to blow out the sparks at the signaling switches which relay the dots and dashes to the aerial wires. Below, the 300 kilowatt, 150 cycle motor generators.







In the photograph reproduced above are shown the signaling motor generators and the disc motor starters at Carnarvon. One of each is a spare. The signaling motor generator supplies current to work the high speed signaling switches through which the station is enabled to transmit from the distant operating station at the rate of 100 words a minute. The motor starters shown on the right operate on the 75 horse-power motors which drive the disc discharger when it is disconnected from the main generator for assynchronous working. The photograph on the lower left hand gives a view of the transformers and inductances. All the current from the generators passes through the transformers and is stepped up to the voltage at which the condensers are charged. The low frequency inductances allow large range adjustment of the amount of inductance in the primary of the oscillating circuit.

The Censorship Situation

THAT the United States Navy Department has exceeded its authority in assuming control of the station of the Marconi Wireless Telegraph Company of America at Siaconsett is the assertion made by John W. Griggs, president of the company, in a letter sent to the Secretary of the Navy. He says that the supervision of wireless companies is invested in the Department of Commerce and declares that the Marconi Company "cannot recognize any authority in your department to make demands, give orders, impose censors or to stop our business."

Mr. Griggs' letter followed the attitude of the government after a marconigram had been sent from the British cruiser Suffolk to a private person in New York, asking for supplies and newspapers. In the marconigram, which was sent on September 2, he was advised to be off Sandy Hook, two miles south of the Ambrose Channel Lighthouse, with supplies and newspapers the following morning at eleven o'clock. The censor detailed at the Siaconsett station by the Navy Department transmitted the marconigram to Washington, and as a result the government threatened to close up the Siaconsett station.

Edward J. Nally, Vice-President and General Manager of the Marconi Company, made the following statement concerning the matter:

"The Secretary of the Navy, having complained that our Siaconsett station forwarded to a New York address a wireless message received from the British cruiser Suffolk ordering provisions and newspapers, asked for an explanation of our having done so and threatened, failing a satisfactory explanation, to close the station. The matter being referred to John W. Griggs, the president of the company, and also its general counsel, he addressed the accompanying letter to the Secretary of the Navy":

Mr. Griggs' letter which is dated September 9, follows:

"To the Honorable, The Secretary of the Navy, Washington, D. C.:

"Sir:—

"We have previously acknowledged the receipt of your telegram of September 2, relating to the receipt at the Siasconsett station of this company of a message from the British cruiser Suffolk and the forwarding of the same by telegraph to New York City. We now beg to submit the following observations, relative to the subject and to the purport of your message:

"The message from the Suffolk was received at a duly licensed station of this company in the ordinary course of business. Under the provisions of the Berlin Conference of 1906 and the International Radio Telegraphic Convention of London in 1912, it thereupon became the duty of this company to forward the message by the nearest land line to its destination, which was done. There was nothing in the character of the message or the circumstances under which it was received to take it outside of the ordinary provisions of the law of this country.

"We beg to differ with you in your opinion that the message in question was entirely unneutral. We are advised that it was not in violation of any law of neutrality.

"This company has been anxious, so far as its legal obligations permit, to conform to the expressed desires of this government to observe in the strictest manner all the obligations of neutrality with respect to the countries now engaged in war. We would have been willing to abate in some degree our strict legal right in order to meet the wishes of the government, had its action in connection with the subject been such as to allow us with safety to do so. You will recall that at the time your Department placed in our stations agents to act as censors, we asked you to point out the provision of statute law, or treaty, or the rule of international law, which justified this action. The information thus requested has not been furnished. We find our rule of conduct in the premises laid down by the Berlin Convention of 1906 and the London Convention of 1912, and by the statutes of the United States regulating radio telegraphy.

"The Act of Congress of August 13, 1912, confers upon the Department of Commerce certain supervisory powers over radio communication, but we know of no statute which confers any such power or authority on the Navy Department. The assumption by the Navy Department of authority to intervene seems to be unjustified by any law and to be practically a usurpation of the power of another Department of the government. This company has always submitted with ready willingness to the lawful supervision of the agents of the Department of Commerce and will still do so, but it cannot recognize any authority in your Department to make demands, give orders, impose censors or to stop our business. It is manifest that the claim of the agents that you have installed in our stations to decide questions of international law and to determine what messages are unneutral is unjustified. The fact that other nations are engaged in war has not changed the law of the land in this country. We are still governed by civil law and not subject to arbitrary military dictation.

"With reference to your threat to close our station we have to suggest that, in the first place you have no right or power to do it. It can be closed only by action of the Department of Commerce in revoking our license, which can be done only for cause and no cause exists. In the second place, the result of carrying out such a threat on your part would be of immensely more injury to the public than it would be to this company, in cutting off one of the coastal stations constantly used by ships at sea and liable to be needed to answer calls of distress.

"We beg also to call your attention to a provision of the Act of Congress of 1912, as follows:

"'No person or persons engaged in or having knowledge of the operation of any station or stations shall divulge or publish the contents of any message transmitted or received by such station, except to the person or persons to whom the same may be directed, or their authorized agents, or to another station employed to forward such message to its destination, unless legally required so to do by the (a) court of competent jurisdiction or other competent authority. Any person guilty of divulging or publishing any message, except as herein provided, shall on conviction thereof be punishable,' etc.

"In our view, your Department does not fulfill the meaning of the term 'other competent authority' as used in this statute and the demands of your Department that we shall submit all messages to your agents is a demand that we shall as to every message subject ourselves to indictment and punishment for a violation of this statute.

"We may observe also that the action of your censor in transmitting a copy of this message to the Department at Washington is a violation of this statute.

"If you differ with us as to the law of the case or any of the views herein expressed, relating to our rights in the premises, we shall welcome any legal action that will decide which of us is correct. We hold ourselves ready and willing to take up with the Department of Commerce, which has jurisdiction of the subject in so far as any Department has been given jurisdiction, any matters relating to this subject, and express our willingnes, as far as the law will permit us, to conform to the wishes of the government in observing in the strictest form the laws of neutrality.

"Very respectfully,

"Marconi Wireless Telegraph Company of America, by John W. Griggs, President."

CENSORSHIP MODIFICATION

A newspaper dispatch from Washington dated September 3 says:

President Wilson announced to-day that he and Secretary Bryan had agreed on a memorandum for the settlement of censorship at wireless stations.

Secretary Bryan later announced that the question of the use of wireless by European belligerent powers had been settled by an arrangement through which all of the powers would be permitted to send and receive messages in code or cipher.

Secretary Bryan in a statement says:

"Hereafter all belligerents may send and receive wireless messages in code or cipher.

"The American censors at the stations will be furnished with copies of code and cipher books, so as to be in a position to determine that the neutrality of the United States is not violated. The code and cipher books, as well as the messages sent, are to remain known only to the official censors and to the United States Government.

"The Navy Department will prepare the regulations under which this decision of the United States Government will be carried out."

SAYS WIRELESS MAY REVOLUTIONIZE WARFARE

Wireless telegraphy and aeronautics are destined to prove most destructive in the present European crisis and may do away entirely with the modern battleship if not the massing together of great armed forces of men on land, according to the opinion of General Nelson A. Miles, U.S.A., retired, expressed in an interview given recently.

General Miles has followed the events leading up to the war of the nations with the keenest interest. A year ago he was in Bulgaria, and at that time predicted that unless the great powers of Europe ceased their preparations for war, the greatest conflict of arms in the world's history would inevitably result.

"The wireless," he said, "will undoubtedly be used most effectively by all the great nations involved in the present struggle for supremacy among the powers. What it will do in the way of changing warfare cannot be anticipated at this time.

"The genius of man has solved the problem of the navigation of the air. The airship is now in use by all the countries engaged in the present conflict. The result cannot be anticipated, as the test has not been made. But the crisis is on.

"The science of aviation has undoubtedly developed the most daring body of men ever engaged in any enterprise. This has been clearly demonstrated in every civilized country of the earth. Assuming, then, that the courage and skill of the aviators of the contending nations may be equal, the results will be determined the same as was the case in the use of the breech-loading rifle, the machine guns, the high-power guns, the steel-armored ships and the dreadnoughts.

"Great battles in the air will soon be recorded, and such heroes as Garros, the French aviator, who it is reported, gave his life that he might bring to earth a giant Zeppelin dirigible which threatened destruction to French life and property, will be immortalized.

"If that report is correct—and I don't believe there has been anything to the contrary—it will undoubtedly stand out as one of the most daring achievements of the war, and one which prefaces a certain change in warfare for all time to come.

"I read with a great deal of interest that the navies of the respective countries engaged in the war are well supplied with aeroplanes, which they propose to set in motion as their fleets of dreadnoughts come together. To venture a prophecy on the result is more than I can do, but I will say that the science of aviation, as well as the control of submarine batteries by wireless, may revolutionize the art of warfare.

"I do not know how long this war will last, but at all events I am satisfied, from close study of the improved implements in use, that the result will stagger the wildest imagination of mankind. In the old days, when it was a question of fighting on land or on the water, conditions were entirely different. But the wireless, the aeroplane and the dirigible have now brought into play new elements."

Radio Traffic

A Paper Read Before the Institute of Radio Engineers and Published by Special Permission

By David Sarnoff

WITH the continuous advance in the state of the art, radio communication has come to embrace a number of subjects other than those of engineering. Traffic regulation is perhaps one of the most important factors. The Traffic Department of a large company is responsible for:

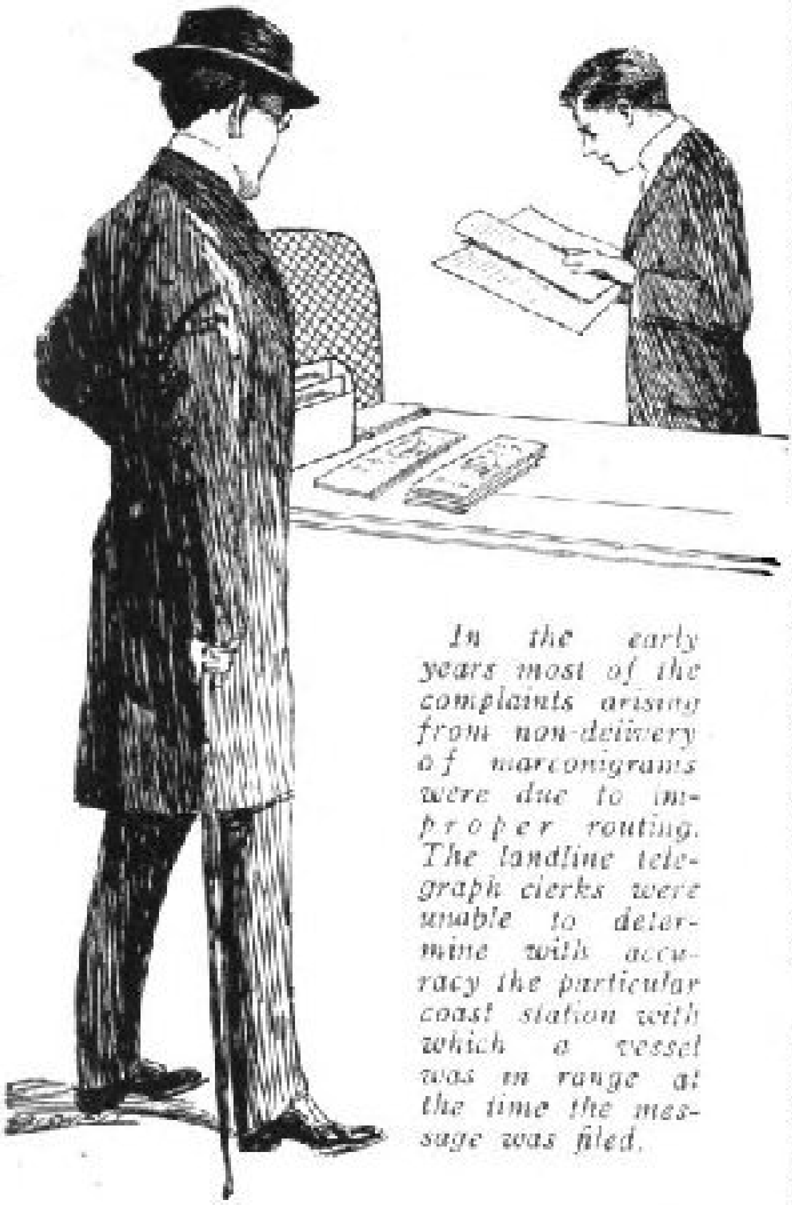
1—The procuring of traffic.
2—The movement of traffic.
3—The procuring of all contracts for wireless equipments.
4—The economical and efficient operation of ship and shore stations.

In order to procure a profitable volume of traffic it is necessary for a company to be so organized as to make the service easily accessible to everyone who may have occasion to utilize the system of wireless telegraphy; but in practice it is required to go beyond this; it is necessary to bring to the attention of the public the value of wireless and its many advantages when viewed from a purely commercial standpoint. This, of course, is accomplished by usual business methods.

The landline telegraph offices all over the United States act as collectors and distributors of messages and transmit and receive them to and from the radio coast stations.

In the early years of its existence the Marconi Company found that most of the complaints arising from non-delivery of marconigrams were due to improper routing. The landline telegraph clerks and operators were unfamiliar with the method of routing wireless messages, and while their tariff books gave them general information as to the names of the various vessels equipped with radio apparatus, their routes and ranges, it was insufficient to enable the landline employes to determine with accuracy the particular coast station with which a vessel was in range at the time the message was filed for transmission. This objectionable feature was eliminated by the Marconi Company through the publication of a monthly list, giving full information of vessels carrying radio equipments. This list is carefully prepared and shows the various coast stations with which arriving and departing vessels communicate and the times when communication with each coast station may be expected. These lists are furnished regularly to the landline telegraph offices throughout the country, and have greatly increased the volume of radio traffic originating on land.

The other day I mentioned to a friend that I intended saying a few words on radio traffic at one of the Institute meetings, whereupon he said: "If I were you, one of the first things I would explain is what happens when a man on shore concludes that he wishes to send a wireless message; how he does it, and what is the modus operandi." I feel that an answer to this gentleman's suggestion might be of some interest to us all. Suppose, then, we consider the case of a person who wishes to send a wireless message to another on board a ship. All that is necessary for the sender to do is to take the telegram to any Western Union telegraph office and make known his wishes. The clerk in charge of the telegraph office then refers to the list of proposed sailings which, as ex-



In the early years most of the complaints arising from non-delivery of marconigrams were due to improper routing. The landline telegraph clerks were unable to determine with accuracy the particular coast station with which a vessel was in range at the time the message was filed.

plained, has been furnished by the Marconi Company, and ascertains therefrom the coast station with which that particular ship is in communication at the time. The message is then routed by landline through that coast station, and when it reaches there, it is transmitted by radio to the vessel.

The operator on board the ship delivers the message to the addressee and obtains a duly signed receipt, which is pasted on the back of the station's message copy, thus forming complete evidence of the receipt and delivery of the marconigram, and serving as the necessary document in case of future complaint or reference.

It now becomes necessary to account to the various companies engaged in the handling of this message for the tolls in connection with its transmission and reception. In attempting an explanation of the method of accounting adopted and pursued in the various countries throughout the world, it must first be stated that the charges on a Marconigram are divided into three classes: namely, ship tax, coast tax and the landline forwarding charges. The ship tax is the charge the ship makes for transmitting or receiving the message; the coast tax is the charge the shore station makes for transmitting or receiving the message; the landline forwarding charge is the amount charged by the connecting landline telegraph company for transmitting and delivering the message.

Referring again to our example, the coast station, after having transmitted the message to the ship, enters all particulars of the telegram on a standard abstract form. These abstracts are forwarded to the auditing department of the company at stated periods, and from the information given therein, invoices for the full wireless tolls are rendered against the telegraph company with which the message originated.

The company or administration controlling the radio installation on the ship station is credited with the shipboard tolls and the remainder of the charge is credited to the coast station. Similarly, messages which are received at coast stations from ships at sea are entered on another abstract form, from which the auditing department debits the company (or administration controlling the ship station) with the coastal tolls, plus the landline forwarding charge, and the landline telegraph company is credited with its proportion of the tolls.

The London Convention prohibits the acceptance and transmission of "collect" radio messages, and as cases may occur where the sender of a radiogram may wish to pay for a reply, provision is made for this in the way of a "reply paid service." The sender of a telegram may, therefore, pay for as many words as he desires, in excess of the ten word minimum, which is applied to all radiograms, and the letters "R. P." together with the number of words are signaled to the receiving radio station, which furnishes the addressee with a reply paid voucher when delivering the received message. This voucher may be returned to the wireless station or any landline telegraph office as payment for the transmission of a reply.

Should the person to whom the "R. P." voucher is issued desire to send a greater number of words than is provided for in the voucher, additional tolls are collected at the sending station. On the other hand, if the reply paid voucher is not utilized, or a less number of words transmitted than were provided for, either the difference in amount or the total amount, as the case may be, is held in reserve by the company and a refund of tolls may be obtained upon written application to the head office.

In accordance with the provision of Article 42 of the London Radio Telegraph Convention, liquidation of accounts is effected directly between the companies operating the ship and shore stations, but in the event that a ship station is controlled by a company with which no special arrangement has been made, recourse may be had to the privilege of liquidating the accounts through government channels; provided, however, that the ship or coastal station flies the flag of a country that has ratified the Radio Telegraph Convention. In the case of a non-contracting country, communication may be denied in instances where special traffic arrangements are not in effect, except, of course, in cases of distress, at which time no distinction is made.

In this connection it might be interesting to mention that notwithstanding the fact that the United States Government had ratified the Berlin and London Conventions, the Mexican Government, which is also a country adhering to these conventions, refused to permit its coast stations to communicate with ships flying the American flag until a guarantee of $1,000 (Mexican) had been deposited by the Marconi Company with the Director General of Telegraphs at Mexico City.

The Government of Mexico gave as its reason that the ship stations of the United States did not appear in the list of "Radio Telegraph Stations of the World," issued by the Berne Bureau. This, however, is an isolated case and even with countries which have not ratified the International Convention—and, by the way, they are few—communication has never been denied; Cuba may be used as an example in this connection.

In brief, then, we have the answer to what happens to a wireless message when one finally decides to file it for transmission. The circumstances incidental to its delivery appear simple on the surface, but it must be remembered that a great deal of effort and energy has been expended by the various companies and organizations which have made possible a successful radio telegraph business.

Unlike its landline brother, the wireless message recognizes no fixed charge for a ten-word minimum. It required six years for the telegraph companies to accept the Marconi Company's point of view and handle its messages on a word-rate basis.

A difficulty which seemed insurmountable for a long time and which was successfully overcome eventually by the Marconi organization, was the method of accounting and charging of radio messages. The Berlin Convention of 1906 stipulated that radiograms should be counted and charged for on a word rate basis, pure and simple, but for a long time the landline companies in the United States absolutely refused to consider radio messages in a class different from their ordinary domestic telegrams—that is, a fixed charge for ten word minimum. To accept and forward radiograms over the land wires on a message basis, and to forward them by radio on a word rate basis, would have caused endless confusion in accounting. It was, therefore, necessary to have all the Marconi companies agree to handle wireless messages on a message basis throughout, until such time as the American Marconi Company could prevail upon the United States landline telegraph companies to accept its point of view. This was successfully accomplished in 1912, and at the present time the Western Union and Postal Telegraph companies handle Marconigrams on a word rate basis, thereby simplifying to the greatest extent the method of accounting and also executing the letter and spirit of the London and Berlin Radio Telegraphic Conventions.

From the very first it was realized by the parent Marconi Company that when wireless equipments were installed on merchant vessels a thoroughly practical means of regulating traffic was needed, in order to make radio communication successful. It is significant to note that the system originally adopted by the Marconi companies, which was modeled after the international landline telegraph and cable methods, is, with few exceptions, still in vogue; and, in fact, so reliable has it proven that the London Convention practically adopted it and stipulated that radio traffic should be so handled.

The operator is a very important factor in wireless. Which, then, is to be preferred—an older, and within reasonable limits, less efficient type of equipment, in the hands of a skilled operator, or a modern and more efficient set in the hands of a poor operator?

It has been my good fortune in my radio activities, both in the traffic and inspection service, to come in close contact with the various representatives of the Department of Commerce, and to these gentlemen, personally, as well as to the Department, must be given due credit for the very important part that has been played in promoting and advancing harmonious work. I feel that regulation in wireless is both necessary and desirable, and feeling thus I find an excuse in presuming to pass judgment upon some of the present regulations.

With the increased number of ship and shore stations, with the present government regulation of wave lengths and with the constant increase in the volume of traffic, it is most desirable to so regulate the transmission of radiograms that they may be accurately received with maximum efficiency during a minimum of time. To accomplish this result three factors must be given constant consideration:

(1) Efficient operator, which, among other qualifications, calls for a competent telegraphist.

(2) Efficient apparatus.

(3) System and brevity in transmission and the elimination of all superfluous words and symbols.

Mr. V. Ford Greaves, Radio Engineer of the Department of Commerce, in his paper on the "Radio Operator Problem," adequately and capably covers his subject. I had the pleasure of reading the paper and heartily agree that the operator is a very important factor in the art of radio communication, and as such should receive careful consideration and study. The importance of the human element in radio communication cannot be overestimated.

It seems to be an open question as to which of the following combinations is preferable: An older, and within reasonable limits less efficient type of equipment, in the hands of a skilled radio operator, or a modern and more efficient set in the hands of a poor operator. My own observations and experiences in connection with the problem inclines me to favor the skilled operator. However, I fully appreciate the necessity and desirability of having the ideal combination, namely, the good operator and the good set.

In his paper, Mr. Greaves states that "so far as safety at sea depends upon the radio operator, speed is not particularly important, although it may be desirable under certain circumstances." I cannot quite agree with this. Speed in wireless, when speed can be utilized, is perhaps more desirable and more important than in any other means of communication, for, nearly all commercial ship and shore stations operate on the same wave length, and it is necessary, particularly in congested waters, to await an opportunity to "come in." As a radio operator with a number of years' experience, I recall those painful moments of waiting. The desirability of speed holds good not only in ordinary commercial work, but also in cases of distress; for example, in the wreck of the Empress of Ireland there were only six or seven minutes available in which to communicate. During this time the operator gave the Father Point station full particulars of the collision and received from that station the assurance that assistance would come to him in time.

We all know the number of deplorable cases, existing to-day, where radio operators require considerably more than six or seven minutes to dispatch a single message, even when static and other interferences are absent. As a general rule, an operator who is capable of telegraphing with speed will employ his ability when it is possible to do so; and as it is admitted that under certain conditions speed is not only desirable, but imperative, it must follow that an operator should have speed. This applies not only to commercial operators, but to all operators engaged in radio work. It must be considered, however, that speed alone does not constitute the "good" radio operator. Speed, plus stability and judgment, is the most effective combination. In an address delivered before the New York Electrical Society, Mr. Marconi summed the matter up in these words:

"Wireless telegraphy, like aviation, is as yet a comparatively undeveloped art, therefore personal skill and practical ability on the part of the operators are of the greatest importance in overcoming the difficulties of the moment."

An amusing feature of the present radio laws and regulations was recently brought to light when it was found that a vessel not required by law to carry wireless apparatus, but which was voluntarily equipped, sailed with a skilled operator in charge; who, however, did not have a license. Had the vessel sailed without an operator, the law would have been fully complied with, but because the vessel sailed with an unlicensed operator on board, the owners became liable for a violation of the law. It would have been an interesting sequel had that operator been the means of saving the lives of several hundred people on some vessel in distress.

The desirability of speed holds good not only in ordinary commercial work, but also in cases of distress; for example, in the wreck of the Empress of Ireland there were only six or seven minutes available in which to communicate

I do not, of course, mean to imply that licenses for radio operators are unnecessary; I simply cite an instance where the regulations might have defeated the very purpose for which they were designed.

In this connection it should be noted that any wireless company which guarantees to furnish operators and equipments to fully comply with the requirements of the law must at all times be on the "qui vive" to see that all operators are in possession of the proper licenses before they are assigned for duty at any radio station. Companies furnishing operators endeavor to employ only those holding first grade licenses, for unforseen circumstances may arise and make it imperative to transfer an operator from a cargo ship to a passenger ship requiring a first grade operator.

I have drawn up an ordinary commercial message, showing every letter and symbol as it should be transmitted in accordance with the provisions of the London Convention. I have also drawn up this message in a form which I personally recommend it be transmitted. In my opinion this conveys all the necessary information and has the advantages of brevity.

"International Regulations For Handling Radio Traffic"

Calling	KA	WSE WSE WSE de KSH KSH KSH
Answering	KA	KSH KSH KSH de WSE K

Order of Transmission

P Nr 1 15 Radio 25th 5:30 P. M.

S.S. Kroonland.

The Honorable Judge Gordon,
Hotel Astor, New York.

—...—

Kroonland expected reach Quarantine early Tuesday morning.

—...—

Lincoln.

"Suggested Method For Handling Radio Traffic"

Calling	WSE KSH
Answering	K

Order of Transmission

P 1 RF 15

Kroonland

The Honorable Judge Gordon,
Hotel Astor, New York.

—...—

Kroonland expected reach Quarantine early Tuesday morning.

—...—

Lincoln.

Before the change from the old Marconi system of working to the present method, the following data was not transmitted:

(1) The word "Radio."

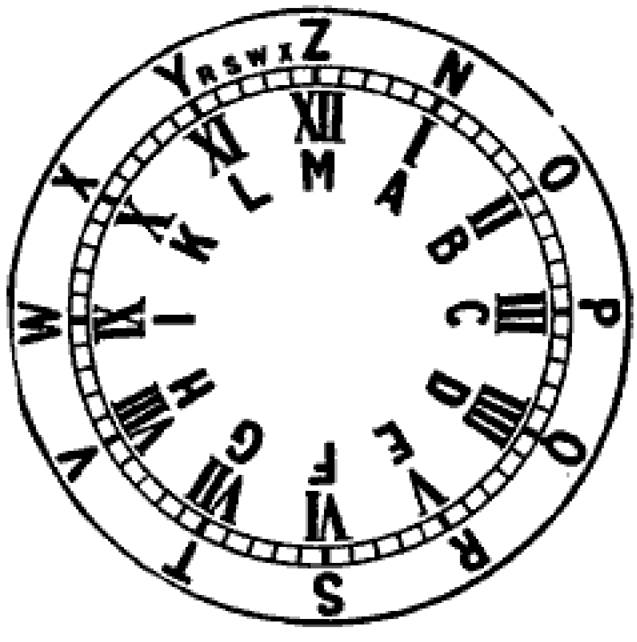
(2) The date. (Provided the date of transmission was the same as the date on which the message was filed.)

(3) The time filed in figures. (Code only was used.)

The word "Radio" is printed on every message blank, and as every message sent by wireless is a radio message, there seems to be no need for the transmission of the word in the check of the message.

If no date is transmitted with a message, it would mean that the radiogram is sent the same day it is filed; and as this is the average case, it is preferable to indicate the date only where a message is transmitted on a date subsequent to that on which it was filed.

Figures are more liable to error in transmission and reception than letters; it also takes more time to transmit figures; therefore, if it is necessary to transmit the time filed, a code should be adopted and used. I give the code time previously used by the Marconi Companies:



The hours from one o'clock A. M. to twelve o'clock noon are denoted by the first twelve letters of the alphabet (J being omitted), and the hours from one o'clock P. M. to twelve o'clock midnight are denoted by the other letters of the alphabet (U being omitted).

In order to denote the four intermediate minutes in every complete period of five minutes, the letters RSWX are employed, R denoting the first, S the second, W the third, and X the fourth minute after each hour or after each complete period of five minutes.

On the North Atlantic, where the volume of traffic is perhaps heaviest, it is no uncommon occurrence to have as many as ten or fifteen of the larger trans-oceanic liners within the radius of a single coast station. Practically speaking, nearly every commercial ship and shore station transmits on the 600 meter wave length, therefore in this case it is possible for only two stations to work at the same time. Unfortunately, too, we have not yet seen the last of that most hated and most despicable enemy of all radio operators, which comes down to us from the realms above in the shape of "static."

During heavy static conditions it is often necessary for the transmitting station to repeat each word a number of times and the advantages of brevity under such circumstances certainly needs no elaboration. Every word and every symbol saved means a saving of time and energy, as well as an increased possibility for disposing of radio traffic. Further, Article 6 of the London Convention stipulates that,

"The exchange of superfluous signals and words is prohibited."

I desire also to call particular attention to several Service Regulations of the London Convention, governing Radio Traffic.

Article 16 reads:

"The coastal rate and the shipboard rate shall be fixed in accordance with the tariff per word, pure and simple, on the basis of an equitable remuneration for the radio work, with an optional minimum rate per radiotelegram.

"The optional minimum rate per radiotelegram shall not be higher than the coastal rate or shipboard rate for a radiotelegram of ten words."

The provision of an optional minimum has seriously restricted the exchange of radiotelegraph traffic. A number of steamships, notably those flying Belgian, Dutch and German flags, insist upon a ten word minimum shipboard rate, whereas a number of coast stations and ships of other nationalities do not apply any minimum.

At the time the Marconi Company arranged with the Western Union Telegraph Company for the establishment of word rates on the landlines in the United States, it was the desire of the Marconi Company that its ship and shore stations should not apply a minimum charge; but owing to the insistence of those foreign ship stations which apply a ten word minimum that they receive the minimum in all instances, the Marconi Company and the Western Union Telegraph Company were compelled to set up the minimum, although in doing so both companies felt that the principle was wrong.

The application of the ten word minimum has to a large extent withheld the exchange of radiotelegrams, particularly those originating in one country to be forwarded to ships at sea through the medium of coast stations located in another country. Owing to the lack of uniformity in the system of counting and charging for wireless messages, the cable companies have been unable to arrange for the prepayment of the wireless charges on radiotelegrams which have to be cabled to a foreign coast station for transmission. As an example, I cite a message originating in New York City for transmission to a passenger on board a German ship through a British coast station. The cable company does not apply any minimum, nor does the British coast station; but the German ship does. This means that in a message containing less than ten words, the cable company would have to collect its own tolls, the British coast station tolls, both without minimum, and the ship tolls with a ten word minimum. It can be readily seen how necessary it is to have the minimum universally abolished as long as radiotelegrams have to be counted and charged for on a word rate basis.

Foreign ships, by insisting on receiving ten-word minimum rates, have discouraged the exchange of wireless messages. In a case cited, it is shown that on a message containing less than ten words the cable company would have to collect its own tolls, the coast station wireless tolls, both without minimum, and the ship tolls with a ten-word minimum.

Another matter which needs correction is the regulation adopted at the London Convention (Article 42), which provides that the coastal and shipboard charges shall not enter into the accounts provided for by the International Telegraph Regulations, but shall be charged directly between the radio management to which the office of origin is subject and the radio management to which the coastal station of destination is subject. It is quite evident that this regulation was framed without giving due consideration to messages originating in one country for transmission via a coast station in another country. The provision lacks the element of applicability to extra-European messages, and it is within this class that messages between points in the United States and Europe, etc., come.

If the optional minimum is abolished and provision is made for settlement of coastal and shipboard charges on foreign radiotelegrams through the International Telegraph accounts, facilities for the exchange of radiotelegrams will be greatly improved and the accounting simplified.

Article 19, Paragraph 2, of the Service Regulations of the London Convention, provides that:

> "The counting of words by the office of origin shall be conclusive in the case of radiograms intended for ships and that of the shipboard station of origin shall be conclusive in the case of radiograms proceeding from ships, both for purposes of transmission and of the international accounts. However, when the radiogram is worded wholly or in part, either in one of the languages of the country of destination, in the case of radiograms proceeding from ships, or in one of the languages of the country to which the ship is subject, in the case of radiograms intended for ships, and contains combinations or alterations of words contrary to the usage of such language, the bureau or shipboard station of destination, as the case may be, shall have the right to recover from the addressee the amount of charge not collected. In case of refusal to pay, the radiogram may be withheld."

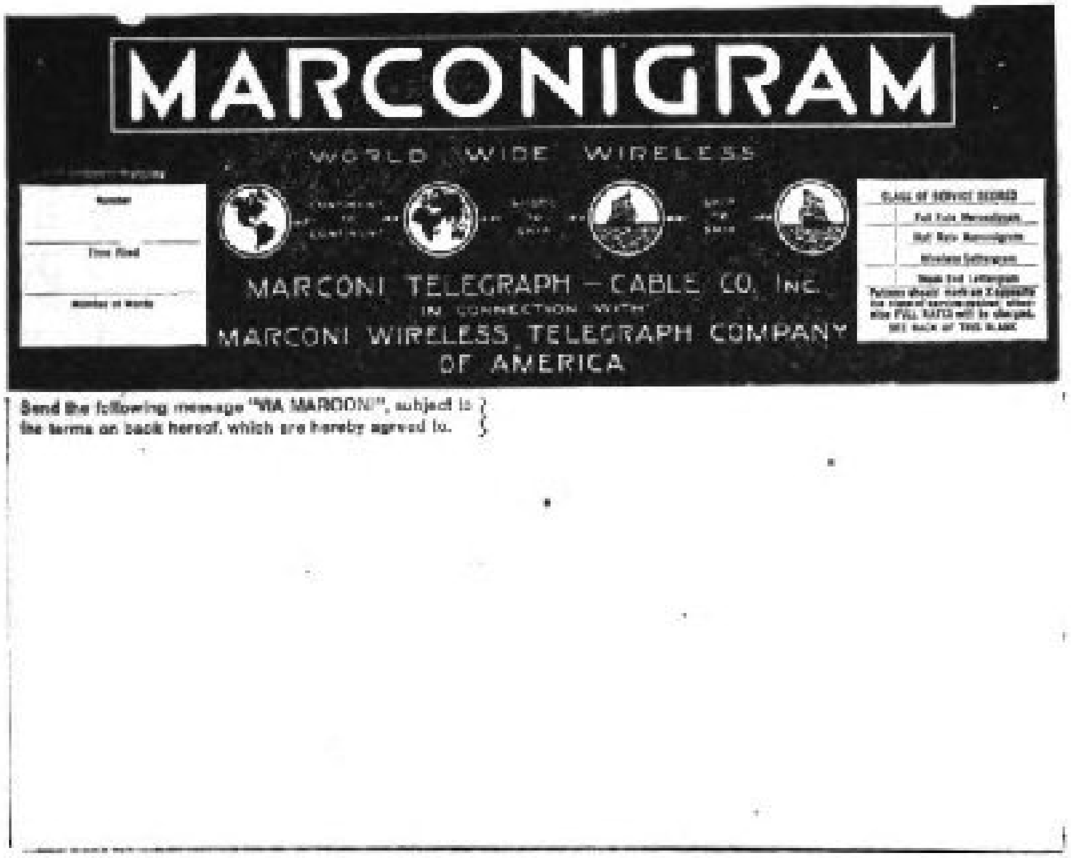
This regulation is not in accordance with any known telegraph or cable practice. The number of words or the "check," as it is called, should be agreed upon by both the sending and receiving stations. In case of a difference of opinion, the sender, and not the receiver of a message, should pay the additional amount required.

In the case of a radiogram originating on shipboard and transmitted to a coastal station for delivery on land, a "collect" service message must be forwarded over the landlines, requesting the addressee to pay the additional amount where the difference in the check requires additional payment. In such cases, who is to pay for this "service"? The London Convention makes no provision.

Article 33 deals with cases where communication between a ship and shore station is unreliable and where uncertainty exists. Paragraph 2 provides that:

the same management, the latter can claim only the rates applicable to a single transmission."

In my opinion, a telegraph operator should not give "O. K." for a message unless he is absolutely certain that he has received it entirely and correctly. An "O. K." or "R" should end all doubt on the part of the transmitting operator as to whether or not the reception is complete and accurate.



The new wireless message blanks used by the Marconi Company

'If in the opinion of the receiving station the radiogram, although imperfectly received, is nevertheless capable of transmission, said station shall enter the words 'reception doubtful' at the end of the preamble and let the radiogram follow. In such case, the management of the radio service of the country to which the coastal station is subject shall claim the charges in conformity with Article 42 of the present regulations. If, however, the shipboard station subsequently transmits the radiogram to another coastal station of

Then no doubt could exist and there would be no possibility of a person receiving the same message from two different stations.

The regulation referred to may also impose a financial loss upon the radio company controlling the two coastal stations; for example:

A message from the S.S. Momus, bound north, addressed to Brown, Paris, is transmitted via the Marconi Station at Tampa, Fla., the cable charge from Tampa to Paris being 34 cents per word. If the reception of this message is doubtful and the receiving station has not given "O. K." to the sending operator, the probabilities are that the message will be sent again, through another coastal station, and the Marconi Company will be out of pocket 34 cents for each word, covering additional cable charges to Paris.

A difficulty often arises in connection with "Call Letters" assigned by the different countries adhering to the International Radiotelegraphic Convention when a foreign vessel is being fitted with radio apparatus in an American port, or an American vessel in a foreign port. Application for call letters must be made to the government whose flag the vessel flies, and where the time is short, money must be spent on cable tolls in order to procure this information before the sailing of the vessel. Some governments even refuse to assign temporary call letters until the radio apparatus on board the vessel is inspected and a license issued. Since the government issuing the call letters also issues the license, it is obviously impossible to comply with this regulation.

Are the present wave length range limitations insufficient for commercial work? Is there not more unnecessary interference than in the days before the adoption of the regulations?

A simple solution would be for each government to furnish its national representative with call letters for a limited number of vessels, and in the case of installation of radio apparatus in a foreign port on a vessel not previously equipped, application for call letters could be made to the representative of the country whose flag the vessel flies. The necessary formalities could be executed later.

I should very much like to have an opinion on the wave length limitations as provided for by the international regulations. Personally, I believe that the present wave length ranges provided for commercial work are insufficient; that they are not conducive to the highest radiating efficiency, and are productive of unnecessary interference; more so, perhaps, than was the case before the adoption of the regulations. It helps very little to stipulate that the logarithmic decrement of the emitted waves shall not exceed two-tenths per complete oscillation and at the same time limit the wave length range so as to bring about a condition where 600 meters is adopted as the normal wave length by nearly all commercial ship and shore stations.

At the present time we have an excellent example of the control of radio stations and radio operation on the part of the government authorities in case of war, disaster or other public peril; and in view of this it seems only reasonable that during times of peace the greatest facilities should be afforded for efficient and harmonious commercial working.

If it were possible to take full advantage of the available antenna space on vessels, the receiving and transmitting range would of course be increased; but if full advantage were taken of the distance between the masts on a good many of the transoceanic liners, the natural period of the antenna would probably be very nearly 600 meters, and adding to this the necessary inductance in the secondary of the oscillation transformer, the wave length would be brought above the present prescribed limits.

It must also be remembered that working too near the fundamental of the antenna causes high damping, and in this respect the regulations provide that the logarithmic decrement shall not exceed two-tenths; therefore, it seems obvious that the best general efficiency cannot be obtained on a good many vessels with the present regulations.

On the average coastwise vessel the use of wave lengths above 1,600 meters is impractical, and in so far as the 300 meter wave length is concerned, its inefficiency seems to be so generally admitted that I need hardly discuss it. One of the United States radio inspectors recently told me that he went on board a vessel lying in port at New York to test the 300 meter wave length and to ascertain just how many people would answer his calls. He called ship and shore stations on 300 meters for nearly two hours without a response; and on the following day when he inquired of those he called as to the reason for their not answering, he was informed that his 300 meter wave signals were not heard. This, of course, would show that the average operator uses the 300 meter wave length so seldom that radio stations do not tune for this wave length.

Where two coast stations are situated close together both may be transmitting simultaneously and vessels may be receiving at the same time; provided, however, that wave lengths of sufficient dissimilarity are used. This is the case at New Orleans, where the United Fruit station transmits its messages during schedule hours on a wave length of 1,800 meters and the Marconi station at New Orleans works with nearby vessels on the 600 meter wave length without interference.

To do this and live up to the letter of the law it is necessary for the vessel receiving the longer wave to transmit its replies on the longer wave also, for Article 4 of the Service Regulations of the London Convention states that:

> "Communication between a coastal station and a station on shipboard shall be exchanged on the part of both by means of the same wave length."

Such regulations make it necessary for both coast stations at New Orleans to adopt the 600 meter wave length, the result being a loss in efficiency and delay in the disposition of the traffic.

It detracts from the general efficiency and from the rapid movement of traffic to have all commercial radio stations use 600 meters as the normal wave length, which unfortunately is the case at the present time. Perhaps in designing new apparatus for use on shipboard, due advantage will be taken of the privilege afforded by the present regulations in that wave lengths between 300 and 600 meters may also be utilized. This will probably help a little, but not as much as if the present limits were modified to permit the use of all wave lengths below 1,000 meters for commercial ship and shore communication. If such extension were granted, however, I would recommend that a single wave length be used for general calling and in case of distress. Possibly the 600 meter wave length would be found the most convenient for this purpose.

Editor's Note.—In his concluding remarks Mr. Sarnoff acknowledged his indebtedness to George S. De Sousa, traffic manager of the American Marconi Company, for assistance in the preparation of the paper.

TRANS-PACIFIC STATIONS OPENED

An exchange of wireless greetings between the United States, Hawaii and Europe marked the opening of the trans-Pacific stations at Marshalls and Bolinas, Cal., and Kahuku and Koko Head, Hawaii, on September 24. In order to take part in the ceremonies, Mayor Rolph of San Francisco and thirty representative citizens of that city went to Bolinas, while a delegation of business men and civic officials came from Honolulu to Kahuku by special train.

President Wilson formally opened the stations by sending the following message to the governor of Hawaii:

"May God bind the nations together in thought and purpose and lasting peace.

"(Signed) Woodrow Wilson."

An inspection of the plant of the American Marconi Company in Kahuku by the guests of the company was followed by a luncheon.

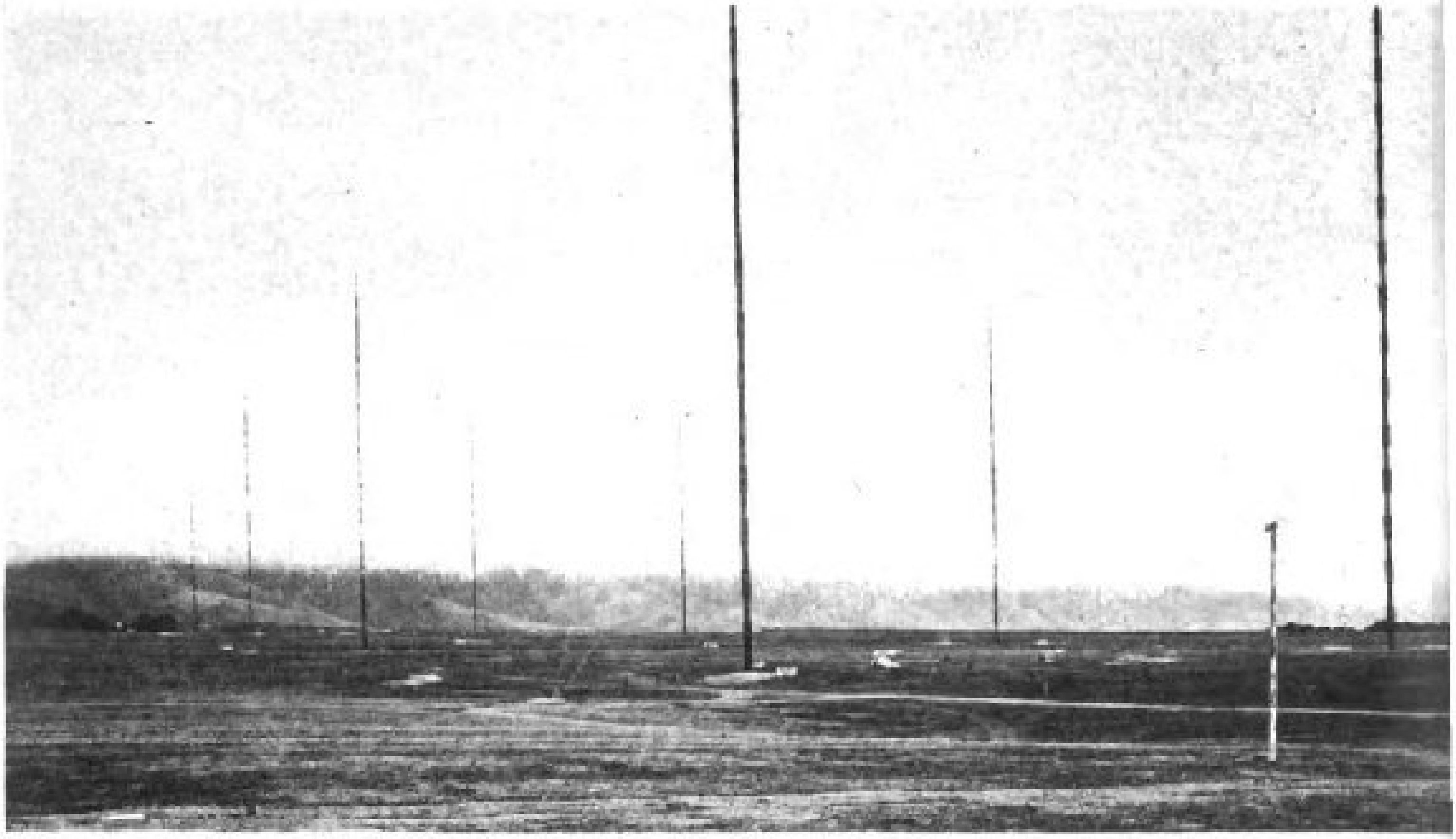
The Honolulu Chamber of Commerce sent the following congratulatory marconigram to Guglielmo Marconi:

"The Chamber of Commerce of Honolulu accepts the occasion of the formal opening of the Marconi wireless telegraph plant in these islands to congratulate you on making it possible to communicate through the medium of other waves, and also congratulate you and your associates on the opening of the magnificent plant here which brings us in closer touch with world affairs.

"(Signed)

"Chamber of Commerce."

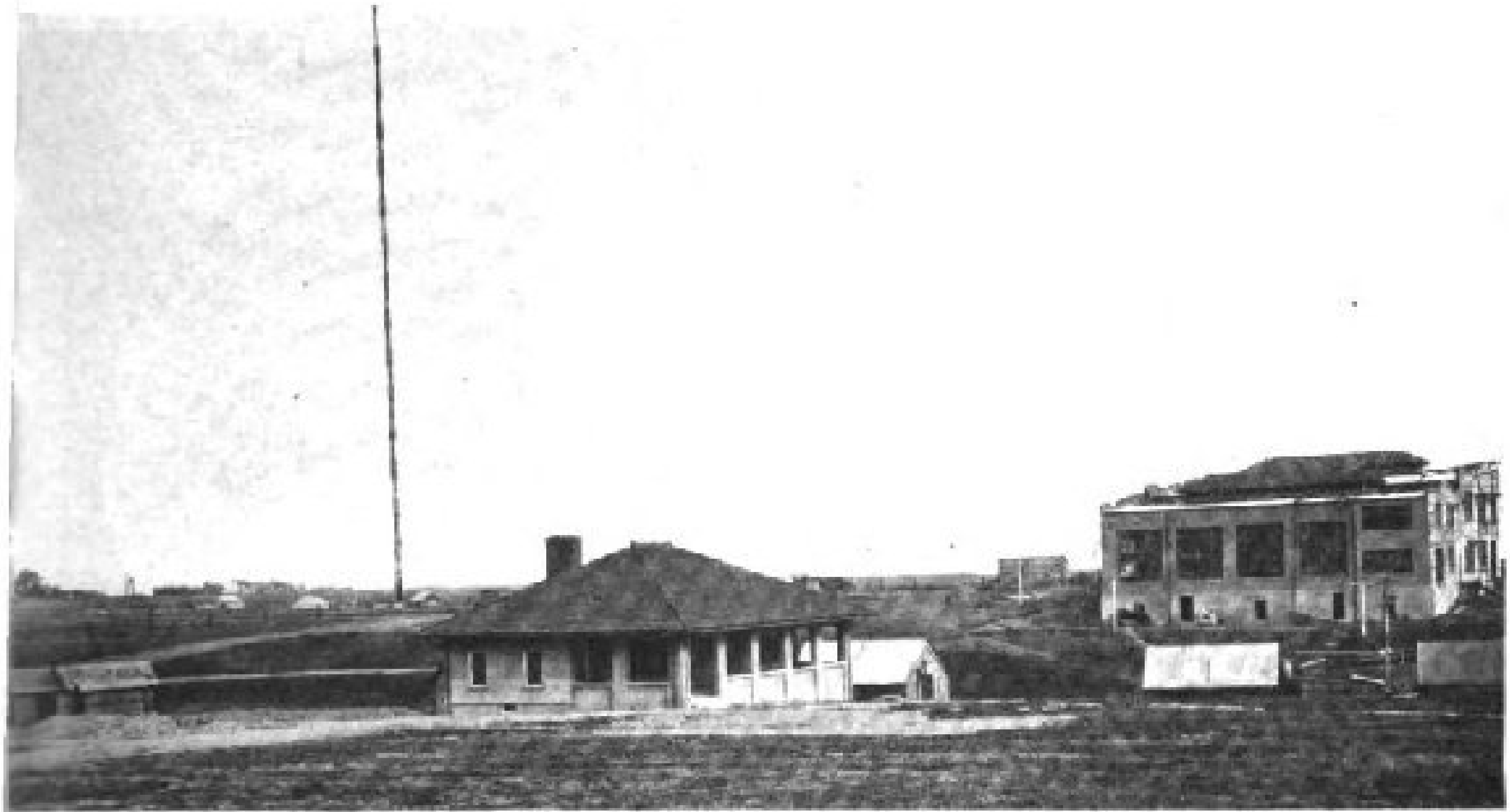
Two Views of the Completed



The power house, auxiliary operating building and the masts holding the mile-long

The engineers' cottages and the operators' hotel at Marshalls, Cal., the receiving section

Trans-Oceanic Stations in California



aerials which, on September 24, connected San Francisco with Honolulu by wireless

of the Marconi trans-oceanic transmitting plant at Bolinas, Cal., shown in the picture above

WIRELESS LIFE-SAVING MEMORIAL.

At a recent meeting of the Board of Directors of the Marconi International Marine Communication Company, Ltd., held in London, a committee was appointed to supervise the preparation of a record of meritorious service performed by operators in the employ of all the affiliated Marconi companies, and of the lives saved by means of the Marconi system of wireless telegraphy. When these records are complete, the particulars are to be inscribed on panels in the main hall of Marconi House, London.

The co-operation of the American Company has been asked in the matter of securing data relative to the cases confined to American waters in which the Marconi system has been instrumental in saving lives of people at sea. The record of those heroic operators who lost their lives in the endeavor to save others, as well as operators who have, without sacrificing their lives, been instrumental in saving people at sea, together with the number of lives thus saved and lost is to become a permanent feature and will be carefully preserved in respect to past and future incidents.

TIMELY RESCUE BY MARCONI MAN

N. Ferrarini, a clerk employed in the New York office of the American Marconi Company, is being pointed out as a wireless hero of a different sort. The call for assistance heroically responded to by Ferrarini came not from a foundering vessel in an ether waved S O S, but was the weak treble cry of a boy struggling in the water off the sea wall at Battery Park.

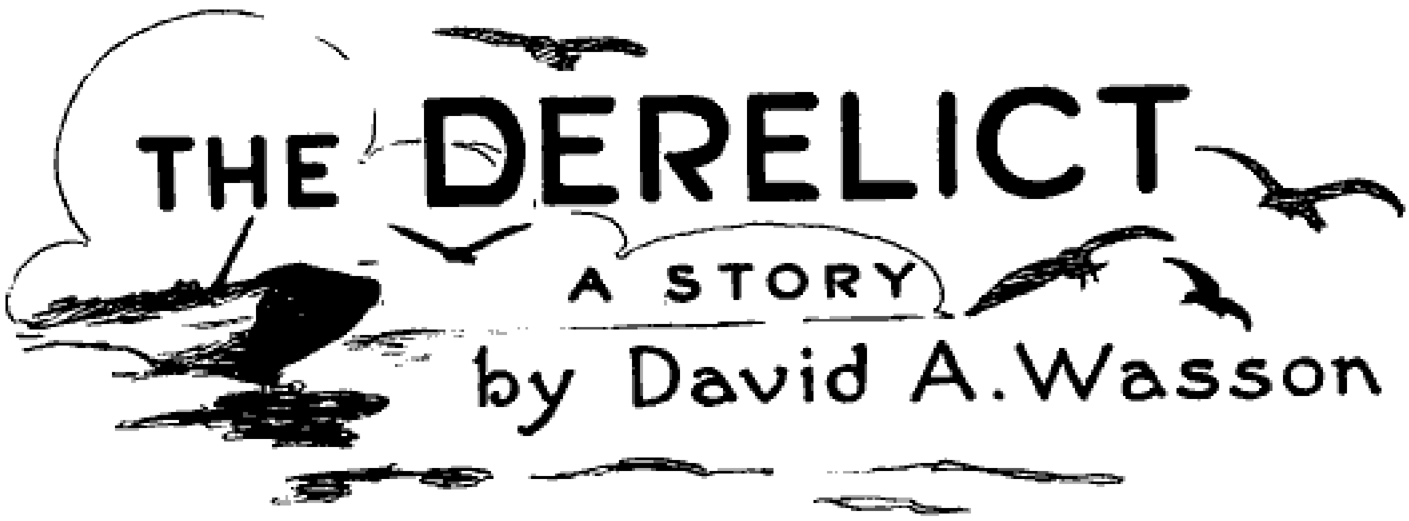
From the way the latest wireless hero describes his experience, he looks upon saving life as quite an ordinary feat; an opinion which was not shared by the spectators, however. Ferrarini modestly disclaims any credit for his heroic rescue and was reluctant to speak of it. "I was strolling along the Battery sea wall," he finally admitted, "when I interrupted my Sunday afternoon constitutional to watch a group of boys who were trying to catch crabs with a long cane to the end of which a hook was fastened. Suddenly a little fellow of about six or seven years of age lost his footing and fell headlong into the water. There were a great number of people about, and like myself they felt confident that the youngster would not be put to any more serious inconvenience than a thorough wetting. As we stood and watched him struggle, however, it suddenly dawned on us that the boy could not swim. I looked about but could not see anyone preparing to make a move. The boy had gone under several times before I fully realized that if anything was to be done, I must do it. Then I jumped into the water, took hold of the boy and swam with him to the wall, where ready hands reached down and pulled us up. It was nothing."

Steven Miller, the little fellow whose life was saved by the timely rescue, did not view the matter in the same light, and although badly shaken by fright, he managed to thank his rescuer amid the plaudits of the crowds that gathered about them. Ferrarini took his honors modestly and seemed more concerned over the fact that his perfectly good Sunday wearing apparel was ruined and his watch had stopped. "What could you expect?" he smilingly observed just before he quietly slipped away. "I have just realized that the date is September 13."

> The article on the share market is omitted from this number of The Wireless Age because of the closing of the exchanges, due to the European war.

STEEL MASTS AT CAPE RACE.

The Naval Department of Canada has agreed to erect two modern steel masts at the wireless station at Cape Race, Newfoundland, in place of the wooden one. This should give the station a normal range of 500 miles, instead of 250 miles—its present radius—enabling it to get in earlier touch with the vessels plying the trans-Atlantic lanes.



THE DERELICT

A STORY

by David A. Wasson

THAT Frederick Ayre was wireless operator of the steamship Talaria at the age of nineteen doesn't mean necessarily that he was a prodigy. There are many such youngsters at the keys on many such craft along our coasts.

Most of them, like Freddy, served their apprenticeships on the home-made apparatus that stretched its flimsy antennæ between house and barn down in Jayport, or thereabout. And, although there was a fine, distinguished sound to the title, the Talaria was only a non-passenger-carrying freighter of some sixteen hundred tons register, and didn't come within the provisions of the Wireless Act.

Freddy had emerged triumphant from a bout with the Federal authorities, which had come about after he, like many another enterprising amateur, had beautifully tangled up a few of the government's important official messages.

He emerged with a highly inflated opinion of his own prowess, and took the Talaria job merely as a makeshift till something decent in his line turned up, as he explained.

He took the job heedless of the tears of an overindulgent mother who had mapped out for him a brilliant career ashore; heedful, instead, of the plaudits of admiring Jayporters.

Freddy was, as may be imagined, something of a spoiled young man; but he was smart—smart as a steel trap, all Jayport said. And few could have doubted it who saw him take the boat for the metropolis and the Talaria on that memorable morning.

From the two inches of freshly shaved florid neck above his celluloid collar to the new pasteboard suit-case waiting at his feet his outfit spelled alertness and prosperity and monumental success.

For three uneventful trips now Freddy had reigned supreme in the little wireless coop up on the Talaria's hurricane deck just aft of the main-mast.

Not grizzled Captain Helme himself swelled more under his double-breasted reefer than did Freddy when first he imparted to an anxious world the momentous news that the Talaria, New York for San Juan, was three hundred and sixty-four miles south of Scotland Lightship at noon of the seventh; relayed from the thousand-mile-away Cunarder Melancholia a love-sick passenger's amorous greeting to the girl he left behind him; or swapped aimless flippancies with unseen brethren over the sea-rim.

But routine ever palls on buoyant youth, and after three aforesaid trips Freddy's ambition yawned and stretched itself again. He could see no reason why Binns, of the Republic; Bride, of the Titanic; Cottam, of the Carpathia; and Ginsberg, of the Trent, should monopolize the glory of the wireless fraternity.

He had so repeatedly assured every one from the quartermasters up that he was too big for his position that

"That's her position, Cap'n!" he panted, pointing at the blank. "Can't be far from us! Crew's taken to the boats, but I told 'em we're coming"

they told him, instead, he was too big for his hat, and privately set him down for a bumptious young upstart.

Aggressiveness and greatness usually go hand in hand, however, and Freddy was to achieve greatness—of a sort. His chance to be a hero came about thusly:

One evening, just after the second mate had got the running lights to winking, Freddy climbed the steep stairs to his aerie, luring the last of his repast to its destiny with not over-clean fingers.

He lit a cigarette and sat down to his instrument prepared to advise the Hydrographic Office at Washington that the "S.S. Talaria, Baltimore for Trapani, had passed at 5 P. M. Thursday, N. lat. 40 degrees 22 minutes, W. lon. 49 degrees 25 minutes, a small berg surrounded by slush."

He threw over the rheostat and tested his magnetic detector. A shrilling hum and whir told of the generation of current for the slender aerials.

He put the receiver to his ears and tuned into the wave-length of someone who was talking near by.

". . . with derelict French bark Latour d'Auvergne," this somebody's Continental was saying. "Am sinking . . . ."

"Great guns! collided with a derelict and is sinking!" gasped Freddy, and blue fire crackled across the spark-gap as he cut in in frantic interruption.

"Got you. Who's talking?"

"S.S. Leviathan, N. lat. 40 degrees 21 minutes, W. lon. 49 degrees 6 minutes," was the answer.

"Right-o! Get your crew in boats. Talaria coming," assured Freddy, pumping the keys as for dear life. He switched off the mains, upset a chair in his exit, and dodged yawning cowls and fat-bellied lifeboats as he raced forward along the hurricane deck.

Captain Helme, seated at the polished table in the chart-room, suddenly found himself staring at a yellow blank covered with hieroglyphics, instead of the month's pilot-chart of the North Atlantic, and listening in amazement to the incoherencies of an excited and breathless youth.

"That's her position, cap'n!" he panted, and pointed at the blank. "Can't be far from us! Crew's taken to the boats, but I told 'em we're coming!"

"Who? What?" demanded the captain, removing his glasses.

"The Leviathan! Struck a derelict! I just got her S O S!" gasped Freddy, and then, as visions arose of the fame that would be his, asked hopefully: "What is she? Big Blue Anchor liner, ain't she?"

"No," said the skipper, as he arose hastily with the blank. "Old, low-powered tramp—Englishman—Tampa for Genoa with timber—coaled at Norfolk and sailed twelve hours ahead of us. She's only twenty miles or so ahead now, according to the position she gives you. Lucky for her she's on the same course we are. Good boy, Wireless!"

And the captain was making for the bridge stairs, leaving Wireless Operator Frederick Ayre in a mood in which complacency struggled with disappointment.

Presently the Talaria's decks began to quake and throb as Captain Helme indicated "full speed ahead" on the engine-room telegraph. Her ponderous screw hurried its pulsing revolutions from thirty-eight to forty-four per minute, and her speed climbed from seven to nine knots an hour. Not an inspiriting gait; but the Talaria wasn't built to break records, and the only one she broke was her own.

In spite of it the luminous breaker that pushed and seethed ahead of her bluff bow grew nobly in size and frothiness, and smoke belched from her salt-stained funnel till it blotted stars and made night blacker astern.

"Keep tabs on the poor fellows, Wireless," ordered the captain, and Freddy shot the unfortunate another question.

"Hello, Leviathan; how's the wreck?" he asked.

"Just blown up forward. Look out for floating wreckage when you come along," the reply came through the night.

The imaginative Freddy, envying the unknown operator his coolness at such a time, went forward and reported to Captain Helme that an explosion of air under the sinking Leviathan's forcastle deck had occurred, and that he had received a last desperate call for help.

Whereat good old Captain Helme, in great agitation, bellowed a message down the speaking-tube to the engine-room that broke the United States inspector's restrictions as to boiler pressure into smithereens, and the valiant Talaria boosted her gait another knot.

Probably Wireless Operator Frederick Ayre was the only person aboard the Talaria who regretted that the night was not one for a dramatic rescue; one such as might be afforded by a screaming, smothering blizzard with licking, galloping crests that knocked oars skyward from gunwales and crushed legs and lifeboats against cavorting broadsides of steel plates.

But the Talaria only churned and nosed and dipped to long, lazy swells a half-mile between glassy summits—summits whose bosoms no zephyr marred. Even the search for the stricken steamer was to be robbed of all spectacular aspects, it seemed.

The sluggish Britisher was on exactly the same course as the Talaria, and the rescuer had but to overtake her or the overladen boats that would be hovering about the swirling vortex where she had gone down.

Freddy's spirits came up with the Talaria's speed, and he reflected that a two thousand-ton tramp with a crew of thirty wasn't such small game after all.

At any rate, it would probably get his name into the head-lines, and his vigilance would have its reward. He mentally began to frame the story he would flash broadcast as soon as the castaways were aboard.

He pictured the sodden, wallowing derelict looming suddenly in the path of the ill-fated steamer; the hoarse, belated cry of the lookout forward; the mad jangling of bells deep down in the engine-room; the despairing blasts of the great whistle that announced "Full speed astern"; the terrific clatter and vibration of giant engines ruthlessly reversed; the jarring, horrifying shock as the steel stem crunched into the deadly hulk; the futile closing of overwhelmed collision bulkheads; the piteous wireless calls as the ship settled relentlessly by the head.

Then the blessings heaped upon the answering Talaria as the harassed crew tumbled into swinging lifeboats in the nick of time—pray God they *were* in the nick of time.

"Ought to be seeing rockets or a flare pretty soon, unless she has gone to the bottom," observed Captain Helme from the bridge. "We've about run down our distance."

"If she's sunk, don't you suppose they're aboard the derelict, sir?" suggested First Officer Crostree.

"'Course not; they're in the boats," said Freddy confidently.

"Well, keep an eye out, everybody," said the captain; "and, 'Wireless,' don't make so much noise with your mouth."

Presently the Talaria began to announce her arrival on the approximate scene of the disaster. Snorting steam burst from her whistle's brazen throat till it seemed as if some demoniac Stentor were raging inconsolably aloft.

Rockets soared from her bridge, and aft a tar barrel blazed its message of cheer, weirdly silhouetting the men around it. Helme slowed his ship to one bell, and still there was not an answering flicker of oil-soaked mattress or smoky lantern from horizon to horizon, much less the bright thread of a rocket.

And then, while the roar of her whistle and the stuttering clamor of escaping steam from the pipe drowned the swash overside, the Talaria hit something a glancing blow on the port bow that made her stagger. Helme stopped his engines dead for the protection of the propeller and dropped a boat from the falls by the run. All the boat's crew found was a couple of badly dented plates on the Talaria's bow at the waterline and the portion of a wrecked vessel's side sluicing awash in the swell. It bore the sonorous legend, "Latour d'Auvergne."

"I'm afraid that settles it," said Captain Helme soberly. "I'm afraid the smash did for both of them, but we'll stand by till daylight and make sure of it. A calm night like this, too! Ain't it pretty tough?"

Hours later a monstrous flaming sun came out of a flaming sea to show the drifting Talaria surrounded only by splintered wreckage, all that remained of the French bark Latour d'Auvergne.

No other craft showed on the desolate horizon, not even wreckage that looked as if it came from the luckless Leviathan.

Captain Helme reluctantly resumed his voyage to the blue Mediterranean, and the disgruntled wireless operator swallowed his chagrin and clicked off to whom it might concern, for the Talaria was now beyond direct shore communication, a harrowing account of the tragedy, in which the redoubtable wireless operator of the good ship Talaria played no unimportant part.

Three days later the steamer, buffeted now by a stiff chop that matched the gray of a steely sky, doffed its white caps airily to a rollicking southeaster and promised other forms of entertainment, overtook a plodding white-funneled steamer, smacking through the pother broad off to the northward. Helme hauled up gradually and for a while the two fought for their easting side by side, in mute sociability.

Wireless Operator Frederick Ayre, wet with flying spume, white of face and shaky of limb, climbed the bridge to where Captain Helme reigned in yellow oilskins and sou'wester, braced sharply against the gale.

"That fellow," he gasped, waving an arm at the floundering steamer off to port, "says he's the Leviathan! I half believe he's the Flying Dutchman!"

"Ay tank she bane one der Leviat'an's sister ships, sir," volunteered the muffled quartermaster at the wheel. "Dey all got white stacks, ya."

"Tell him," said the captain sternly—he had been an old windjammer—"tell him that a man who would joke on such a subject ought to be strung up to the yard-arm—or the steampipe!"

And the outraged Talaria, scorning further common courtesy of the high seas, forged grimly ahead of the illtimed jester. As inky night fell his low-lying smoke was only a smudge on the leaden sky astern.

While the storm-swept Talaria, listed heavily to starboard by a rampaging coal cargo and shorn of deck fittings from stem to stern, was recuperating a week later in the shadow of frowning Gibraltar, there entered the roadstead a white-funneled steamer whose elliptical stern, as she anchored near by, showed the words "Leviathan, of West Hartelpool."

Captain Helme called away his boat, silently beckoned Wireless Operator Ayre to follow, and the two were pulled across the quiet water to the newcomer.

She, too, had seen rough weather, and Captain Helme doubted that they would still be in the mood for pleasantries. Freddy ventured to assert that he didn't consider the Leviathan's wireless operator's position worth a hurrah in Halifax after such shameless trifling with the responsibilities of his office.

Captain Helme quite heartily assured Freddy that he himself need have no qualms in that respect, as he intended to commend his sprightliness to the Marconi people at the first opportunity.

Then they scrambled up a Jacob's ladder dropped over the stranger's bleak side. The Talaria's skipper climbed the bridge to where a bedraggled brother captain leaned wearily on the pipe-rail and dug flaked salt from his eyes.

"I suppose you got my message a few days ago," began Captain Helme crisply. "Now before I report you I want to know what in Sam Hill you mean by all this tomfoolery!"

"And before I kick you downstairs I want to know if you realize whose bridge you're on!" said the other, rising nobly to the occasion.

"What was your idea in reporting yourself sinking after collision with a derelict?" demanded Helme, restraining himself with difficulty.

"Report myself sinking?" repeated the other blankly. "Sparks, come here!" he called to his wireless man. "These gentlemen of the Talaria have had a hard passage across, and as you suspected are a little queer in the upper story. Still, it wouldn't be hospitable not to humor them. Show them your duplicate copy of our report of the derelict Frenchman incident."

The Leviathan's wireless operator obediently went aft to his house, while Captain Helme looked queerly at his fidgeting subordinate. Then Sparks thrust the yellow slip into his commander's hand, and the latter presented it stiffly to Helme. Freddy read over the skipper's shoulder:

"SS. Leviathan, Port Tampa for Genoa, N. Lat. 40 degrees 21 minutes, W. Long. 49 degrees 6 minutes, 5 P. M. Thursday fell in with derelict French bark Latour d'Auvergne. Am sinking her with dynamite as she is a menace to navigation."

Someone gasped: then:

"I'm sick of this job, anyway! Here's where I pull my freight," said Wireless Operator Frederick Ayre, anticipating his superior officer by something like two and a quarter seconds.

METEOROLOGICAL SERVICE IN RUSSIA

The Deutsche Verkehrszeitung announces that there has been established in Russia a service of meteorological reports transmitted every morning through the coast wireless stations of Reval, Riga and Libau, informing ships of the atmospheric conditions prevailing over the Baltic Sea and the neighboring country. The reports summarize the information collected from ten meteorological stations by the Nikolajewiski at St. Petersburg, and concern barometric pressure, wind, the state of the sky and temperature. A special report is transmitted whenever it is considered necessary to warn mariners of the approach of a storm or exceptional atmospheric condition. In addition the Reval station transmits at eleven in the morning of each day (St. Petersburg time) reports concerning the displacement of lightships, wrecks, derelicts or other obstructions observed along the shipping routes, the location of buoys or the lighting of navigable waters.

INSURANCE FOR WIRELESS MEN

It is announced by the Telegraph & Telephone Life Insurance Association that during the forty-seven years of its existence nearly $1,800,000 has been disbursed to the beneficiaries of its deceased members. The association is under the supervision of and subject to periodical examination by the Insurance Department of the State of New York, which certified at a recent examination that "the affairs of the association are in a most prosperous condition, claims are paid promptly and in full and expenses of management are confined to office and other incidental expenses attending collection of assessments."

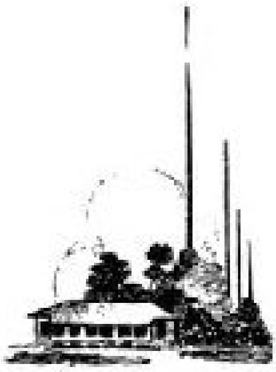
This organization is of particular interest to wireless men, as its benefits are intended solely for persons connected with the telegraph and telephone service, although membership once acquired cannot be affected by change of occupation or residence, and certificates are incontestable for any cause after one year's membership. Wireless operators in good health between the ages of eighteen and forty-five are offered insurance in two grades: Full grade, $1,000 benefit, and half grade, $500 benefit; the assessment calls being based on age at entry. Persons between the ages of eighteen and thirty are assessed $1.00; between thirty and thirty-five, $1.25; thirty-five to forty, $1.50; and forty to forty-five, $2.00. This schedule is not subject to change. An initiation fee of $2.00 covers the cost of medical examination and provides against further charge thereafter for new certificates and other incidental expenses.

Within the past few months a number of men in the Marconi service have been admitted to membership, according to Secretary M. J. O'Leary, influenced by the reports that the assessment calls of the charter members still surviving have averaged but $12.30 yearly for $1,000 insurance.

The reserve fund of the association has now reached $344,000, the income from which is used to lower the mortality cost.

Wartime Wireless

Its Part In the European Hostilities



WITH the declaration of war in Europe a new romance was born for wireless telegraphy. One day it is heard of as a means of launching word far out over the waters to recall a fleet of war ships or to give warning to passenger vessels of the proximity of hostile craft; again it is discovered in use by a German spy on the roof of a hotel in Paris. In fact, the war is replete with incidents in which wireless and wireless men are the central figures.

Not less interesting than the place which the art itself has been allotted in the conflict are the additional responsibilities thrust upon the operators, both at ship and shore stations, as the result of the war. To the perils of icebergs, fog and storm for vessels are now added those of hostile war ships, submarines and mines. Already the war has brought forth one instance of how a wireless operator on a cruiser displayed heroic self-control, even after a mine had exploded under the craft.

"The ship's back must have been broken and the two minutes following the explosion and before she sank must have been terrible," relates an eye-witness. "But somebody seems to have kept his head and a wireless message was certainly sent out."

The English government was quick to realize the importance of wireless telegraphy in the war. Even before the declaration of war the order for the first fleet which had left Portland after the review at Spithead on the morning of July 30 was recalled by wireless and directions were given not to disperse for manoeuvre leave, as had been previously arranged. The government took over all the wireless stations of the Empire from the outset of hostilities. These included the three high power Marconi stations at Poldhu, Towyn and Carnarvon. The control of the Welch stations enables Great Britain, in an emergency, to communicate with vessels of her navy within 3,000 miles of Wales. The station at Clifden, Ireland, which communicates with Glace Bay, Nova Scotia, was also commandeered for part time use by the British Admiralty. The Marconi Company, however, operates the Clifden-Glace Bay circuit during certain hours for the transmission of censored messages.

Marconi men will take an active part in the war. The British government has demanded the exclusive services of 150 of the wireless operators who were employed at the Wales stations. These men will be placed at the Welsh and other stations and aboard ships.

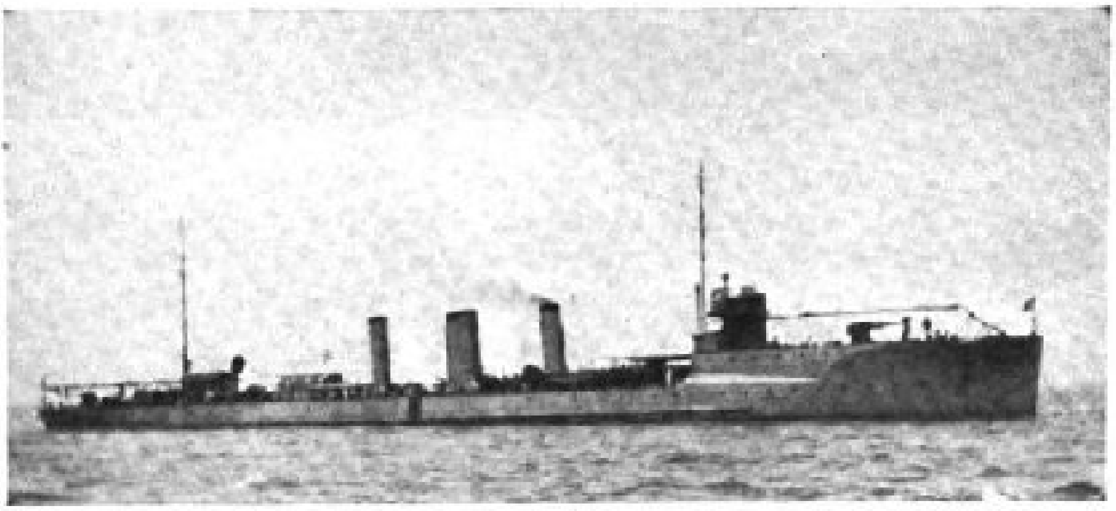
The Admiralty has taken other steps to obtain the services of wireless men. The captain of the Royal Naval Volunteer Reserves issued the following appeal:

"The Royal Naval Volunteer Reserve requires recruits. Men with knowledge of Morse and semaphore telegraph or wireless especially useful. Apply headquarters, R.N.V.R., Commercial Road, London."

It is believed that these men will be drafted off to the prize vessels which have already been captured by the British fleet and brought into English ports, where they will be transferred to the service of the navy and equipped with wireless telegraphy which will be controlled by operators drawn from the Naval Reserve Wireless Corps. Another appeal was issued for volunteers to operate wireless on the naval airship fleet, and even the Boy Scouts were called upon to give their services and their wireless equipments to the government for purposes of defense.

The government has been active in taking measures to reduce to a minimum the leakage of official information which might be transmitted by wireless telegraphy. The following order to this end has been issued by the Admiralty:

"The use of wireless telegraphy is prohibited in the harbors and territorial waters of the United Kingdom and Channel Islands. On entering any port or harbor, or on directions being given to that effect by any naval, military, examination service, customs or police officer, the aerial wire or antenna is to be at once lowered, disconnected from its halliards and from the operating room, and is not to be rehoisted while the ship remains in British territorial waters. Any breach of these regulations renders the masters of offending ships liable to penalties and to the confiscation of the wireless apparatus of their ships. These regulations do not apply to ships owned (not chartered) by the Admiralty, whether they fly the Blue or the Red Ensign."



Wireless has become an absolutely indispensable part of the equipment of the modern nautical war machine

Another communication to this effect was published:

"The Postmaster-General has issued instructions for the closing of all experimental wireless telegraph stations in this country.

"He will be glad to receive from any quarter information of any wireless station which may be observed to be kept up in contravention of his orders.

"The instructions do not apply to wireless stations doing public business, such as the coast stations which carry on wireless communication with ships at sea.

"Ordinary telegrams for places abroad and radio-telegrams, however addressed, can only be accepted if written in plain English or French, and at sender's risk. They will be subject to censorship, and must bear the sender's name at the end of the text, otherwise they are liable to be stopped until the name is notified by paid telegram. Registered abbreviated addresses will not be accepted either as addresses or names of senders."

An emergency war ruling stipulating that no merchant vessel carrying wireless apparatus may send messages while within three miles of the English coast has also been made.

Protective measures as regards wireless, however, were not sufficient. The government took aggressive action, as well, with the object of crippling Germany's means of radio communication. The Secretary of State for the Colonies issued instructions to the British officers in the Gold Coast Colony to seize the town of Lome on the west coast of Africa. His order was immediately carried out. The invaders met with no resistance, and South Togoland, up to 120 kilometers (approximately seventy-four miles) north from the coast, was simultaneously surrendered. Togoland is situated between the Gold Coast and Dahomey, the French colony, and has belonged to the German Empire for some thirty years. Except for the fact that it possesses a large wireless telegraph station, it is a colony of little importance; but its value to the German government as a means of communicating with the outside world made it a desirable capture. On August 10 a telegram from Nairobi, British East Africa, announced that a British cruiser had destroyed the German wireless station at Dar-es-Salaam. This is the only well-sheltered harbor on the German East African coast, and is in direct railway communication with the interior. Nor was this all. A coaster arrived at Cape Town on August 11, reporting that the Germans had evacuated Swakopmund in German Southwest Africa, after having blown up the jetty and dismantled and sunk the tugs in the harbor. Warehouses and shops had been closed and all provisions removed to Windhuk, the capital. Luderitzbucht had suffered similar treatment. Both these towns are wireless telegraph land stations, each with a range of 500 nautical miles by day and 900 by night. Windhuk was a more powerful station.

A MARCONIGRAM was sent from the British cruiser Pathfinder following the explosion which sank the craft, according to a story told in London by an eye-witness. The cruiser was destroyed recently after striking a mine in the North Sea. An official announcement of the disaster says that four men were killed, two wounded and 242 are missing. The story of the eye-witness is as follows:

"In less than a minute after the explosion we saw the smoke of two vessels, and suddenly two torpedo boats came into view, tearing through the water. We tried to attract their attention, but they made straight for the scene of the wreck. I don't know how any wireless operator could have sent a message from the cruiser, as there seemed to be no time for anything. The ship's back must have been broken, and the two minutes following the explosion and before she sank must have been terrible. But somebody seems to have kept his head, and a wireless message was certainly sent out. Three other destroyers soon arrived. One appeared to have men standing by the guns and on the lookout for submarines."

The captain of the British Royal Mail steamer Allianza, on a recent voyage from Buenos Ayres to Southampton, reports he was stopped off Cape Blanco, Morocco, by the armed merchant ship Kaiser Wilhelm der Grosse. The captain of the German vessel inquired if there were any women and children aboard the Allianza. The captain of the English vessel replied in the affirmative.

Thereupon the German commander ordered the captain of the Allianza to throw his wireless equipment overboard. The order was complied with and the British vessel was allowed to proceed.

SINCE the outbreak of war, attempts have been made to disable two of the wireless stations operated by the Marconi Wireless Telegraph Company of Canada on behalf of the Canadian government.

During the early hours of August 14 an attempt was made to wreck the Port Arthur station, the men taking part in the attempt being surprised in the act of cutting the guy lanyards supporting the masts. Chief Operator J. A. Bartlett gave chase, and was fired upon, the bullet passing close to his head. The damage to the aerial was not extensive, and the wireless service was only out of commission for two hours.

A similar attempt was made a few days earlier on the wireless station at Sault Ste. Marie, but as in the case of Port Arthur it was frustrated by the vigilance of the company's staff. Strong military guards have been placed in charge of the wireless stations all over Canada.

An English newspaper reports that many agents of the German Secret Service who were in England before the war broke out were possessors of amateur stations on or near the East Coast, by means of which they hoped to be able to get into communication with German cruisers on the North Sea. Prompt action by the government forestalled their plans and although one or two instances of discoveries of concealed apparatus have come to light, they are nothing to be compared with the organization of the German Secret Service which is said to have existed in France and Belgium to establish wireless communication with Berlin, or to overhear messages. A German at Versailles was arrested on suspicion and a search in his rooms revealed a most cunningly contrived wireless apparatus concealed along the sides of the chimney.

A similar case was reported from a shop in Antwerp, where this time the apparatus was hidden on the roof of a large German bazaar, and concealed behind a statue draped with flags.

But the case of a German hotel proprietor in the Champs Elysees in Paris is perhaps the most noteworthy. As soon as war had been declared by Germany, French plain-clothes detectives drove up to the hotel in a taxicab. They crossed the hall to the manager's office. He was seated at his mahogany desk, spruce, self-possessed, a model of urbanity. "You have been using a secret wireless apparatus on the roof of your hotel for the purpose of confiding messages to the enemy. You are arrested as a spy," he was informed. A moment later some of the detectives drove away with their prisoner. The rest stayed behind to make arrangements for the immediate closing of the hotel. The conclusion of the story connects the fate of the hotel manager with a court-martial, a ditch and a firing squad.

THE German cable and wireless station on the Island of Yap has been destroyed, thus cutting off from communication with the outside world all of Germany's island possessions in the Pacific, according to a dispatch from Manila. Yap is the principal station of the German wireless system in the Ladrone and Caroline groups. It is an eastern extension cable office and, through the Shanghai terminal in the Pelew group, is in connection with Shanghai, and through Japan, with Europe. Through its wireless station the other possessions of Germany in this part of the Pacific not on direct cable lines are kept in communication.

WIRELESS telegraphy saved the passengers of the Cunard liner Ivernia considerable anxiety on a voyage which ended when she docked in New York on August 22. She steamed away from Naples on August 1. War between Austria and Servia had been declared and she had left Gibraltar and was twenty-eight hours at sea when British cruisers sent her marconigrams, instructing her to go back. She steamed back to Gibraltar where she remained six days before she was notified it was safe for her to proceed.

The Ivernia was off Shinnecock, L. I., when Captain H. M. Benison, her commander, saw a three-funnelled cruiser on the horizon. The Cunard liner was steered close in shore, the captain determining he would run her aground before he would be captured by a German cruiser. Those aboard the Ivernia were in a state of considerable excitement until the Marconi operators on the steamship got into communication with the cruiser. They could tell she was British by the manipulation of the wireless keys, and the precautionary measures taken by the Ivernia's commander to avoid capture were relaxed. The liner had been effectively disguised by deft touches with the paint brush, however, and it was a long time before the captain of the cruiser was satisfied that she was an English-owned boat.

A sidelight has been thrown on the usefulness of such outlying stations of the German empire by a discovery in Bombay. In that port eighty Germans were detained in harbor owing to the outbreak of war between England and Germany. All would have gone well had not the authorities found that their wireless apparatus had been disturbed and ascertained that the disturbance originated with the Hansa liner Rheinfels, one of the vessels which had been detained. As a result, the installation on board was immediately destroyed and the captain and crew of thirteen imprisoned.

DETAILS of the capture of the German tank steamship Leda, Captain Klemz, bound from Rotterdam to Baton Rouge, La., by the British cruiser Suffolk, and related by a passenger on board the Caribbean, of the Royal Mail line, show the war to have its amusing side. According to the passenger, the capture of the Leda was effected through one of her own officers who innocently gave the whereabouts of the vessel to the cruiser.

The Leda is not equipped regularly with wireless, but this officer had rigged up an amateur set on board. The Leda was approximately 180 miles away from Bermuda on August 9. That morning the wireless amateur began calling CQ. The operator on board the Suffolk cruising in the vicinity heard the call and getting into communication asked the Leda's nationality and position. At once the German answered, giving his name and his morning position. Within two hours the Suffolk ran alongside and ordered the tank steamer to stop. She then convoyed the German vessel to Bermuda. As the cruiser and her prize entered port the French cruisers Conde and Descartes also entered Hamilton harbor. The Suffolk left at once.

THE perils faced by the wireless operators in war times are illustrated by the statement of John MacKenzie, an Englishman, who had been in Belgium for six weeks. He recently arrived in London from Ostend.

"When I left Ostend," Mr. MacKenzie said, "the people were much frightened. The British consul had left the city and tourists had been warned to leave. The wireless operators were still on duty, but they had their bicycle ready to flee. The wireless stations had been mined so that they can be destroyed when the Germans begin their entrance into the city."

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION

When the construction of the globe girdling chain of wireless stations was little more than a rumor, an enterprising New Jersey editor got wind of the scheme and published an account of it in a Newark newspaper. A copy of that particular journal in the regular course of things found its way into the hands of a Newarkite—or would you call him a Newarkan?—anyhow, an able-bodied citizen born in that enterprising vicinage. Lynn Cory Everett, said citizen, being an individual of destiny, was duly and properly impressed with the greatness of modern wireless. Wireless telegraphy, in fact, looked so good to him that the question was settled. Everett made his application. Then he waited . . . and waited. . . .

But finally there was an opening. The Marconi Company's chief engineer needed a man. Everett was sent for, and next day it was whispered about in engineering circles that the Safety Car Heating & Lighting Co. would soon have a vacancy in its laboratory staff.

And thus it was that in August of 1912 this man and his three family names came unobtrusively into the engineering department, and took charge of a lot of odds and ends of the work. Two years have wrought some changes. Everett was odd-and-ending at first, solely because it gave him more time to dig into the engineering side of wireless. About two months after he entered the service, the supervising engineer picked out Everett to look over the many details in the general scheme of transoceanic station construction. One of the first things he did was to design condensers from which the glass and zinc plates could be removed without disturbing the tanks, dumping the oil or interrupting the working. Then the insulators planned for suspension of the wires didn't look right for local conditions; besides, the strain wasn't evenly distributed. This type of insulator had never broken in use, but Everett figured it might some day, so he corrected the mechanical fault and incidentally created a new type. Looking about for other things that showed symptoms of breakage, his eye lighted on the mast guy cables, designed to follow the usual practice in the matter of splicing at the insulating point. Now guy splices have been known to elongate their loops under strain and the slack set a mast vibrating, so out went the splice in favor of a socket joint and an insulating block that permits the use of heavier and stiffer cables, giving a straight pull and developing 100 per cent. as against the 80 or 90 per cent. of the old system.

These few instances give you some idea of what Everett does. Nominally he is assistant to the supervising engineer; in reality, he is a breakage preventer of a high order and as such has already become a big engineering factor in the construction of continent-to-continent wireless stations.

The Installation and Maintenance of Lead Storage Cells

By H. Winfield Secor

THE present paper covers some practical points in the installation and maintenance of lead storage cells, particularly the chloride accumulator, supplied by the Electric Storage Battery Company. These cells are very extensively employed for electric lighting plants, telephone exchanges, wireless auxiliary sets; and many other purposes. The data and instruction herein given may be generally applied to all storage cells, particularly as regards the charge and discharge rates, etc. The data given is not deduced from mere theoretical consideration, but is taken from notes made on actual installations. This article is intended for practical value, no attempt being made to discuss the matter historically or to put forth elaborate technical explanations of the chemical actions taking place; these phases of the art are amply covered in many excellent text-books published on the subject.

In view of the advantages to be derived, the practical use of storage batteries is daily becoming more extended. Like other electrical equipment, if efficiency is to be expected, intelligent supervision and constant care are required. It is not intended to go into the details of laying out and planning storage-battery plants, this part of the problem having been assumed as settled.

It has often been observed that storage-battery installations are placed in inconvenient locations, as regards ventilation and maintenance facilities. It will be assumed here, however, that the actual location has been decided upon, and the work of installation is about to take place. It should be known that the better class of storage-battery installations, especially those employing lead cells giving off a large quantity of sulphuric gas fumes, are designed with privately sealed-off rooms or individual rooms. Whatever the location, the room should be well ventilated. It should be dry and as clean and free from dust as possible; furthermore, precautions should be taken to prevent sunlight from shining directly on the cells. The sun's rays striking the glass cells will cause a considerable rise of the temperature of the electrolyte, which is, of course, very undesirable, because standard battery maintenance does not tolerate a higher working temperature for the electrolyte than 100° Fah., 90° being the safer limit. If the location is such that the sun's rays shine on the cells for a considerable period of time it will be necessary to give the windows a frosted coating, making them translucent, or an awning may, of course, be provided.

A few words will be devoted to the general arrangement of lead storage cells with glass containers. Within reasonable limits, the statements are applicable to cells of various types and sizes. Very large tank cells require, of course, extra substantial supports. In the sketch, Fig. 1, the usual double-tier cabin form of installation is indicated, this particular view being that of a telephone exchange plant, located in the suburbs of New York. This set of chloride accumulators consists of 11 (known as a standard 24-volt, exchange battery for talking current) type F, 400 ampere-hour capacity cells. The cells are of course connected in series, and hence the ampere-hour capacity of the entire battery is that of 1 cell, viz.: 400 ampere-hours. The voltage is 11 times that of 1 cell, which varies during discharge, as shown further on; the average, however, is close enough to 24 volts to require very little regulation by the rheostat.

The battery cabinet shown is generally installed near to, or in, the dynamo room itself. This obviates the necessity of lengthy and expensive heavy copper conductors betwen the charging

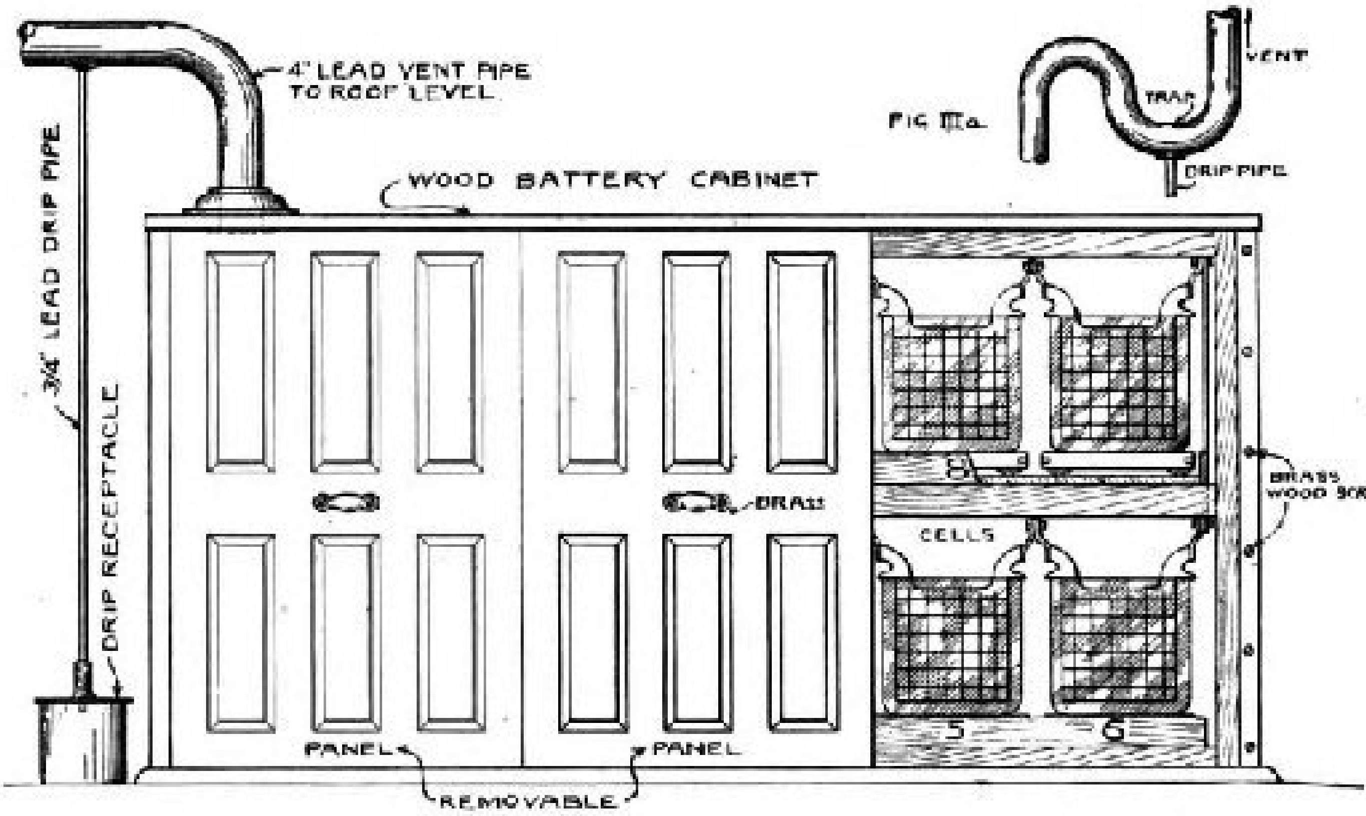


Fig. 1

dynamo and the battery. With the battery, including generators arranged in one room, the expense of maintenance is reduced to a minimum, for less help is required. The cabinet referred to is provided with removable parallel doors, which are lifted up and out of the frame, allowing easy access to the cells. When the cabinet is placed in the center of the room the ventilation is vastly improved. It is then of value to have the doors on both ends and sides removable, all tending to ease of maintenance.

The woodwork of battery frames, etc., should be given a thorough coating of black asphaltum or acid-proof paint. It is the usual practice to give the inside of the cabinet at least five coats of paint, as the acid quickly rots the wood if it reaches the unprotected pores. Once the battery is put into operation a gaseous spray is emitted by the cells, which may settle over the woodwork; hence the precaution.

In battery installations where the cells are exposed or open the ventilation is easily effected by air currents traversing the room. In the cabinet style of installation, however, some means of artificial ventilation must be provided.

A common arrangement is to run a 4-inch pipe vent out through the top or side of the cabinet. It then is carried out through the wall of the building and preferably led on to the roof. It is well to have an off-set in the vent pipe (as shown by the sketch). A small ¾-inch lead pipe drip line, ending in an earthenware vessel, is attached to the bottom of the set. This should be readily removable for purposes of emptying.

All wires brought into the cabinet enter in iron pipe conduit such as "L oviduct," the conduit being carefully fitted into the woodwork to make a tight joint. The mouths of the conduit are sealed up by pouring in hot sealing compound around the leads, effectually preventing the entrance of acid fumes from entering and destroying the insulation or wires.

Four hundred A. H. glass cells of the type here discussed are set on shallow wood trays filled with dry, white sand to absorb any acid drippings. The wood trays rest on four glass petticoat insulators about 2 inches high, placed with the petticoats facing down. Each cell contains 6 negative and 5 positive plates, each measuring 11 x 10½ inches. The cells have more negative than positive plates, because the former deteriorate more rapidly than the latter. That battery shown has a capacity of 50 amperes for 8 hours, the usual discharge rate for lead cells in the United States.

The rate of discharge may be varied as desired. For instance, it may be 70 amperes for 5 hours, 100 amperes for 3 hours, or 200 amperes for 1 hour. As the discharge rate is increased above normal (8 hours), the ampere-hour capacity is reduced accordingly. The exact rate of capacity decrement for various rates of discharge are given as follows:

	Per Cent of Capacity at 8-Hour Rate	
Discharge Rate	For Pasted Plate Per Cent	Plante Plate Per Cent
8-hour	100	100
6-hour	96	96
4-hour	88	80
2-hour	70	61
1-hour	48	56

The appearance of the cell and its parts is depicted in Fig. 2. For cells of this type up to 500 A. H. capacity bolted connections formed of lead-covered brass bolts are employed between the lead terminals of adjoining cells.

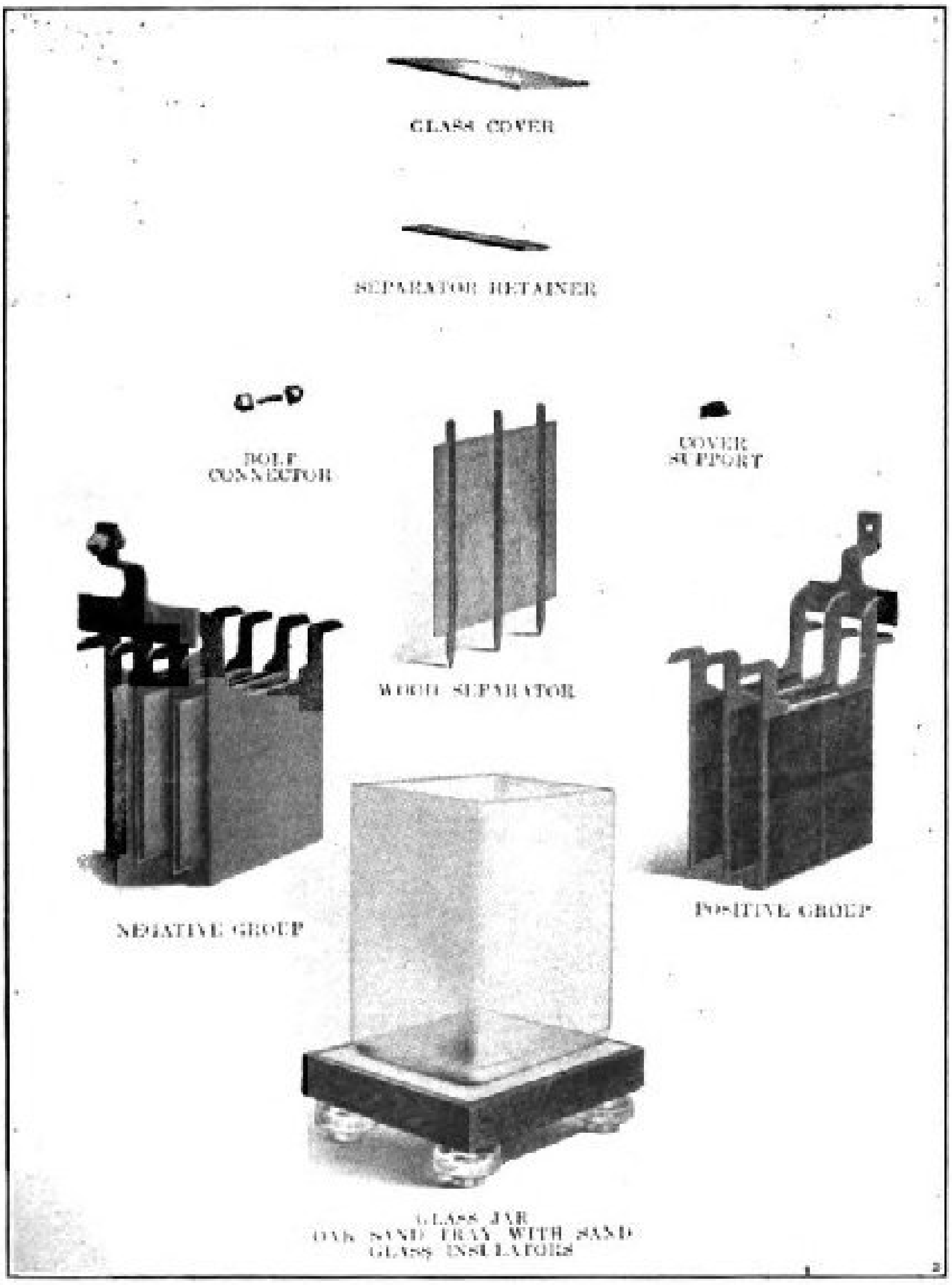


Fig. 2

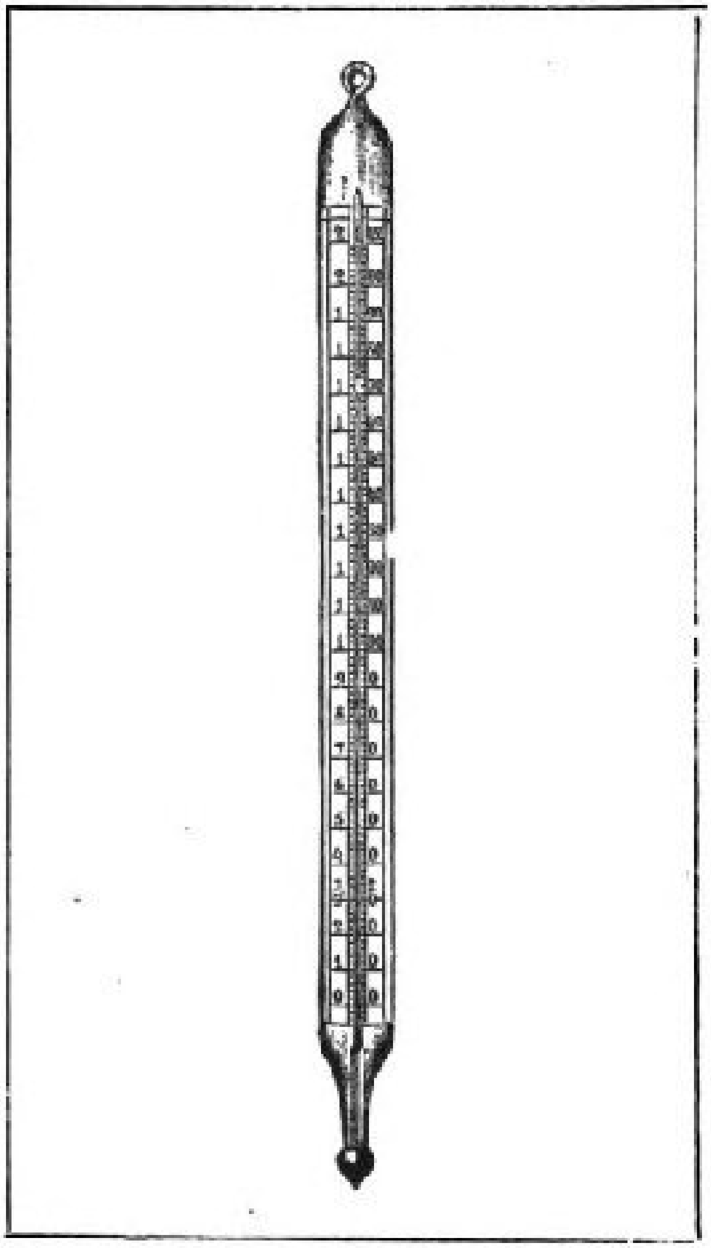


Fig. 3B

When the connection is thoroughly made the whole terminal is wrapped with gum rubber tape. It is then covered with a few wrappings of black friction tape, and finally painted with four or five coats of acid-proof paint. On the cells of great ampere-hour capacity the lead terminal straps of adjoining cells are "burned" together by means of a hydrogen flame. This work requires a considerable amount of skill and suitable apparatus to generate the hydrogen, which may be supplied by the various battery companies.

When burning or welding the lead terminals great care must be taken to apply an exact degree of heat, particularly avoiding an abnormal degree, or the lead will melt. Insufficient heat will also result in failure. A little practice with some old scrap lead strips will soon give the mechanic a fair degree of skill along this line. If a hydrogen flame is not available, ordinary illuminating gas combined with a few pounds air pressure will effect the weld. In any case, a very small tip should be used so as to give a pointed or "needle like" flame.

After all connections have been thoroughly made, it is then in order to fill the jars with suitable electrolyte. For lead cells the electrolyte is composed of about 5 parts water to one part of pure sulphuric acid. The electrolyte purchased in the open market generally has its specific gravity of 1.250, as tested by the hydrometer. In large commercial cells the electrolyte and sulphuric acid should be as pure as possible. .. should be of the grade obtained from sulphur, and not from pyrites, which invariably contains iron in solution,—one of the greatest enemies encountered in the successful operation of storage cells. Traces of iron or any other impurities will

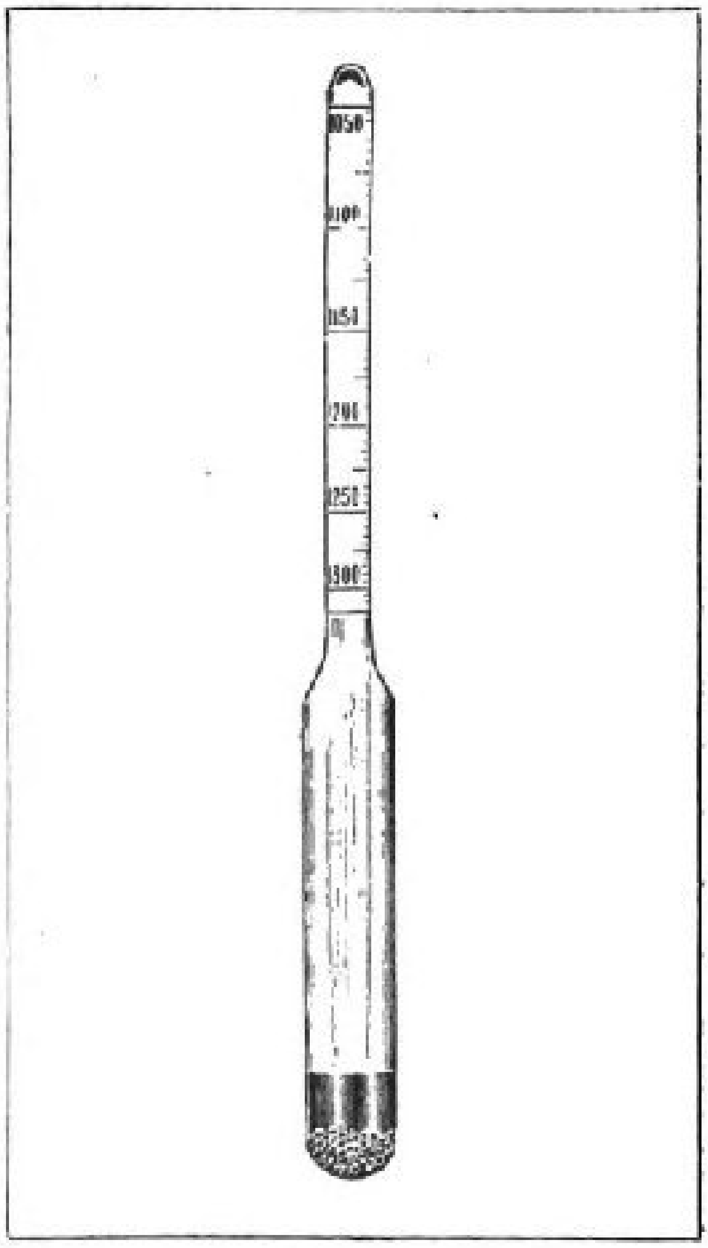


Fig. 3A

cause the filling of the lead plates to disintegrate. The sulphuric acid need not be chemically pure, but should at least be absolutely free from chlorine,

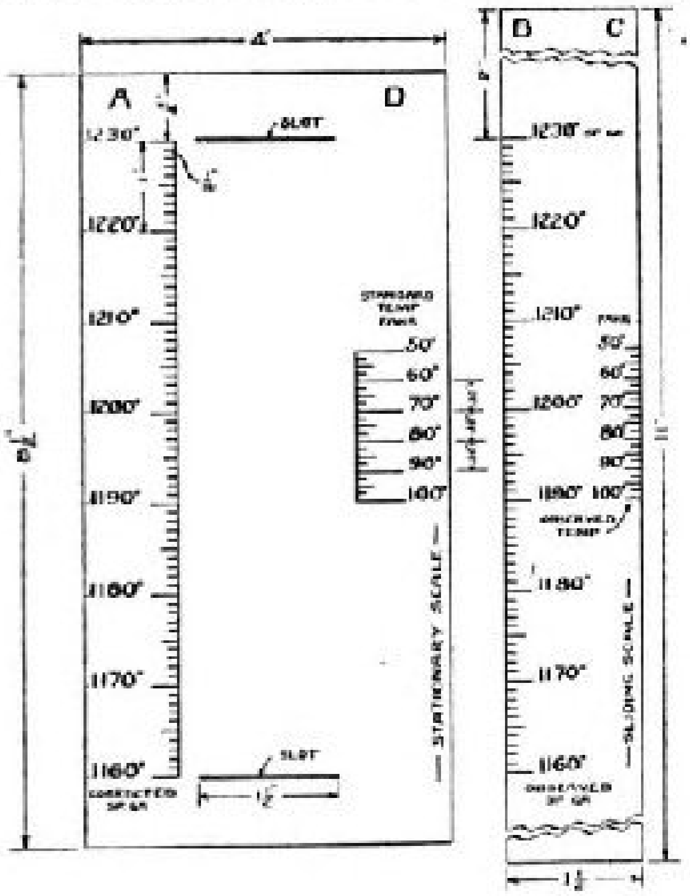


Fig. 4

nitrates, copper, mercury, arsenic, acetic acid and platinum. Any chemical handbook will give simple testing methods for finding the presence of such foreign admixtures. Distilled water should be used when mixing new electrolyte.

For chloride accumulators, the specific gravity of the electrolyte should be 1.210° at a temperature of 70° Fah. And any specific gravity readings subsequently made at other solution temperatures are always corrected to 70° Fah., the common temperature standard.

This is a point often overlooked by ordinary battery users; i. e., the electrolyte temperature and specific gravity play such an important part in real operation and action. In commercial maintenance the temperature and specific gravity readings are taken carefully and accurately, and are often used as a guide to the state of charge or discharge of the battery.

By way of further advice in reference to the filling of the cells and mixing the electrolyte it is the ordinary practice to use a couple of glass or porcelain pitchers, into which the contents of the carboys are emptied. When the electrolyte is mixed on the job, an earthenware or other non-metallic vessel (except lead) may be used. *The acid must always be poured into the water; not vice versa, else the mixture* is liable to be forcibly thrown at the face of the person performing the operation. Owing to the great amount of heat developed, the acid should be poured into the water slowly. When the mixture has thoroughly cooled the specific gravity and temperature readings should be carefully noted by floating a standard hydrometer and thermometer in the electrolyte. In Fig. 3A a suitable hydrometer reading from 1.050° to 1.300° specific gravity corresponding to 7° to 33.5° Beaume is shown. A floating, or bath, thermometer is seen at Fig. 3B. Instruments of first-class construction

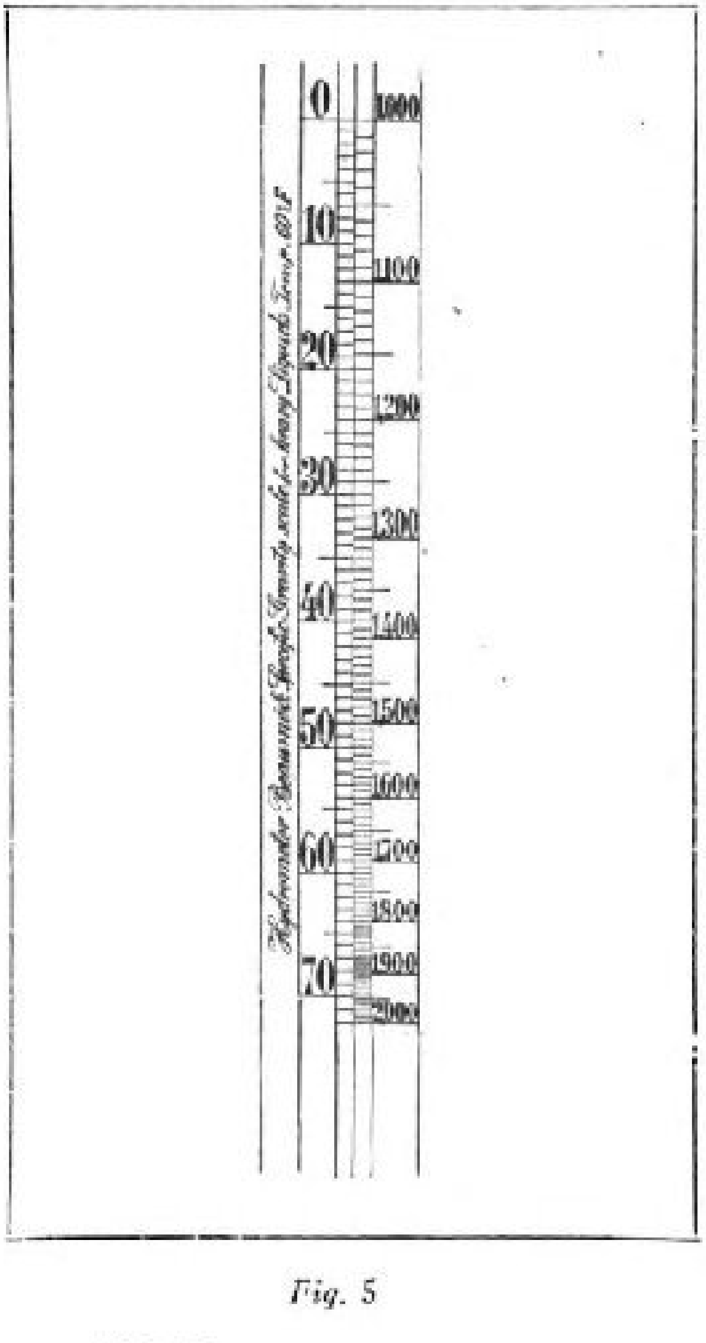


Fig. 5

should be employed for large commercial or private work.

Hot, or even warm, electrolyte must not, under any conditions, be poured into lead cells, or the plates are sure to become coated with an insulating film of lead sulphate, stopping the action of the battery. Furthermore, if the solution is very hot, the plates are liable to buckle or become bent. Before filling the jars let the electrolyte be the same temperature as the room, and no trouble will be experienced. The electrolyte should cover the plates at all times. Charging should always commence immediately after the cells have been filled, or at least within a couple of hours.

The observation and corrections of specific gravity and temperature readings call for some attention. The reading on the hydrometer is secured by observing the point on its scale on a line with the level of the electrolyte. When reading the temperature the thermometer is moved from cell to cell, allowing it to remain a sufficient length of time for action. This usually requires no more than two minutes. Readings are taken of specific gravity and temperature every half hour on initial charges, but hourly readings during charge are sufficient during general maintenance. A peculiar action of the electrolyte is that, as its temperature goes up its specific gravity goes down correspondingly and in a definite ratio. It is common to allow 1° specific gravity change for every 3° change of temperature. To be more accurate, it should be stated that the specific gravity variation is ⅓° for every 1° temperature change.

From the foregoing rule it is at once seen that if a specific gravity reading of 1.208° was observed at 79° Fah., then the actual specific gravity at standard, or 70° Fah., temperature would be 9° temperature difference times ⅓ or 3° specific gravity difference. As the observed temperature was higher than standard, then the corrected specific gravity must be higher by 3° or 1.211°. Fractions of specific gravity degrees below ½ are usually discarded, and above ½ they are called one. A table is given which will be of great service for specific gravity corrections. The author has also designed a sliding scale for obtaining directly the corrected specific gravity values at standard temperatures. This is shown at Fig. 4. This can be made on bristol board or drawing paper. The slide at the right slips through the two slits cut in the main part of the device. The scale is easily layed out, and can be readily suited for any desired range of temperature and specific gravity readings other than the usual ones encountered in storage-battery practice. In Fig. 5 is given a scale for converting specific gravity readings from the common decimal scale into degrees Beaume. As will be seen, 1.210° about equal 25° Beaume. The latter scale is very little used in this country except in laboratory practice.

The specific gravity of the sulphuric

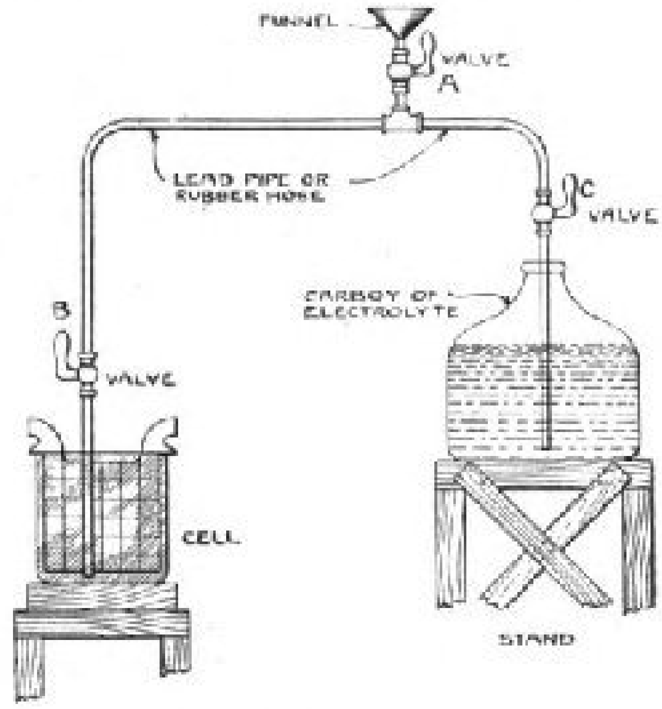


Fig. 6

acid used for making electrolyte usually measures about 1.835° at 70° Fah. solution temperature. Electrolyte made from this acid reads 1.208° a 60° Fah., and contains 30 per cent. of 1.835° acid. Its weight per cubic foot is 75.34 pounds, and there are 22.60 pounds of 1.835° acid per 1 cubic foot of electrolyte (dilute H_2SO_4).

Where a number of jars are to be filled, requiring a great quantity of electrolyte, an acid pump of standard type will be very useful, or it may be syphoned into the battery jars from the carboys, as indicated in Fig. 6. The bottom of the battery should be a little lower than the bottom of the carboy.

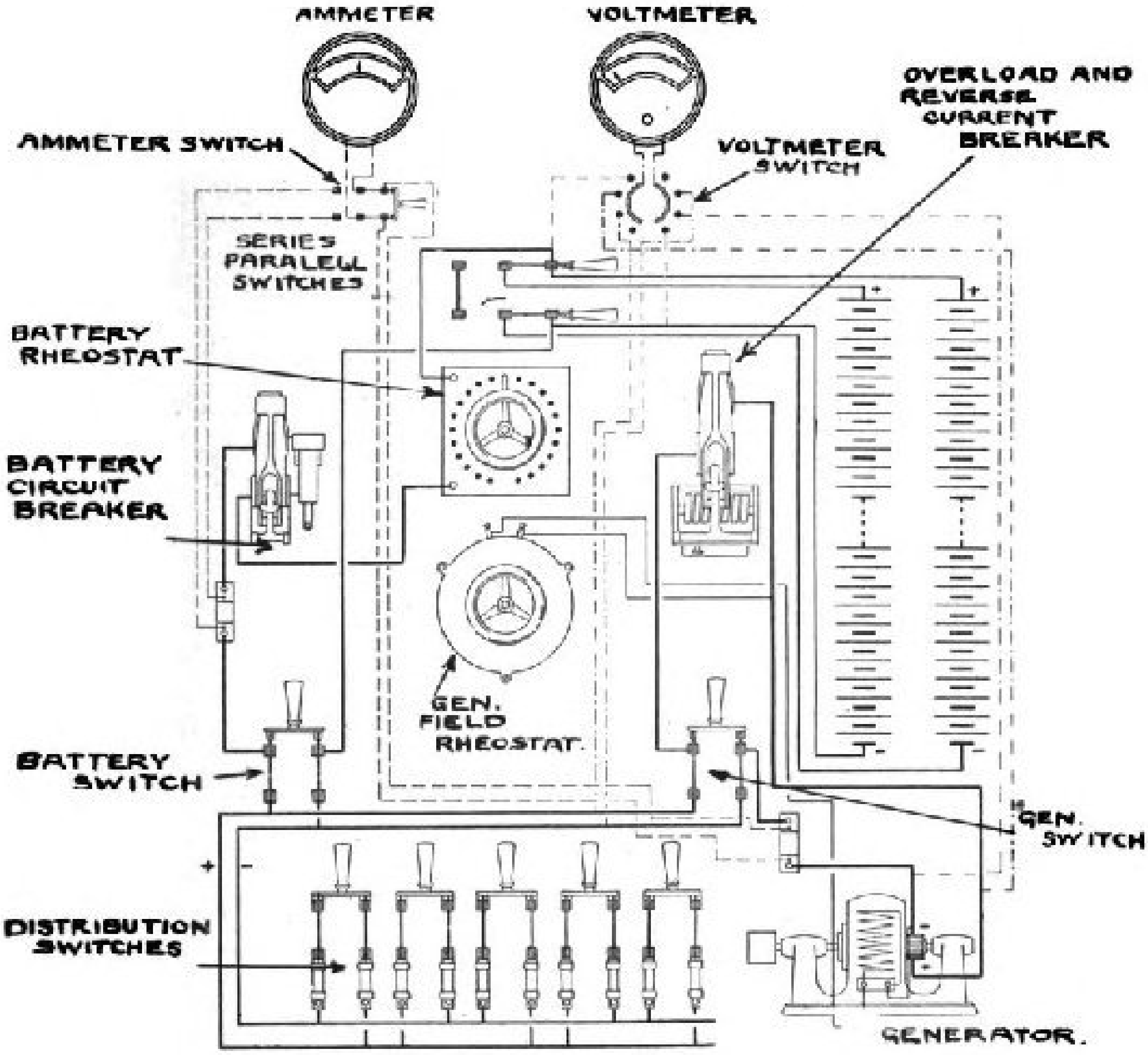


Fig. 7

All connections should be of rubber or lead pipe. In using the syphon, the valves B and C are first closed. Then valve A is opened and a quantity of electrolyte from a small earthenware or glass vessel poured into the funnel shown. When the pipe from B and C is full the valve A is closed, and at the same time B and C opened, when the atmospheric pressure on the solution in the carboy will cause it to run up the pipe, following the air pocket, and so out into the jars.

Before describing the method of making the initial charge, the equipment of a typical charging switchboard will be outlined. The diagrams given represent standard engineering practice as used by the Gould Storage Battery Company, in Isolated Lighting Plants, etc.

In Fig. 7 a layout of a battery plant is shown arranged for the parallel charging and series discharging of the battery. This type of plant is intended for a separate D. C. charging generator driven by any prime mover, such as a gasoline engine, steam engine, electric motor or water-wheel, if sufficiently steady, or the generator may be the regular supply unit, the battery being used to help it out on peak loads.

The switchboard contains all the necessary apparatus for the proper protection of both the charging generator and the battery. As will be evident, the ammeter can be placed in either the charging or discharging circuit by means of the D.P.D.T. knife switch. The voltmeter connected to a rotary dial switch can be used to measure the potential flowing across the generator terminals, the battery terminals or the main line. In the generator charging circuit is placed a double protective device, viz.: an overload and reverse-current circuit breaker. This prevents an overload of current in either direction from doing harm, and the reverse tripping magnet makes it impossible for the battery to discharge back into the generator. An overload circuit breaker is also placed in the discharge circuit to protect the battery against any overloads.

The battery cells are connected in parallel for charging and in series for discharging by means of the two S. P. D.T. knife switches. Voltage controls of the battery on discharge is effected by adjustment of the battery rheostat, which is cut out while charging. The voltage of the charging current from the generator is regulated by the field rheostat. In charging the battery the circuit-distributing switches are opened, and the series parallel switches thrown to the parallel position. The main battery switch and circuit breaker are closed and the voltage across the generator terminals adjusted until it is about 10 per cent. above the battery voltage, when the overload and reverse circuit breaker is cut into circuit, followed by the closing of the main generator switch. The charging current is then brought to its proper value by adjustment of the generator field rheostat. At the end of the charge the charging current is reduced to a low value and the main generator switch pulled out, leaving the battery at full voltage across the discharge mains. Before throwing

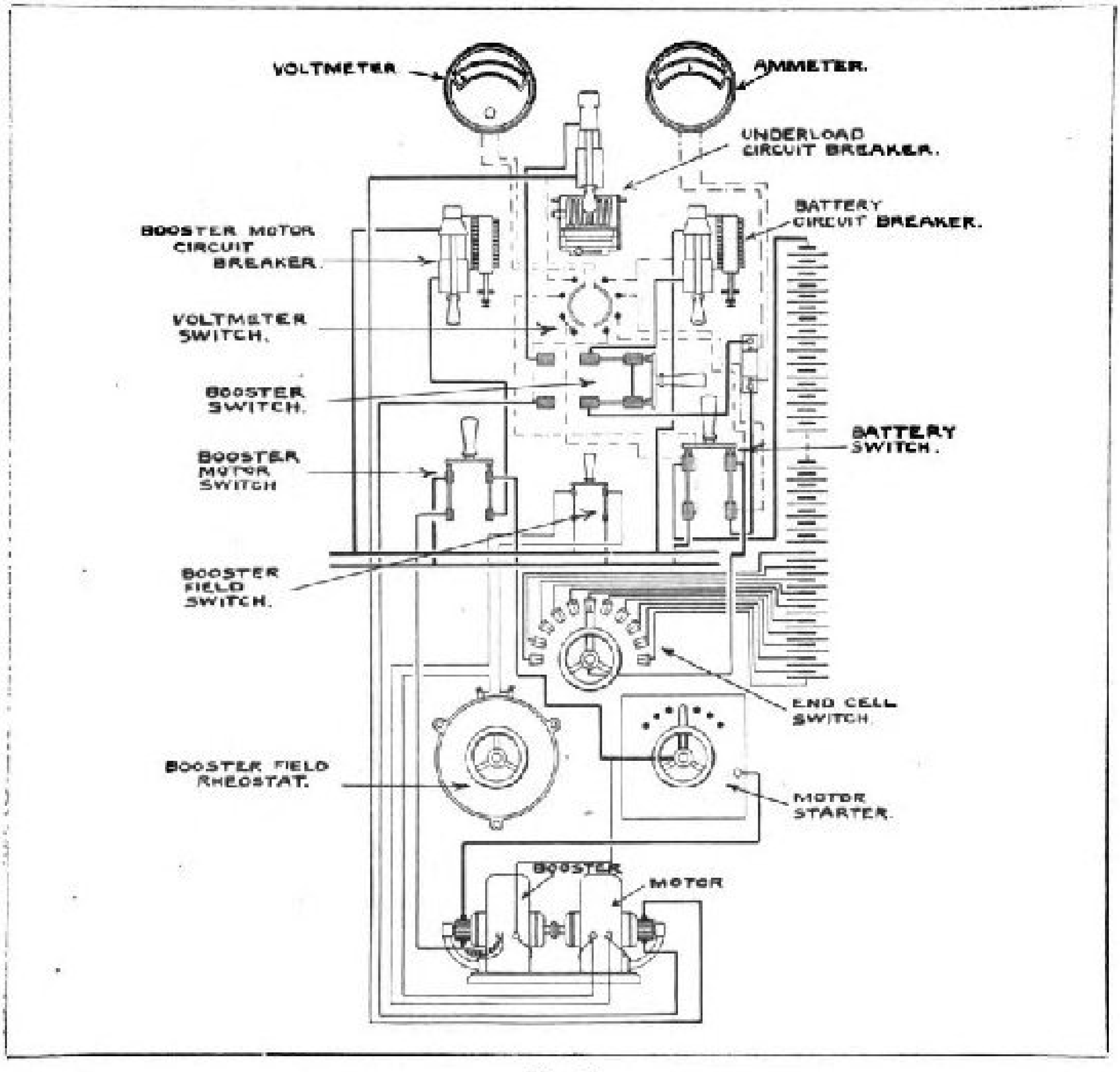


Fig. 8

in the circuit-distributing switches the battery rheostat should be cut in and the voltage regulated to the proper value, after which the switches may be closed. The directions just given apply to the plant if the generator is only a charging unit, but if it is the regular supply unit, utilizing the battery as an aid in cases of heavy load, then the charging current of the battery is controlled by the same battery rheostat used to control the discharge battery current. In this instance the generator voltage is maintained at a constant value across the main supply wires and the circuit-distributing switches may remain closed.

In isolated-plant operation one of two methods are employed to regulate the voltage of the battery during discharge: by rheostat or resistance control, as described in the layout, or by the utilization of end cell switches, the latter method consisting in switching additional cells into the circuit at the end of the battery, as the main battery voltage falls. A fully charged battery generally shows about 2.1 volts per cell standing idle, while during the latter part of the discharge at the 8-hour rate it will register about 1.8 volt, and perhaps less on higher discharge rates. By the 8-hour discharge rate (which is generally understood in speaking of battery capacities) is meant a rate whereby the total current output of a battery is delivered in 8 hours. For example: if a 400 ampere-hour battery is discharged at 50 amperes for 8 hours (product of $8 \times 50 = 400$ A. H.), the discharge is said to have been at the 8-hour rate. If a 1,000-A. H. battery were to be discharged at the 8-hour rate, current on discharge would be $1{,}000 \div 8 = 125$ amperes per hour discharge. Charging generators are generally computed on a basis of at least an 8-hour normal charging rate.

We shall now consider a case where the battery is charged in series from the mains, necessitating the use of a booster (or auxiliary generator) to raise the charging voltage to a sufficiently high point. The diagram, Fig. 8, illustrates what is known as a booster charge and end-cell discharge type of plant. The shunt booster generator is motor driven at constant speed, and its voltage added to that of the charging mains, the proper value being maintained by adjustment of the booster field rheostat. The discharge

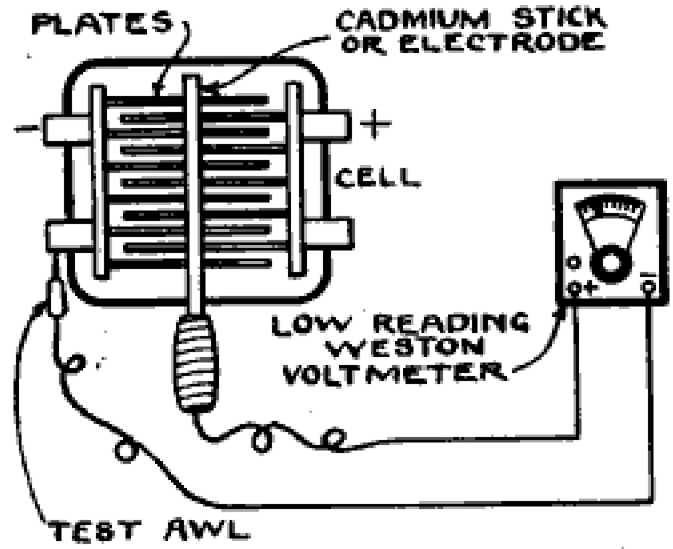


Fig. 9

voltage of the battery is controlled by the switching end cells into circuit. The entire arrangement of circuits should be clear from the diagram.

THE INITIAL CHARGE

The details of the initial charge will now be taken up. The matter here given applies to lead cells in general, but is based more particularly on the operation of the chloride accumulator cell manufactured by the Electric Storage Battery Company. It should be borne in mind that practically every make of storage battery has its peculiarities, and with this fact in view, complete instructions covering its operation should be obtained from the manufacturers. For example, while with the chloride accumulator initial charge must start immediately, or very soon after, filling with electrolyte, the "exide" vehicle cell must stand at least 12 hours before starting the initial charge, owing to the difference in construction.

It is common practice to start the initial charge at about ½ the normal charging rate and maintain it at this point for a number of hours, when it may be raised to the full normal rate and continued until the initial charge is completed. If the temperature of the electrolyte is not allowed to exceed 98° to 100° Fah. the charging current may flow at full value. If this degree of temperature is exceded the charging cur-

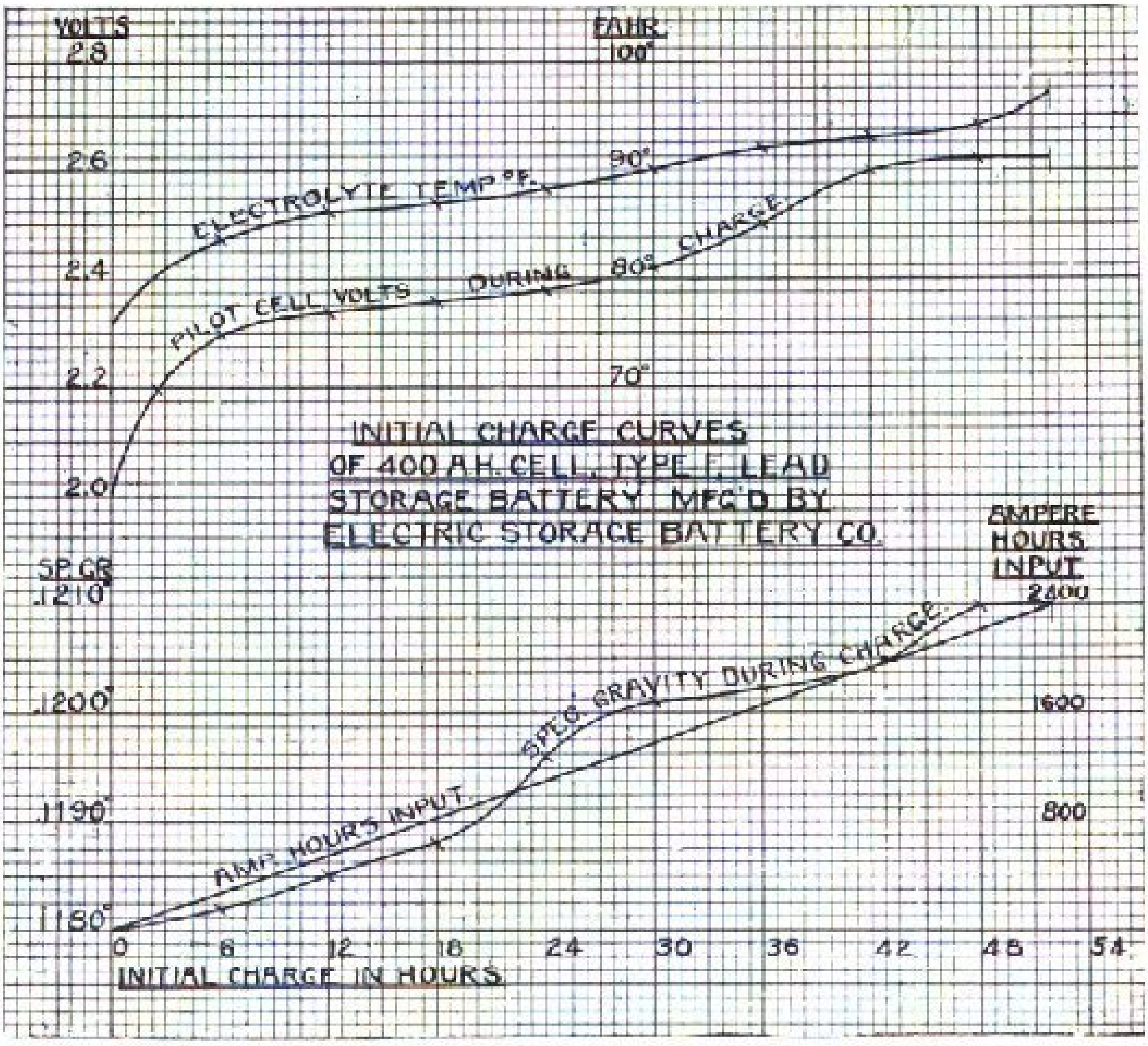


Fig. 10

rent must be reduced until the temperature falls to normal value.

The initial charge per cell is carried to 2.6 volts, and thereafter regular charges to 2.5 volts, the actual voltage varying the temperature of the electrolyte, its density, etc.

In Fig. 10 is reproduced curves showing the initial charging characteristics of an 11-cell chloride accumulator battery of 400-A. H. capacity. The curves were plotted from 30-minute readings of voltage temperature and specific gravity, the initial specific gravity being 1,210° at 70° Fah. before throwing on the charging current, which was immediately placed at 50 amperes (the normal charging rate), and, as the temperature did not exceed 100° Fah. at any time, it was continued at this rate throughout the initial charge extending over a period of 52 hours, or until 10 consecutive specific gravity readings were obtained. Also the cadium readings were taken every hour after the 40th hour, the final cadmium reading being 0.18 volts between the cadmium electrode (it being positive to the negative battery electrode), and the negative electrode of the cell. This is considered an indication that the negative plate was fully charged. The voltage read between the cadmium electrode and the battery plate was 2.42 volts, the sum of the two readings being 2.6 volts, which balanced the reading obtained across the cell, as it should.

THE CADMIUM TEST

It may be of interest to know how cadmium tests are made, for it is the most exact method in existence for ascertaining the exact condition of the plates of a storage cell.

The stick of cadmium (obtainable from any chemical or electrical supply house) is bent with a small off-set so that it may be immersed in the electrolyte at the top of the cell, placing it across the plates at the centre. It is protected from accidental short circuits by the perforated rubber tube covering it. Before taking readings with the cadmium it should be entirely immersed in the electrolyte and free from bubbles. The complete connections are shown in the diagram 9B.

Before use the cadmium stick should be soaked in water for at least 30 minutes and kept wet by immersion in a pitcher of water. While the charge is progressing, evaporation of the electrolyte will occur quite rapidly, and should be compensated for by the frequent addition of pure water sufficient to keep the level of the electrolyte above the plates at all times. Sulphuric acid need be added but once a year. The specific gravity drops considerably on starting the charge, as can be observed by inspecting the curves in Fig. 10, but it slowly rises to its original value again near the completion of the charge. As the charge progresses, the counter-electro motive force of the storage cells increases, and will cause the charging current to drop. It must be maintained to the normal value by raising the charging voltage by means of the resistance coils in series with the battery, or by

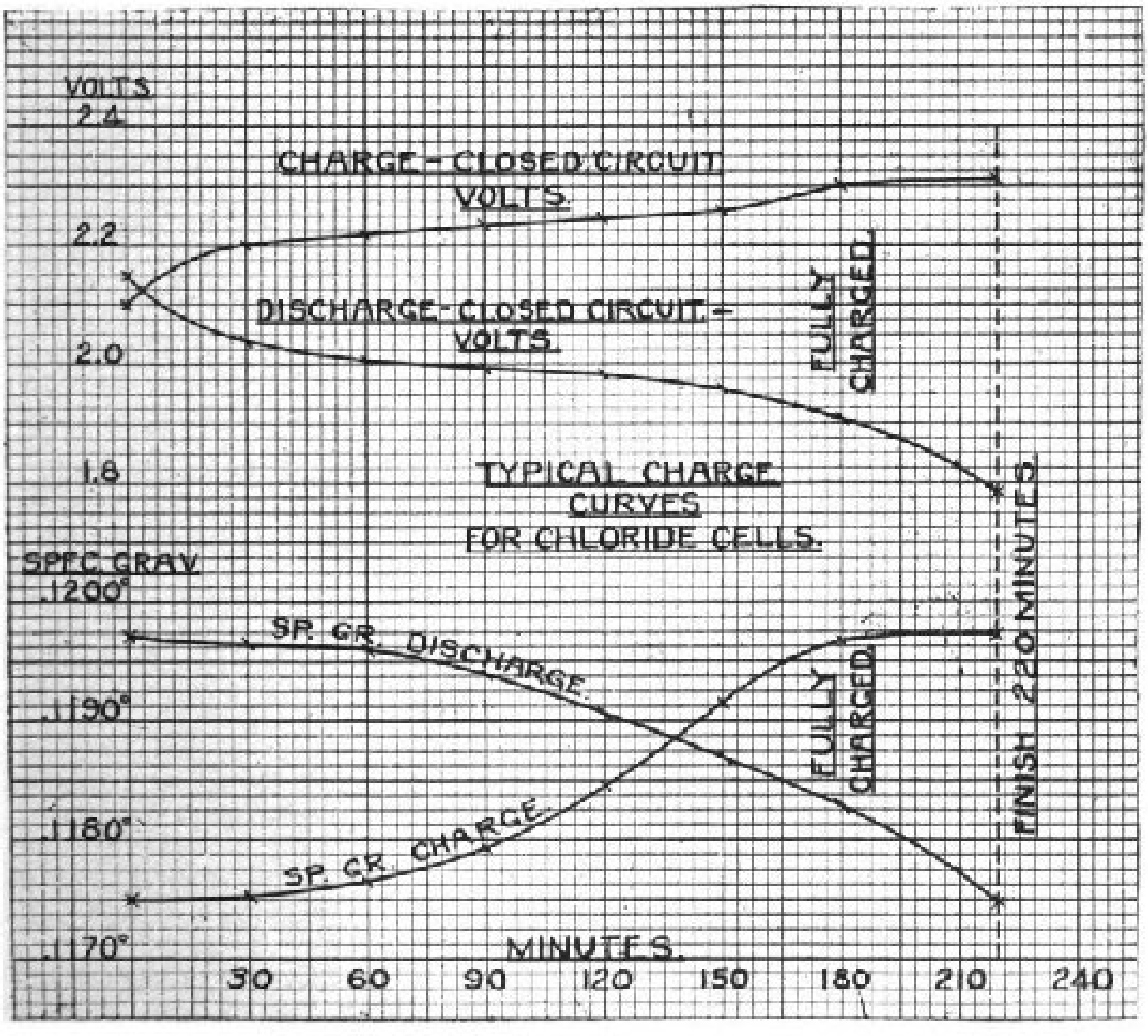


Fig. 11

variation of the field rheostat of the generator or booster.

The final indications of a complete initial charge may be summed up as follows: The specific gravity readings taken every 30 minutes should be alike for 10 consecutive readings. The cadmium and negative plate reading should indicate about 0.10 volts. The cells should all be gasing freely, the surface of the electrolyte sometimes assuming a milky appearance, caused by a multitude of fine gas bubbles. The positive plates become a dark brown in color, and the negative plates a light gray. The voltage per cell (with charging current flowing, should measure about 2.7 volts.

REGULAR MAINTENANCE

After the initial charge, the battery may be discharged at the normal or 8-hour rate, but preferably at a lower rate for the first discharge. It is the usual practice to make note of the specific gravity from time to time, and when it has dropped to a certain point, about 1.185°, the battery must be recharged. As the fall in density of the electrolyte is in direct proportion to the ampere-hours, taken out of the battery, it forms a reliable guide as to the amount of charge left in a battery.

The voltage on discharge (with current flowing, readings taken on open circuit have no practical significance) should be closely watched, and a cell should never be discharged below 1.7 volts; better 1.75 or 1.8 volts, with the exception of the one-hour rate of discharge, when the value may be 1.6 volts.

The cadmium readings for ascertaining the state of discharge are of immense value in testing for faulty plates. The cadmium readings, when taken to show the degree of the discharge, should not register higher than 00.27 volts, measured between the cadmium electrode and the negative battery plate (the cadmium is now negative to the negative plate). The cell discharge should proceed no further, regardless of the reading obtained across the cell. These readings are taken when the current is flowing.

The loss of charge in any battery standing idle on open circuit is approximately 25 per cent. in one week. A battery should not be allowed to go without a freshening charge once a week, or at least once in two weeks. A battery should always be immediately recharged after being discharged, and not allowed to stand in this condition; i. e., discharged.

The charge usually left in a battery is from 10 per cent. to 30 per cent. of the total capacity, depending on the rate of discharge. The rate of discharge bears an important relation to the capacity of the battery at that rate. For instance, a cell whose normal, or 8-hour, discharge rate is 100 amperes may be readily discharged at 400 amperes for 1 hour, but only 50 per cent. of the cells' capacity in ampere-hours is obtained at the latter rate.

The curves presented in Fig. 11 are typical ones for regular charge and discharge. The rate of discharge bears lead-sulphuric acid cells. These are plotted from actual conditions and readings, and show the rise and fall of the voltage and specific gravity at different points of the charge and discharge. It may be observed that both the voltage and specific gravity remain nearly constant near the completion of the charge; i. e., when either the specific gravity or voltage shows no tendency to increase over a period of from ½ to 1 hour.

The evaporation on regular charges, although not so excessive as on the initial charge, is considerable, and is taken care of by the addition of a little pure water, a wine glass or glass graduate being very useful.

The efficiency of storage batteries, both of the Planté or formed-plate type, and the Faure or pasted-plate type, varies greatly with the condition and maintenance of the battery, but the following results have been obtained in actual practice.

In a large-battery installation at the Edison Electric Company power station in Boston a series of careful tests disclosed an efficiency of 75 per cent. in operation.

The average output per pound weight of complete cell with the Planté type of plate is 2 to 7 watts, with the Faure type, or pasted, 8-14 watts.

IN THE SERVICE

SHORE-TO-SHIP DIVISION

If you happen to be born on the only side which takes cognizance of the Mason and Dixon line it is inevitable that your boyhood hours will be filled with tales of valor of the days of the Confederacy. Particularly is this true of Petersburg, Va., where Charles Jackson Pannill, superintendent Southern Division of the Marconi Company, first saw the light o' day. Thus it is not surprising to learn that at the tender age of nineteen years he discarded a legal career and enlisted in the navy for the Spanish-American war. Early knowledge of telegraphy gleaned from a clothes line circuit to other boys' houses, and later experience in Western Union offices, stood him in good stead and secured for him full charge of the telegraph end of the U. S. Coast Signal Service, operating observation stations between Norfolk, Va., and Wilmington, N. C.

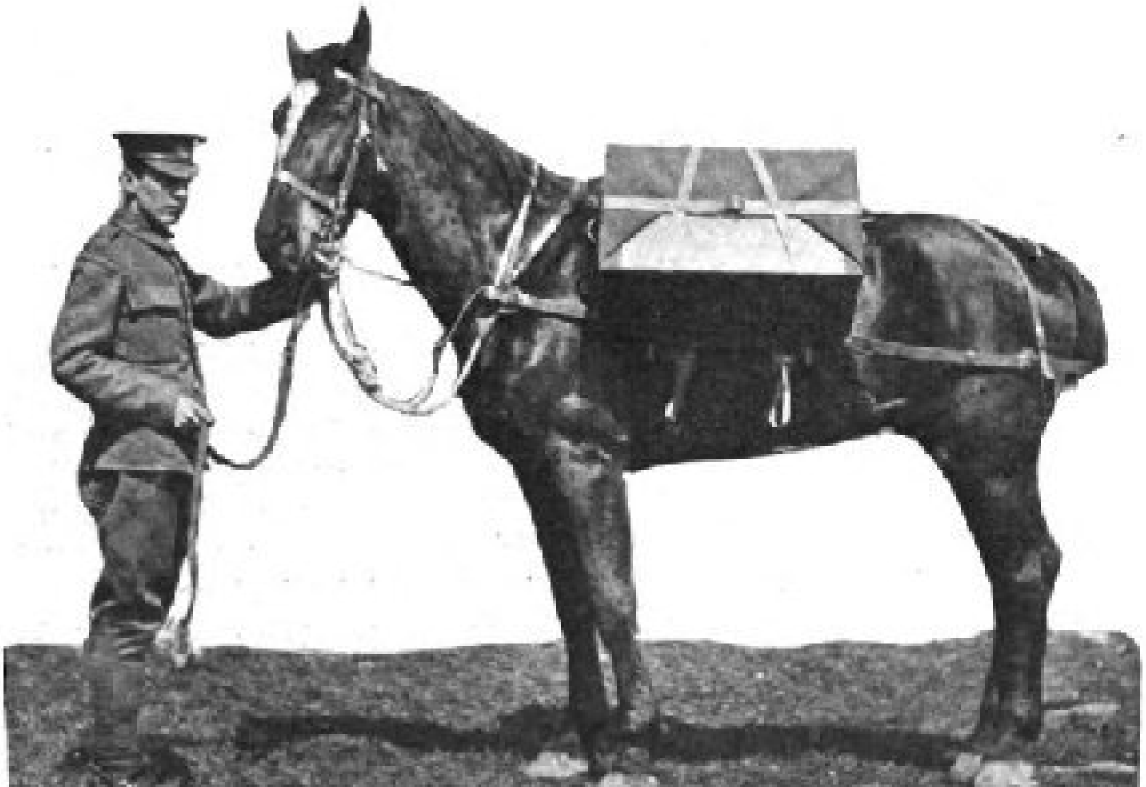
Soon afterward his activities centered about the Norfolk Navy Yard, where he became clerk to the commandant and was given full charge of the government telegraph wires. The reports of Marconi's early experiments drifted in here and Pannill became an omniverous reader on wireless subjects. He was all wrapped up in the possibilities of the art when, in 1902, he had an opportunity to join Professor Fessenden at the experimental station raised at Old Point, Va. This was his first employment in the wireless field and his services were recognized by the princely stipend of $50 per month, out of which he had to pay $35 for board and lodging.

The experiments conducted by this station were made with Ocean View, Va., four miles across Hampton Roads. Pannill's duties involved anything from constructing and operating stations to research work in the laboratory or serving as expert demonstrator in naval tests. He was a very busy person in those early days of wireless, installing apparatus on numerous war vessels, equipping the Brooklyn Navy Yard and Navesink Highlands for the navy, conducting tests at Fort Schuyler and Fort Wright for the army, besides building stations at Lynn and Schenectady for the General Electric Company. These activities were followed by a year at Brant Rock, when he assisted in that station's construction and equipment, took charge of the operating and assisted the experimental engineers. Among other distinctions Pannill can claim are those of being appointed chief of the first expedition to install wireless stations along the Amazon River and the pioneer in the Great Lakes district, from which it may readily be imagined that this man knows a thing or two about commercial wireless.

He maintains that wireless is still in its infancy, that, commercially, the surface has only been scratched. This being so, one wonders after noting the Southern Division's progress in the past five years just when Pannill will find time to eat and sleep in the future with the growth continuing as in the past.

Marconi Field Sets

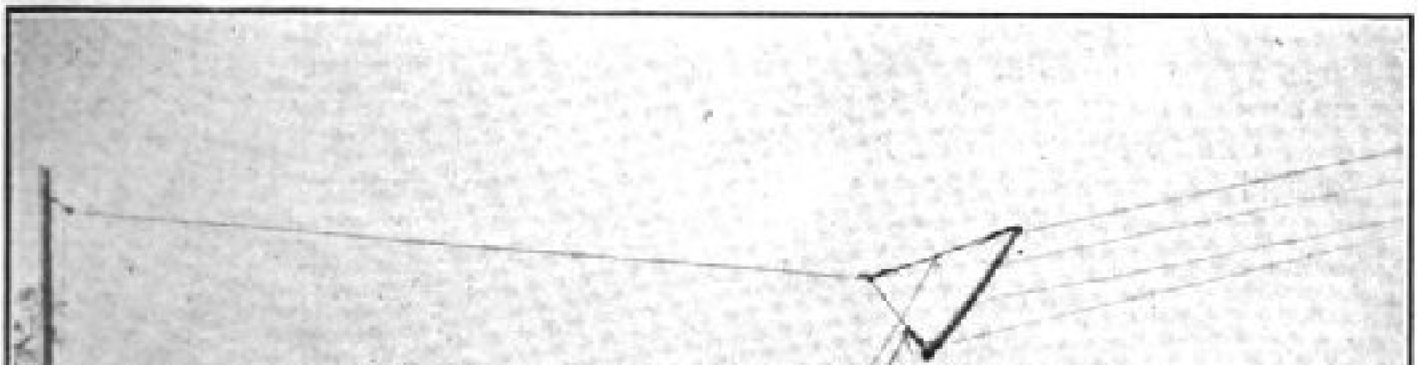
England's King and Queen inspecting an automobile equipment



How the various parts of the cavalry sets are carried

Used in the War

Servian Signal Corps making camp on the march



British Territorials receiving instruction in wireless operation

From and For those who help themselves

Experimenters' Experiences.

FIRST PRIZE, TEN DOLLARS

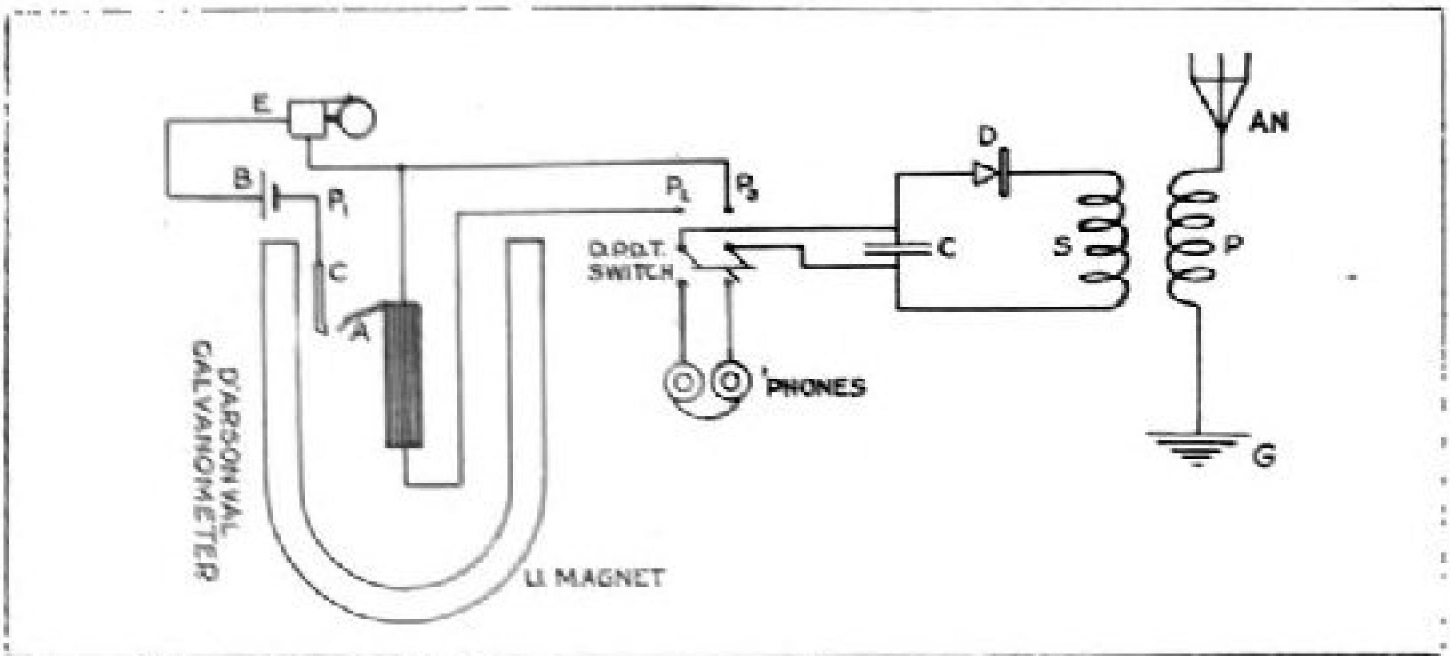
A Radio Call System

The only call bell system, generally known to the amateur wireless experimenter, is the coherer, which is not as satisfactory as it might be because it cannot be readily used in conjunction with the modern receiving sets. I have devised a simple system which gives very good results. The apparatus has been tested up to a distance of one hundred miles.

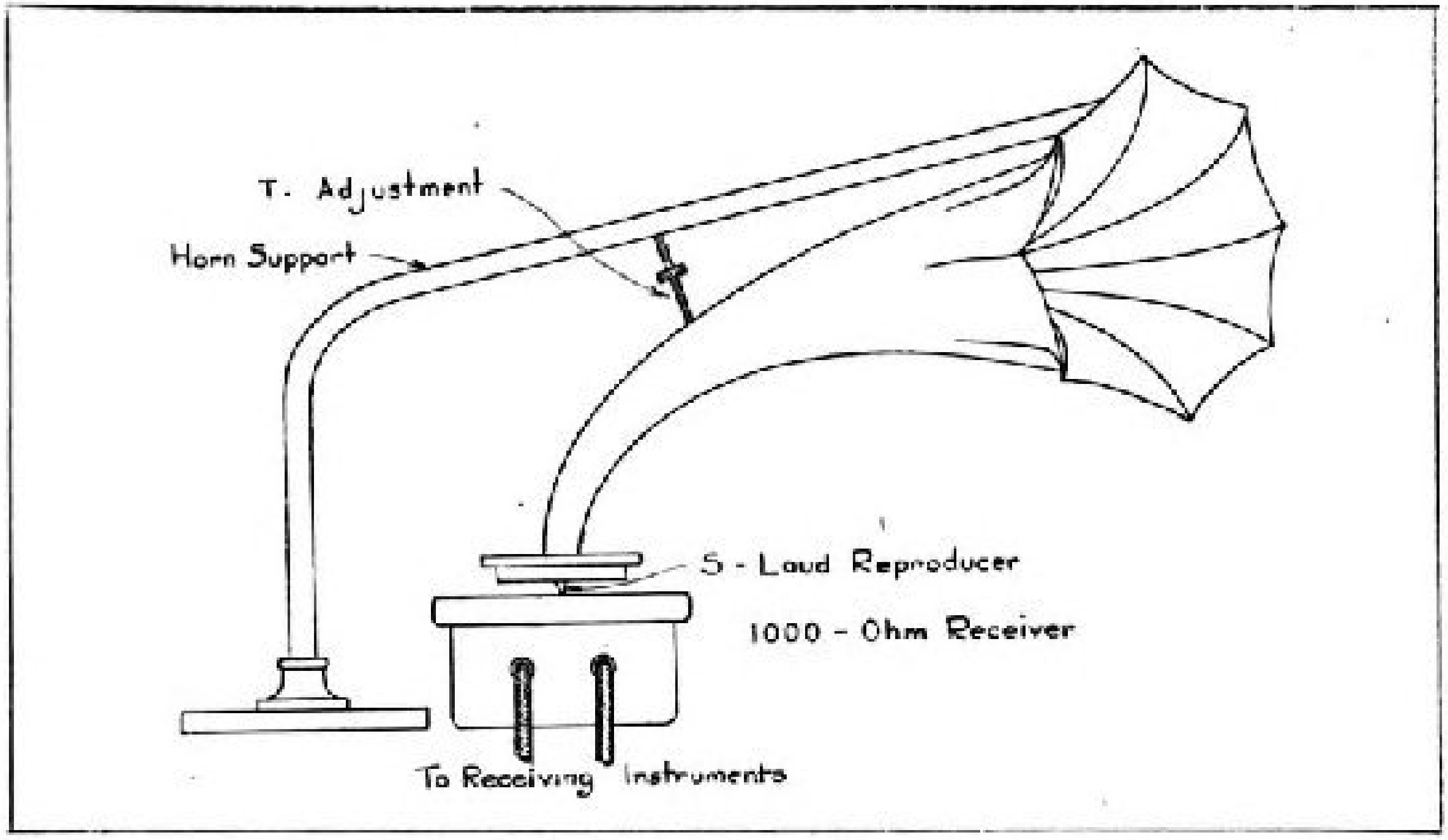
The only piece of apparatus to be used in this system, which is not usually found in the amateur station, is a D'Arsonval galvanometer. This, of course, can be constructed by the experimenter, but should if possible be a commercial instrument. The galvanometer is an instrument for measuring continuous electric currents. I shall not describe it in this article, but a detailed description of it will be found in any complete electrical book.

The first step to be taken in assembling the apparatus is to affix to the galvanometer a small contact, C, a little to one side of the middle of the scale and insulated from the rest of the instrument, as shown in the accompanying diagram. An insulated copper wire is taken from this contact to a binding post, P1, on the exterior of the instrument. Next the two ends of the revolving coil of the galvanometer, P2 and P3, are connected through the medium of the D.P.D.T. switch, in the receiving circuit in place of the regular telephone receivers. By throwing the switch to one side the galvanometer is put in circuit and the phones are cut out; and in the opposite direction the phones are placed in circuit and the galvanometer is disconnected.

The remaining operation is to connect up the bell circuit, as follows: to



Diagram, First Prize Article



Drawing, Second Prize Article

the binding post, P I, connect one pole of the battery, B, the other pole of which is connected to the electric bell, E, and the circuit is completed through E to the pointer, A.

It should be noted that this system can be used only on a receiving circuit using detectors such as galena or silicon, which do not employ a local battery to operate them.

The operation of the apparatus is quite simple: A calling station makes a long dash, which causes a current to be passed through the galvanometer, moving the pointer, A, into contact with C, which closes the bell circuit, P A B E, thereby ringing the bell.

If when the apparatus is first put into operation, the pointer, A, swings away from the contact C, instead of towards it, the current is flowing through the galvanometer in the wrong dicertion. To rectify this, merely reverse the connections, P2 and P3.

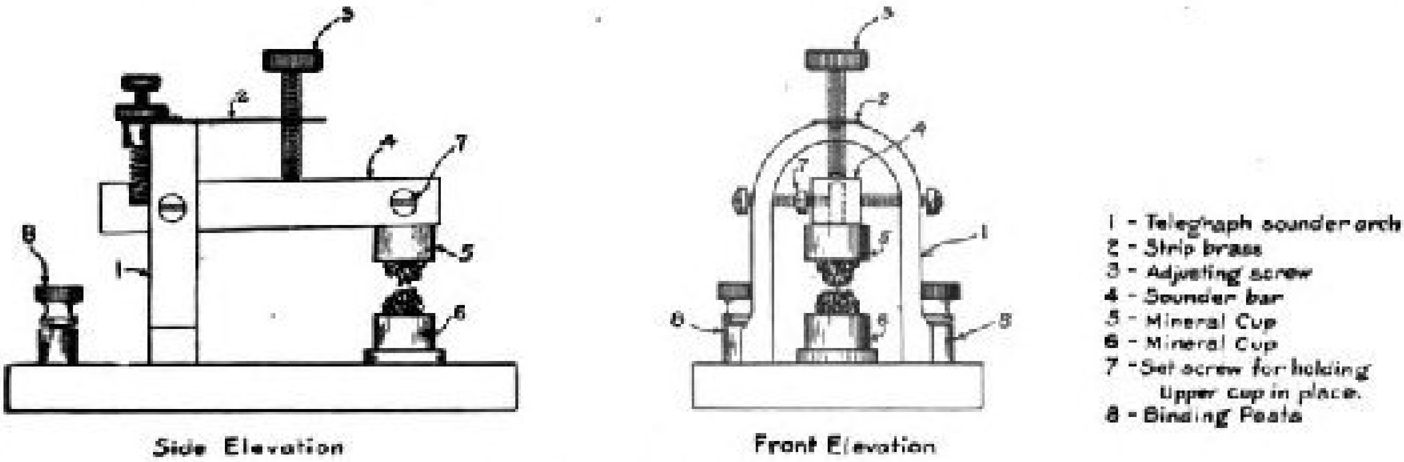
Ralph E. Henry, California.

Note.—We are of the opinion that this device would give more practical results if used in the local circuit of an audion, where more energy is available for its operation. It should, of course, be understood that the device is too sluggish in action to record individually the dots and dashes of Morse signals.—Technical Editor.

SECOND PRIZE, FIVE DOLLARS SIGNALS

Loud Reproduction of Wireless

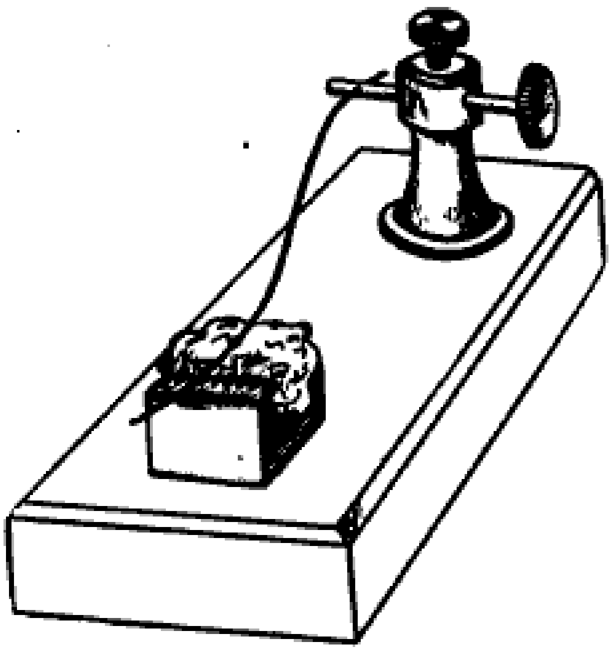
Many wireless experimenters try different forms of apparatus in an effort



Drawing, Third Prize Article

to increase the audibility of incoming wireless signals.

Though I believe the method I am about to describe to be original with



Drawing, Fourth Prize Article

myself, it may not be new to some. It should, however, be of interest to all experimenters. The accompanying drawing is self-explanatory. The only apparatus required is a good wireless receiver, a loud phonograph reproducer with a needle soldered to the point (if the one one it is not long enough) and a horn. The horn and reproducer from an Edison phonograph will prove satisfactory. The needle, S, is mounted so it presses gently against the center of the receiver diaphragm. The tension of the needle upon the diaphragm is regulated by the thumbscrew and spring at T. The tone of the signals may be changed by altering the adjustment of the thumbscrew, the highest pitches being obtained when the pressure of the needle upon the diaphragm is very light.

When a wireless signal is being received it causes the receiver diaphragm to vibrate. This vibration is transmitted through the needle to the sounding disc of the reproducer and then to the open air. The head phones are not really necessary if this device is properly adjusted, as the horn may be directed to the operator's ear.

Fred N. Ludwig, Iowa.

THIRD PRIZE, THREE DOLLARS

A Unique Receiving Detector

I recently constructed a receiving detector stand from a 4-ohm telephone sounder which I had in my scrap box.

I drilled the support, as shown in the accompanying drawing (1) and fastened a piece of spring brass (2) and fitted it with an adjusting screw (3); the mineral cup (5) is attached to the lever of the telegraph sounder in any convenient manner. Both mineral cups (5 and 6) are the brass cups taken from cracked or broken automobile spark plugs. The minerals are held in place by any soft metal such as Wood's metal.

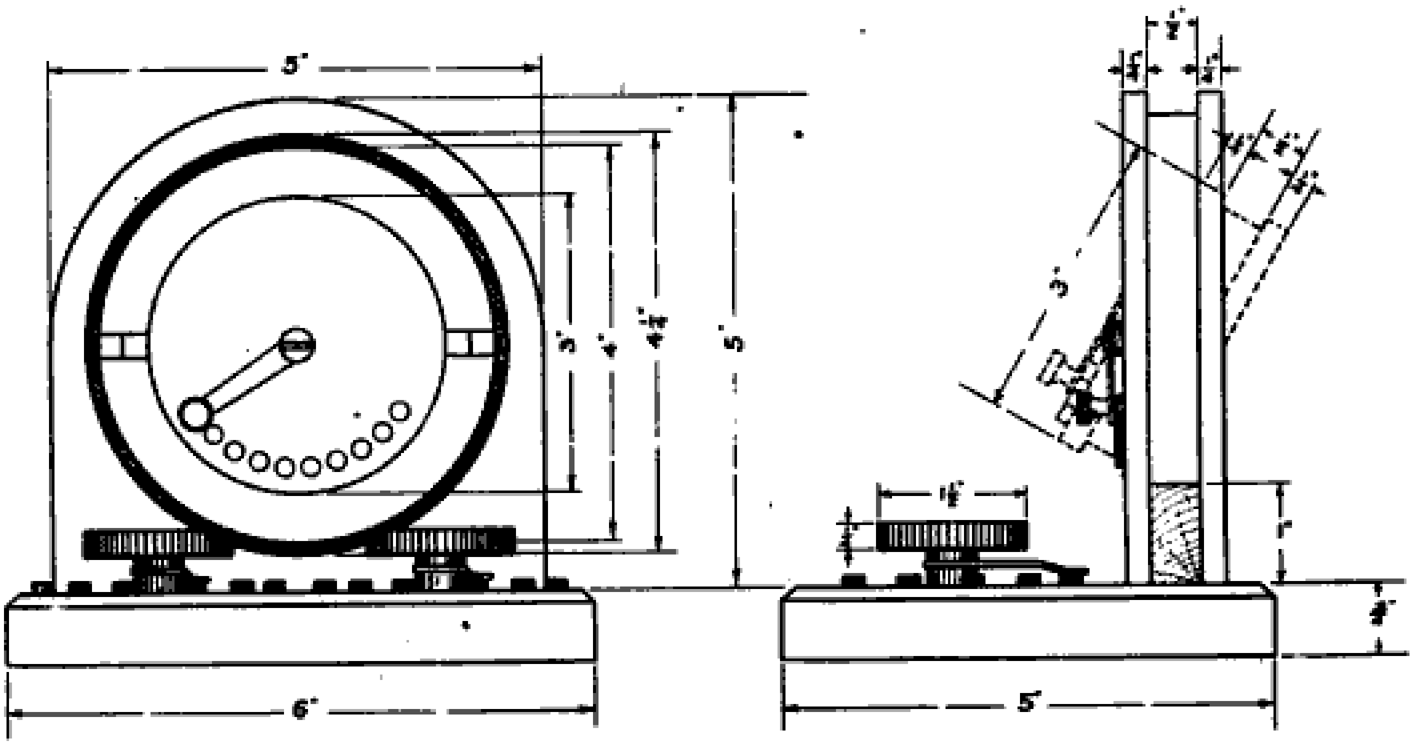


Fig. 1, Honorable Mention Article, Thomas W. Benson

The tension of the sounder bar is readily adjusted by the spring as shown in the accompanying diagram. I have two detectors of this type in use, one employing carborundum and the other silicon as a rectifier.

R. R. FERRIS, Michigan.

Note.—If the magnets of the sounder had been left in position, also the soft iron armature strip, a current of electricity could be supplied to the magnets in connection with an adjustable rheostat and the amount of tension could be very finely adjusted by a variation of the current flowing through the sounder magnets. Then when the amateur desires to transmit and wishes to protect his receiving detector he simply opens up the battery circuit, which allows the minerals to separate, thereby protecting them during the period of transmission. This is only offered by way of suggestion.—Technical Editor.

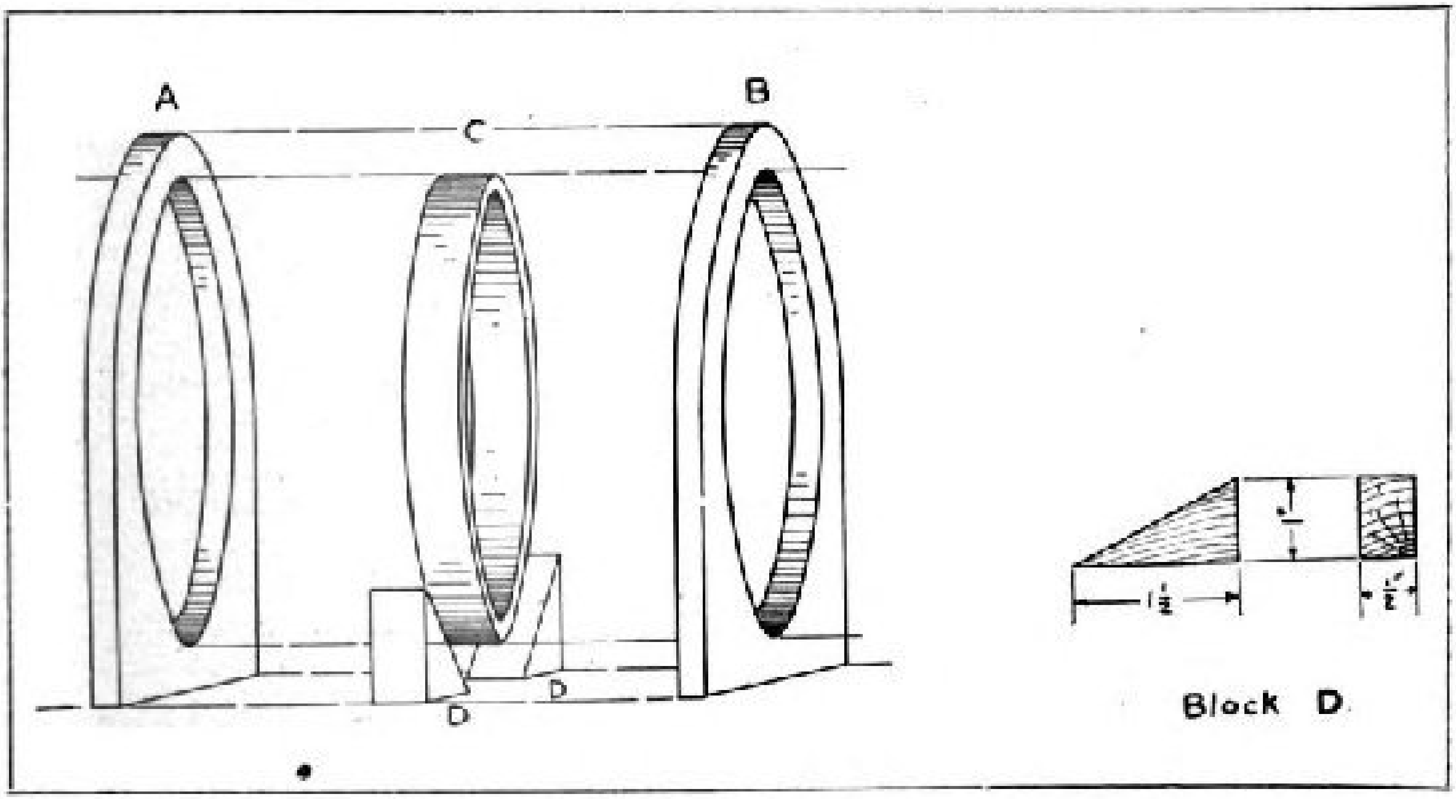


Fig. 2, Honorable Mention Article, Thomas W. Benson

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

The Silicon "Cat-Whisker"

In this article no attempt is made to describe anything new or novel. It is more in the line of an appreciation of a piece of wireless apparatus that in the writer's opinion is not as popular as it should be. Reference is made to the silicon cat-whisker detector.

It is undoubtedly true that many a beginner in wireless work has given up in disgust because of detector trouble. It is the bane of all, from the beginner clear through to the experienced commercial operator, who has to call for a repeat because his detector has failed.

It was just such trouble as this, and the outcome, that induced the writing of the article. At the beginning of experiments, detector bothers were at once encountered, and to get away from them nearly every type of detector was tried, with the exception of the audion. They were all about alike in their failure to hold their adjustment, which was difficult to establish. Finally the cat-whisker was tried, and that ended the detector hunt. During four years of use it has been compared with many others, but has always held its own, and more. Of the several experimenters that have been induced to try it, not one has discarded it, which is surely a recommendation.

In referring to the cat-whisker reference is made not to the kind wherein the end of the wire whisker is used, but the side of it. That is, where the side of the whisker is in contact with the crystal as per the accompanying drawing.

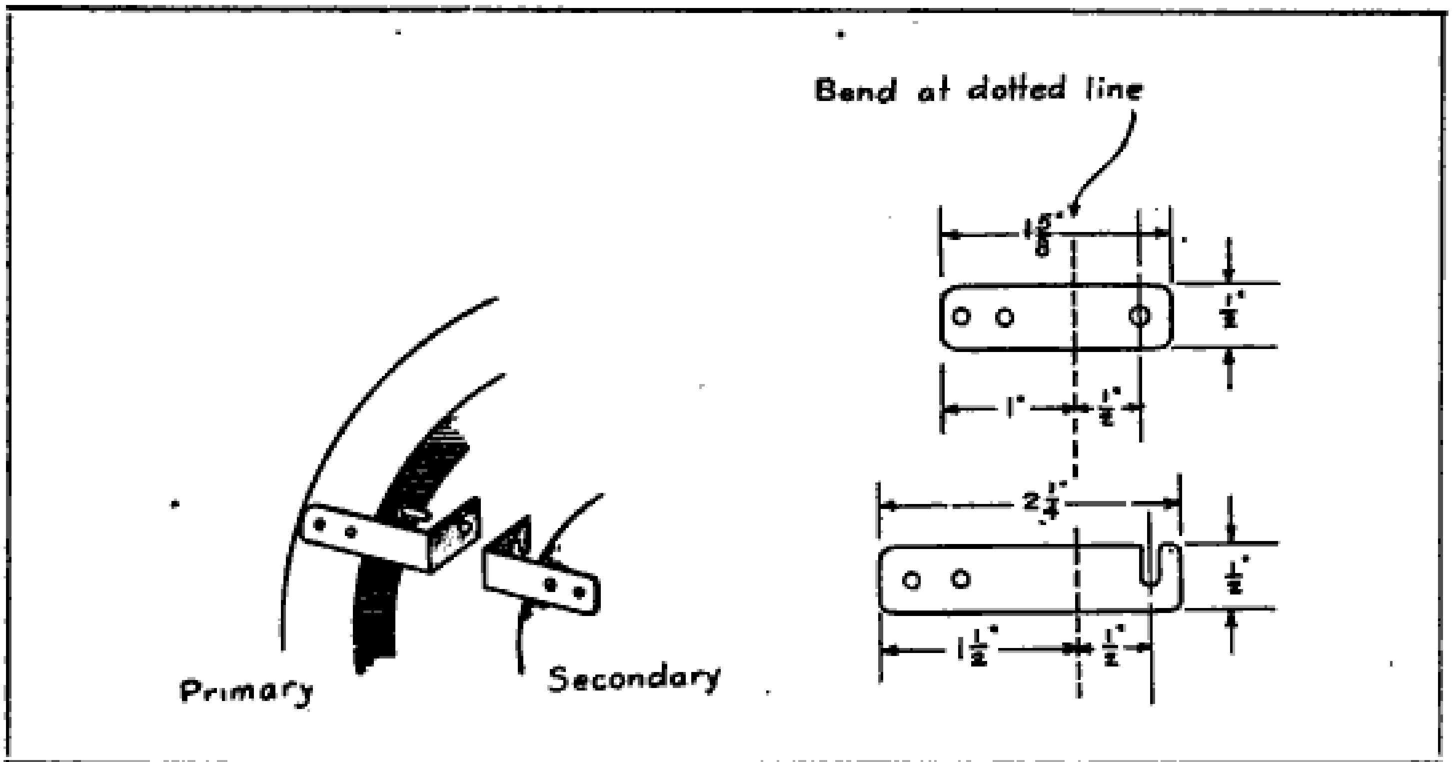


Fig. 3, Details of bearings for secondary, Honorable Mention Article, Thomas W. Benson

Among the many advantages of this device is its extreme simplicity of construction, its essential parts being a standard for the whisker, a holder for the crystal, and a short length of E violin string. The violin string is perfectly suited to this work, and nothing will surpass it. It should extend from 2½ to 3 inches from where it is supported, to where it makes contact with the crystal, and should project about ½ inch past the crystal, the projection being used for making adjustments. In using silicon, or other crystals, with this detector, remember that the edge of the crystal should be as thin and sharp as possible.

If properly used this detector, using silicon, is as sensitive as any crystal detector in use. But its greatest advantage is its ease of adjustment. In fact, it can be adjusted almost instantaneously, it only being necessary to raise the whisker and let it spring back until you get the desired result, once or twice being generally sufficient. It is possible to adjust an untried crystal in five seconds, or to adjust while taking a message without losing more than a letter or two.

To sum up, its advantages are: It is easy to construct, the cost is almost nothing, lends itself to any construction, is very sensitive, and in short is THE detector.

Hats off to the silicon cat-whisker!

Leslie Long, Oregon.

HONORABLE MENTION

A New Rotary Tuner

In the fall a young man's Fancy
Quickly turns to thoughts of Wireless.

I write the above with all apologies to the author, whoever he may be, because the amateur at this time of the year is beginning to look for data on improved apparatus to put in his set for the coming season of ether jamming. They are all trying to increase

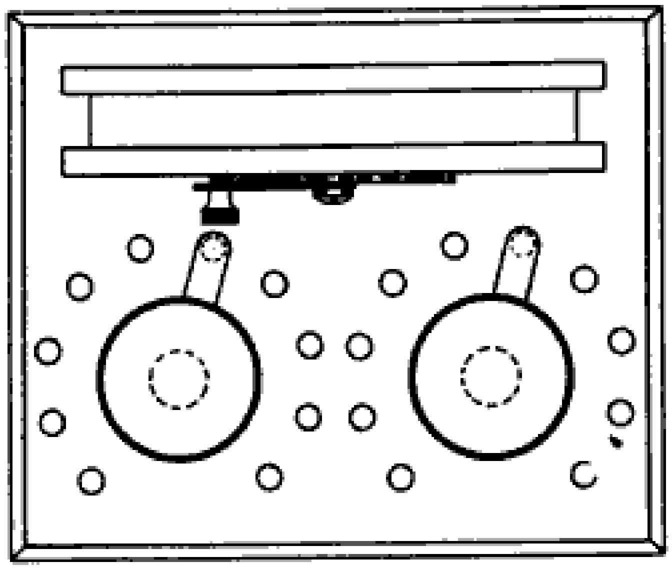


Fig. 4, Top view of tuner, Honorable Mention Article, Thomas W. Benson their selectivity and to that end will adopt a rotary tuner, as they combine great selectivity with ease of operation, and when using tapped winding are the acme of perfection which the owners of modern amateur sets are all striving to reach.

I have looked the field over pretty well and found numerous instructions for constructing rotary tuners, but all are hard of construction or possess the disadvantage of requiring numerous metal parts, or have a poor appearance. I therefore set to work and designed one for myself and with such success that I will describe it more or less in detail so others may profit from my endeavors in this line.

The primary winding consists of 110 turns of No. 24 S. C. C. wire. Take a tap from every turn for the first ten turns and then a tap from every ten turns until 100 more turns are wound on. In making these taps do not make a loop long enough to reach to the switch points; make a small one and solder a piece of stranded wire to them to reach to the contacts. The blocks may now be put in place and a base made of the dimensions shown. The layout of the base is not given, as many will no doubt prefer to incorporate this tuner in a cabinet or panel set.

After mounting the tuner and connecting to the switches we come to the construction of the secondary and its supports. (Fig. 3.) The latter are made from strips of 1/16 inch spring brass, cut, drilled and bent according to drawing. The shorter ones are fastened to the primary and the longer slotted ones to the secondary.

STATION RECORD

Sending Op'r.: ____________ LICENCE No. ____________ Time: ____________

Receiving Op'r.: ____________ Date: ____________

STATION RECEIVED										RECEIVING STATION												
																	Audion Det.					
Call	Location	KW.	Wave	G	C	A	Dist'ce	Land	Water	Sta. Cld.	Coup.	L_1	L_2	L_3	C_1	C_2	E_1	E_2	R_1	L	R	W per M.
NAX	Panama (Colon)	25	2200	✓	-	-	2200	1/4	3/4	NAR	MAX	8	20	15	–	110	9	6	18	-	✓	11.36

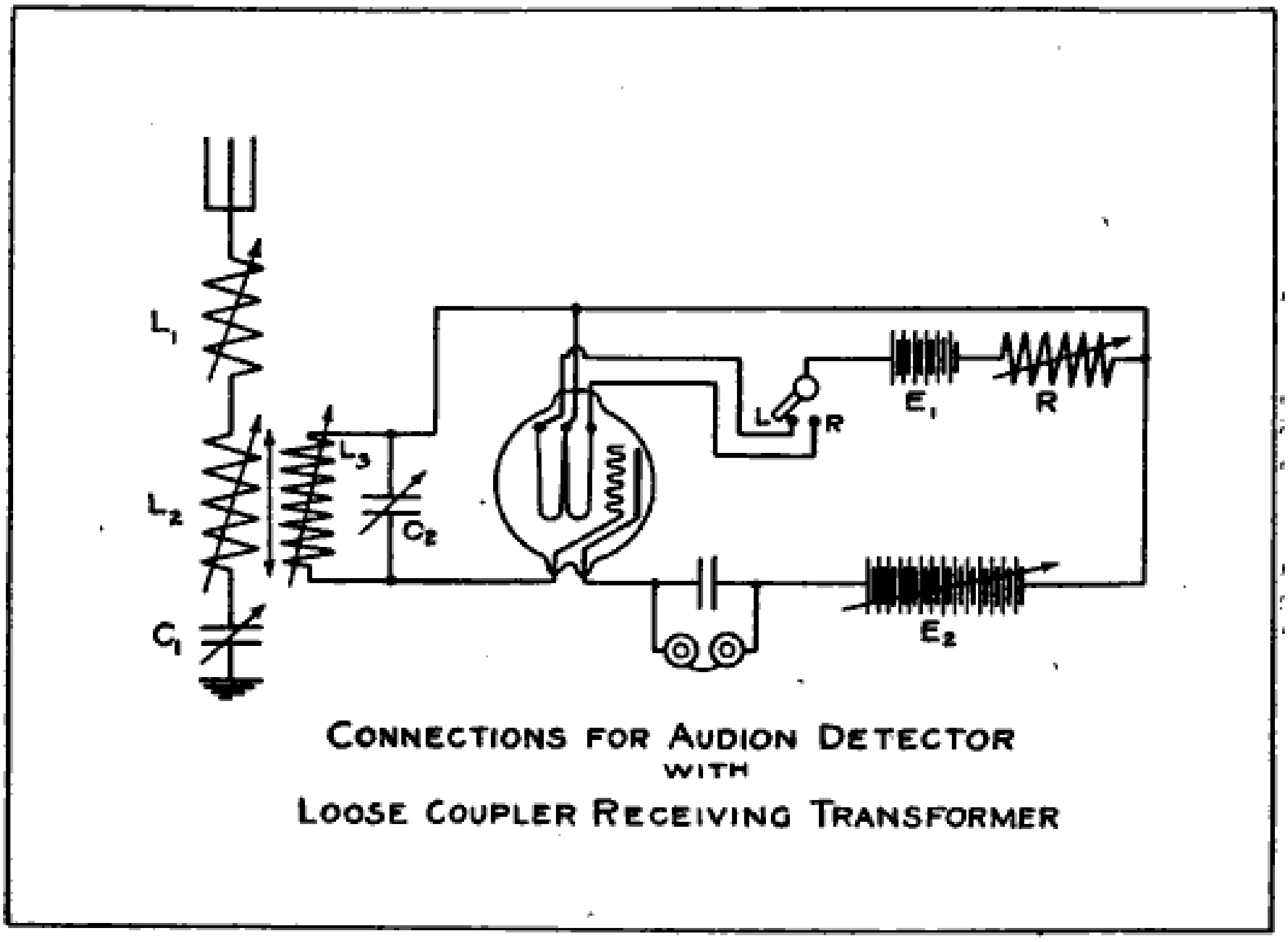
Table, Honorable Mention Article, L. R. Jewett

In Fig. 1 is shown the front and side views of the apparatus and gives a good idea of its appearance. The primary is shown in parts in Fig. 2. The end pieces are cut from wood ¼ inch thick; the dimensions are given in the drawing, and by looking carefully you will be able to see how the wood is to be marked off for cutting. The tube, C, is made from a strip of fiber ⅛ inch thick and 1 inch wide, which is steamed and then wrapped around a form 4 inches in diameter.

Two small blocks of wood are placed between the heads to hold them the proper distance apart. The dimensions of these are also given in the figure. The tube is inserted in the heads and the wire wound on before these blocks are glued in place. Use glue for holding the tubes in the heads as well as the blocks and avoid the use of iron in any part of the construction.

The secondary is made from a disc of soft wood ½ inch thick and 3¼ inches in diameter with a 3-inch disc of ¼-inch stock glued on both sides. It is advisable to lay out the ten-point switch and mount it before you glue that side to the smaller disc and leave the leads from the contacts extending about 1 inch so the taps from the winding may be easily soldered on.

The winding of the secondary consists, for ordinary work, of 150 turns of No. 28 S. S. wire tapped every 15 turns. In winding this coil don't wind is evenly, as the condenser effect will thereby be increased and thus destroy



Diagram, Honorable Mention Article, L. R. Jewett

the selectivity. This fact should also be kept in mind when winding the primary coil. The two wires from the secondary are each connected to one of the two brass bearings. The constructor is expected to use his own discretion as to the position of the binding posts.

The instrument is assembled. by hooking the slots in the strips on the secondary over the head of the small bolt run through the hole in the strips on the primary and is now ready for use. (Fig. 4.)

As described, this tuner will "tune up" to 1,500 meters which is sufficient for regular work; when longer waves are to be received a loading coil is connected in primary circuit and a secondary with more turns should be hooked into position. By making an extra secondary with twice the number of turns you will be able to tune to approximately 2,500 meters.

It is very apparent that with this coupler the flexibility of the set can be increased, as another secondary may be slipped into place in an instant. I would like to say that advantage can be taken of this fact to construct a tuner with no dead ends. This is done by using inductances of fixed value. I find, however, that two secondaries of the size mentioned do not have any noticeable "dead end" effect if they are wound as unevenly as possible. Another important advantage is that inductance can be changed at the same time the coupling is altered, an advantage not found in other rotary tuners.

Take my advice and search no further for data on couplers, but build one like this and learn to handle it and copy the fellow's you could not get last year.

THOMAS W. BENSON, Pennsylvania.

HONORABLE MENTION

Tabulating Station Records

The object of the following article is to suggest a method to tabulate in some systematic and logical manner the characteristics of a wireless message received over a long distance or simply good work on the receiving end. Sometimes an operator receives a message over an exceptional long distance proportional to the power used. At the transmitting station perhaps the signals are very faint and his instruments are set to the very finest precision. Later he may desire to receive that station again, but cannot do so often, due to inaccurate adjustment of his instruments to produce a perfect condition of resonance with that station. If, however, the characteristics of that station are tabulated, he can easily set his instruments again as before by referring to the "table."

If these records are kept on a long sheet or a series of sheets, they are handy for further personal use or of value to a competitive friend on long distance. The arrangements and characteristics used in this table are optional and vary with each station.

The license number should be conspicuous so as to show that the station is licensed by the government.

The time and date should be recorded as security against any argument as to the genuineness of the message. The writer has often written to a station received to prove that the message was genuine. The sending operator might be known to the receiving operator and these facts might be useful.

After the call has been received the location and power (k.w.) may be obtained by means of the call-book. The wave length can sometimes be determined by a calibrated receiving instrument or wave-meter, but the call-book will no doubt give the necessary figure. G, C, and A signify whether the station is government, commercial or amateur. However, this information may be ascertained generally by the first letter of the call.

Every modern wireless station should have a large map of the world so as to measure the distance covered by any received message. Whether the message is over land or water or both is an important factor because it is universally understood that a greater distance may be reached over water than land.

If the station called is not the receiving station, then it is desirable to record this fact. The coupling might be useful to set the instruments for maximum strength of signals. Sometimes a station cannot be heard at all if the movable coil of the transformer is moved from its original position in either direction a distance of ½ inch due to a "sharp" wave. A suggestion is to attach a graduated scale to the movable coil and arrange a pointer that indicates its position in relation to the stationary coil or vice versa. The scale should consist of a series of equally numbered parts so that any position of the movable coil may easily be found by reference to the number in the table.

The letter L is used universally as the symbol of inductance. L_1 may be used as the amount of inductance in the loading coil when it is used for a long wave and L_2 as the inductance in the primary of the receiving transformer. If slides are used a graduated scale may be attached to the slider and used as explained before. In case the better method of using a switch arm and a series of contacts is used, the contacts may easily be numbered. L_3 signifies the amount of inductance in the secondary coil of the receiving transformer. The number may be obtained as explained above.

C is the symbol for electrical capacity, generally applying to the capacity of a condenser. C_1 is used for the condenser connected in series with the primary of the receiving transformer and the ground. It is only used when receiving short waves or when the natural period of the autemna is greater than the wave length one desires to receive. This condenser should be variable.

C_2 is for the variable condenser shunted across the secondary of the receiving-transformer. This is mostly used for interference, but is also used to balance the circuit when long waves are received. If the condenser is of the rotary type, a scale in the form of a protractor is used, indicating the number of degrees for any given position. If the condenser is of the plate type, a scale may be attached as suggested before.

(*Continued on page* 81)

Reker, Hero of the Admiral Sampson

The Story of the Wireless Operator who Sacrificed His Life to Live up to His Ideals of Duty

THE name of W. E. Reker has been added to the list of Marconi men who died as heroes. He was senior wireless operator on the steamship Admiral Sampson, which sank off Point-no-Point, near Seattle, Wash., after coming into collision with the Princess Victoria, resulting in the loss of eight lives. While the Sampson was foundering he made his way to the captain on the bridge, preferring to share whatever fate overtook his commander rather than seek safety by leaving the doomed craft. And on the vessel he remained, even as the waters claimed the ship for their own.

Not less praiseworthy was the conduct of H. F. Wiehr, junior Marconi operator on the Sampson. He stayed on the vessel until the last, finally being compelled to jump over the side. He was picked up by one of the lifeboats.

The Sampson, owned by the Pacific Alaska Navigation Company, was feeling her way carefully along her course soon before five o'clock on the morning of August 25. The majority of the passengers were asleep in their berths, but some, aroused by the siren, had come on deck. The Princess Victoria, of the Canadian Pacific line, was also making her way through the fog in much the same cautious manner as the Sampson.

The fog whistles on both vessels were sounded continuously, according to reports of the accident, but the thick mist blanketed the warnings. Neither ship was steaming faster than approximately three miles an hour when the crash occurred. The Victoria rammed the Sampson, a steel vessel, directly on a line with the after hatch, cut three-fourths of the way through her and opened a 12-foot gash in the steel plates of the former, in which the cover of the Sampson's after hatch was still jammed when the Canadian Pacific liner arrived in Seattle with the survivors.

With the impact the Sampson began to fill, and the captain of the Victoria, realizing the danger of the doomed ship, rang for slow speed ahead and kept the bow of the Victoria jammed in the gaping wound. The vessels were so close together that the majority of the Sampson's passengers were able to climb on board the Victoria. The bow of the Victoria entered the side of the Sampson at a point where a considerable quantity of fuel oil was stored and crushed several large containers. They were set ablaze and in an instant both vessels were enveloped in flames. For a time it seemed as if both the Victoria and the Sampson would be destroyed by fire. The Victoria, however, soon backed away and stood by to pick up the passengers that were being lowered to the water in boats. When the Victoria backed away the gap in the Sampson's side was left uncovered and the latter began to settle. She went to the bottom four minutes after she was struck.

In the meantime the wireless operator on the Victoria had not been idle. He sent out an S O S call which was picked up at the Marconi station at Seattle by A. E. Wolf, and established communication with the steamship Admiral Watson. The first information that came by wireless was to the effect that the Sampson and Victoria were in collision. Then came a marconigram saying that the Sampson had gone to the bottom. The Unalga left Port Townsend when news of the accident was received and began a search for bodies. Among the victims of the accident was Z. M. Moore, captain of the Sampson. Only two passengers out of a total of fifty-four lost their lives.

Operator Wiehr, who was on duty when the collision occurred, immediately awakened Reker. The latter had every opportunity of finding a way to safety with the remainder of the survivors. Wiehr last saw the senior operator a minute before the Sampson sank. At that time Reker was leaving the social hall. Reker was seen on the bridge with Captain Z. M. Moore of the Sampson a few minutes previously. The senior operator did not possess a life preserver and was unable to swim.

The Marconi Wireless Telegraph Company of America sent the following letter to Theodore Reker, father of the operator:

"Mr. Theodore Reker, 3508 Sixteenth Street, San Francisco, Cal.

"Dear Mr. Reker: Now that the first shock of your bereavement has passed, this company ventures to extend to you some measure of its appreciation of the noble devotion to duty shown by your son, the senior Marconi operator on the Admiral Sampson, who calmly and heroically went down with the ship he had served so well.

"Our official reports show that as the vessel was sinking he made his way to the bridge to report to his captain, deliberately ignoring opportunities of securing safety with the passengers and thinking only of his duty as a ship's officer. It is evident that had he so chosen he might have saved his own life, for he was off duty and asleep at the time of collision, and the wireless appeal for aid to the sinking vessel had already been answered. That he further upheld the Marconi tradition and sought instead his post by the side of the commanding officer makes his record an immortal one with those who have courageously gone to death in the simple discharge of duty.

"Your son was one of our most valued employees, a thoroughly reliable and efficient operator, held in high esteem by fellow workers and his superior officers. Appreciation of his ability was expressed many times during the period he was in our service; in fact, on the very evening prior to the disaster Captain Moore of the Admiral Sampson praised him highly to Superintendent Irwin and expressed the wish that this company would not transfer him while the captain was in command.

"We sincerely share your grief that so promising a career should have been brought to such an untimely end and seek what small consolation there is in the thought that the great voyage on which he has embarked will be more glorious than the fateful one which took him from us and from you."

W. E. Reker was born in St. Paul, Minn., twenty years ago. He entered the Marconi service eighteen months ago and had been detailed at various times on the steamships Dirigo, Dorax and Admiral Sampson.

Wiehr reported that there was absolutely no necessity for using the wireless apparatus of the Sampson because when she struck he could hear the operator of the Victoria communicating with ship and shore. He assisted several passengers in adjusting life belts and took charge of a three-year-old boy. When the Sampson was about to be engulfed by the waters he was compelled to throw himself over the side. He was drawn down by the suction of the sinking vessel and when he came to the surface seized a bit of floating wreckage. He clung to this until one of the lifeboats reached him.

George S. De Sousa, traffic manager of the Marconi Company, sent the following letter to Wiehr:

"Dear Mr. Wiehr: According to the reports I have received concerning the loss of the SS. Admiral Sampson, you conducted yourself well, and I wish to extend to you a word of appreciation for faithful service nobly performed under trying conditions.

"Facing death fearlessly in the line of duty has become a tradition among Marconi operators, but your consideration for the safety of passengers when your official duties had been discharged showed a high courage that will live long as an inspiration to your fellow workers.

"We treasure the thought that actions such as yours have been performed in the service of this company and that we have in your case an instance of exceptional devotion to duty in the cause of humanity.

"I am happy your life has been spared and I trust that you will continue to enjoy and merit success in our service."

Marconi Men

The Gossip of the Divisions

Eastern Division

E. N. Pickerill, the first man in the Marconi service to receive the new Commercial License, Extra First Grade, sailed September 12 on the Kroonland to Liverpool and Antwerp. Pickerill's license is No. 1. The Kroonland has been sent to the assistance of American refugees, who no doubt will have no fears for safety when they see that certificate of ultra-efficiency in operating. Pickerill says it represents passing an examination lasting three full days, copying thirty words a minute in Continental, twenty-five in Morse, and answering between seventy-five and eighty questions. He succeeded J. A. Nash on the Kroonland. Nash has been temporarily assigned as first operator on the Princess Irene, vice S. Rosenfield, off on sick leave.

Operator Doehler, of the Brilliant, has had an odd experience. Doehler applied for a transfer to the Southern Division and received it. He was then assigned by C. J. Pannill, superintendent of the division, to a newly-equipped vessel, the Glenartney, which has been put under the jurisdiction of the Eastern Division and he now finds himself back in his old division.

T. L. Brewster, formerly second man on the El Oriente, has been promoted to first on the El Siglo.

H. A. Pendleton, from the Marconi school, has been assigned to the El Norte, where he is the only operator.

W. J. Ferrick has resumed duty on the Creole, relieving A. L. Heimbecker, who has been transferred to the Mohawk.

Harold Tuttle has taken up duty as second on the Jamestown again, relieving F. S. Monschau, who made a trip on the Relay.

Watson Sidney and William E. Meyer have resigned from the service.

Pierre Boucheron and C. Murray, senior and junior operators respectively on the Byron, have been transferred to the Lenape.

Raymond Giles, of the Old Colony, has been assigned to the City of Savannah. J. Churchill, formerly of the Guantanamo, has been assigned as first operator to the Old Colony.

P. H. Krieger has been transferred from the Mexico to the Saratoga as senior operator. His second man, R. R. Robb, has just returned from a short vacation.

H. M. Ash, a new man, is assisting L. H. Marshall on the Parima.

F. A. Boyle is now junior operator on the Olinda.

The Comanche having laid up, S. Merrill, senior operator, has been transferred to the Santiago, and S. Kay, junior operator, to the El Alba.

Newton I. Carman, who has re-entered the service, has been assigned to the newly-equipped J. L. Luckenbach, which has been equipped with a half-kilowatt set.

A. Lever has been assigned by Superintendent Pannill to the Neches, recently equipped at Newport News. After calling at New York the Neches sailed for San Francisco.

S. Hopkins, of the Trinidad, has been assigned to the Chicago, a French vessel, in an emergency call. Let us hope that Hopkins' neutrality is unchanged by French enthusiasm.

John Eckhardt has been assigned to the steam yacht Cassandra. It is believed the yacht is going on a nine months' pleasure jaunt, cruising to West Indian, Mediterranean and the "land of the midnight sun" waters.

C. R. Robinson has been assigned, as first operator, to the United States Transport City of Macon. W. C. Thompson is second.

George Oschman has been transferred from the Huron to the Carolina, relieving H. Graf, who was released to the Baltimore division. R. Pettit, second operator of the Huron, was assigned to the El Cid as first man. N. B. Lazarus, fresh from the school, is his second.

H. Hanf has been assigned by the Gulf Division to the Northwestern, an oil boat, newly equipped.

M. B. Berger has been transferred from the Lampasas to the Mexico, as senior operator pro tem. R. Raggie of the El Occidente, takes his place as junior on the Lampasas.

Signey Giffen has been assigned by the Gulf Division to the new Culflight.

Leslie Southgate, of the Stephano, has resigned to go to college. His place on the Stephano has been taken by O. C. Temple, formerly of the Hamilton.

P. S. Lewis has returned to the service, relieving John Eckhardt on the Radiant.

T. R. Bunting has been transferred to the Princess Anne from the Santiago.

F. J. Murphy, that much-traveled operator, has been temporarily assigned to the Noordam of the Holland-Asia line, which has since been captured by a British warship and escorted into Liverpool.

H. J. Meldrum, who was the operator on the power lifeboat Lundin which started to cross the Atlantic, but was compelled to turn back by reason of the unfavorable conditions existing in Europe, has taken up duty at the Boston station again, relieving R. G. McKenzie. The latter has been assigned to the City of Atlanta.

J. R. Byers has been transferred to the Marquette from the North Star.

J. F. Flood has been assigned to the Bay State.

William Gruebel, of the Santiago, has been transferred to the El Rio as first operator. C. W. Sturz has been transferred from the Rio to the Siglo, William Bohn, from the school, has taken Sturz's place on the Rio.

Matt Bergin, of the Nuecess, which laid up, has been assigned to the steam yacht Aloha.

Clarence Cesin, recently from the school, is on the Winifred.

B. J. Harvey and E. Marschall are now on the San Jacinto.

William O'Connor has replaced W. F. Dillon on the City of St. Louis; Dillon is on leave.

H. V. Griffing, after a rather lengthy lay-off on account of sickness, has resumed duty and is now on the W. B. Keene.

J. Casebeer, a new man, has relieved C. P. Whitney on the transport City of Memphis.

Oscar Oehmen, who has just re-entered the service, has been assigned to the La Flandre, of the French Line. To prevent any possibility of his being imprisoned in France for being a German spy, Oscar prudently deemed it advisable to secure an American passport before sailing.

C. P. Whitney, late of the City of Memphis, has been assigned to the John D. Rockefeller. This vessel is one of the many ships recently equipped by our busy Southern Division.

Our own "undownable" Fijie Elstein, assigned to the pilot boat New York on a Saturday, bobbed up in the office the following Monday morning. When questioned, Fijie sadly admitted having been very seasick, but is still eager and willing to go out again.

L. M. Burt is doing temporary duty at the Port Arthur land station.

E. K. Oxner is back to his old post on the Currier, relieving J. F. Forsyth, who was assigned to the Camden. Oxner recently secured an Extra First-Grade license and dares anyone to say he isn't a crackerjack key-pounder.

S. W. Dean, a tyro, has been assigned to the Boston.

F. D. Pitts and A. W. Mayer of the Bunker Hill and Massachusetts, respectively, have left us to resume their college studies. A. S. Fish, new to the service, takes Pitts place on the Bunker Hill as second man and H. D. Coneland replaces Mayer on the Massachusetts.

A. R. Morton, first, and M. Stearns, another tyro, are on the Governor Dingley.

Southern Division

Operator Adolph Doehler has been detailed to the British steamship Glenorthney and is en route to Brazil and Calcutta.

Operator A. Lever, of the Philadelphia District, has been transferred to the new steamer Neches of the Mallory line and is now en route to Honolulu via the Panama Canal.

Operator C. R. Robinson has been detailed to the United States Transport City of Macon, now at Newport News.

Installer Wyble has just returned to Baltimore after equipping the steamships Neches, John D. Rockefeller, Nantucket and Medina.

The Nantucket, of the Merchants & Miners Transportation Company, has been repaired at Newport News and is to go into commission on September 25, taking up the sailing of the SS. Dorchester from Norfolk. Operators Miller and Diggins, of the Dorchester, will go to the Nantucket.

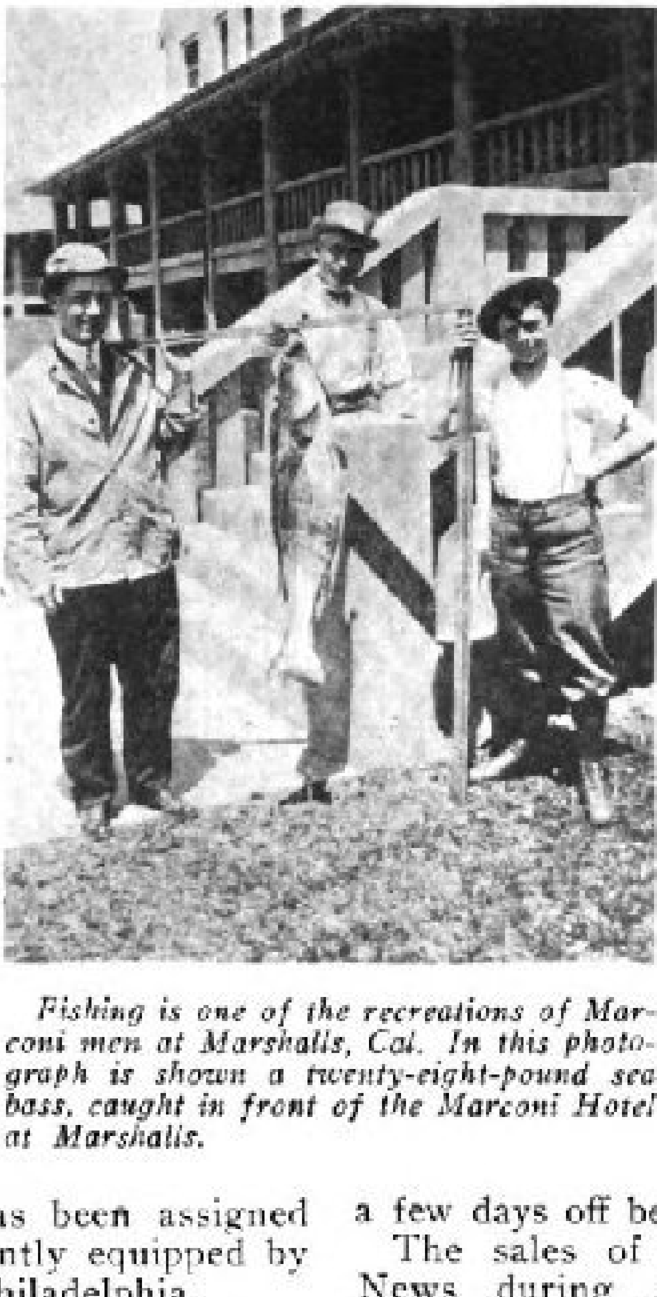
Operator H. Hanf has been assigned to the Northwestern, of the Texas Company, equipped at Philadelphia recently by Installer Morris. The ship was equipped within twenty-four hours' time.

Operator James H. Gaffey, of the steamship Cretan, has been assigned to the Alabama, recently equipped by Installer Morris at Philadelphia.

Operator Herman Graf, formerly of the Eastern Division, has returned to Baltimore and is now on the SS. Cretan.

Operator H. H. Faithful has been transferred from Virginia Beach to the Mexicano, now en route to Norway via Newport News.

Operator W. J. Phillips has entirely recovered from his accident and has returned to his post at Virginia Beach. Phillips was treated at the John Hopkins Hospital in Baltimore.



Fishing is one of the recreations of Marconi men at Marshalls, Cal. In this photograph is shown a twenty-eight-pound sea bass, caught in front of the Marconi Hotel at Marshalls.

Assistant Operator Campbell, of the Philadelphia station, spent a few hours in Baltimore recently.

Construction work has been very brisk in this Division during the last few weeks. About twelve ships have been installed.

Owing to re-arrangement of the railroad property at Savannah, where our Savannah wireless station is now located, a new site will be secured in the near future and the station moved.

Plans are under way for the building of a two-story cottage for the men at Hatteras before the winter sets in.

Operator F. Chapman has been transferred from Hatteras to the managership of the Miami station. His wife will follow soon.

Operator W. P. Grantlin has been transferred to the SS. Ontario.

Operator Hax, of Cape May,, spent several days in Baltimore recently.

Operator S. Cessenfeld, of the Baltimore Station, had a few days off beginning September 20.

The sales of the Ocean Wireless News during August were nearly double those of the previous month.

Operator J. J. Harrigan has been transferred from the Cretan to Hatteras station as third assistant. Harrigan says that barring mosquitoes it is a nice place—to save money. Ham is served three times a day during the entire year under different names.

Pacific Coast Division

G. F. Harvey relieved H. N. Royden as assistant on the SS. Aroline September 1. Mr. Royden is leaving the service to resume his studies at Stanford University.

N. D. Talbot, formerly of this coast, arrived here recently in charge of the SS. Admiral Dewey. L. McCargar joined the Admiral Dewey on September 3 as assistant.

I. L. Church recently arrived from the East in charge of the Admiral Schley, and was transferred to the SS. Admiral Watson on September 10th, M. O. Smith acting as assistant.

The Admirals Dewey and Schley are duplicates of the Admiral Farragut. These three vessels will run between Seattle and San Francisco for the Pacific Alaska Steamship Company, the Admiral Watson having made her last sailing from San Francisco recently. On reaching Seattle she was equipped for the Seattle-Alaska trade.

S. W. Bartlett relieved J. H. Southard as assistant aboard the SS. City of Topeka September 6.

A. R. Short and T. Lambert sailed on the SS. City of Para for Panama as first and second, respectively, September 5.

E. J. Browne, acting purser of the SS. Cuzco, was assigned as wireless operator on that vessel when she was equipped August 26.

W. M. Blodgett joined the SS. Celilo as assistant September 4.

C. H. Cannon, of the SS. Coronado, was transferred to the Construction Department on August 25, the Coronado having laid up August 24.

A. W. Baxter relieved R. V. Harris as station manager at East San Pedro on September 1.

F. W. Brown relieved S. J. Morgan as first operator of the SS. Fifield August 19. Morgan was hurried to a hospital and operated upon for appendicitis. He is rapidly convalescing and expects to be in active service in the near future.

C. J. Fleming assumed the position of first operator aboard the SS. F. H. Leggett on August 16, with H. F. Otto as assistant.

E. Diamond joined the SS. General Hubbard at Eureka on August 31 as operator in charge.

J. H. Southard relieved S. W. Bartlett on the SS. Governor September 6.

C. Thomas and H. G. Austin, first and second, respectively, left here August 18 for New York on the steamer Honolulu, one of the first vessels with passengers to pass through the Canal.

S. E. Miller, acting as temporary assistant on the Harvard, spent a few days recently assisting the Construction Department. Mr. Miller appears to have enjoyed the duties assigned to him by Mr. Stevens.

C. Berntzwiller and A. Koch are acting as first and second of the SS. Klamath. Mr. Berntzwiller expects to leave on a vacation in the near future.

W. E. Gawthorne and L. T. Franklin are on the Korea as first and second, respectively, having left here on August 28.

With the war news eagerly looked for aboard all vessels, big Ocean Wireless sales are expected. The Honolulu and trans-Pacific vessels especially are expected to bring in large returns.

B. E. Fenn and E. S. Howard leave aboard the SS. Lurline as first and second, respectively.

J. S. Philbrick, temporarily assigned to the San Francisco Construction Department, was transferred to the Bolinas engineering staff September 1.

F. L. Wisner joined the SS. Multnoman as assistant August 21, 1914.

H. R. Sprado and J. A. Miche left on the SS. Manoa August 27 as first and second, respectively.

J. H. Falke, of the F. H. Leggett, was taken seriously ill on September 1 and is now at a hospital in San Francisco suffering from typhoid fever.

P. E. White relieved O. K. Bullard as assistant aboard the SS. Northland August 30.

G. Jensen joined the SS. President as first operator September 11.

J. M. Switser, after taking a month's vacation, rejoined the SS. Redondo August 8.

O. K. Bullard has relieved Operator G. Kelly, who is on sick leave. The Roanoke is now operated by J. A. Wilson, with Bullard as assistant.

F. W. Shaw, after a short vacation trip up and down the coast, has resumed his duties as manager in charge of the Hillcrest Station, with E. D. Bryant and A. M. Quasdorff as second and third trick man, respectively.

E. T. Jorgensen and B. McLean were assigned to the SS. Sierra as first and second August 16.

H. M. Currie has relieved Operator J. M. Chapple as assistant aboard the SS. Sonoma.

I. W. Hubbard joined the SS. San Juan as assistant August 19.

A. J. Svenson relieved A. W. Walsh as assistant on the SS. Hanalei September 8.

W. M. Kenworth relieved M. Johnson as second operator of the SS. Willamette August 18.

F. W. Murphy relieved M. J. Ensign as assistant of the SS. Yosemite August 25.

F. Roy was assigned to the SS. Yale as assistant August 27.

A. W. Walsh and G. H. Davis, temporarily assigned to marine positions in this division, were relieved on September 7 and sailed on the SS. Matsonia September 9 for Honolulu. On arriving there they will join the operating staff of the trans-Pacific station at Koko Head.

Seattle Staff Changes

J. Hutchinson has taken charge of the big freighter Seward.

J. D. Taylor, one of the oldest construction engineers in the service, has resigned to accept a position with the Canadian Dominion Wireless Service.

D. I. Moir, of the Seattle Construction Department, has been assigned as engineer in charge of the Astoria semi-high power station.

H. F. Regan, first on the Alameda, has exchanged with F. Wilhelm, of the Cordova.

G. V. Wiltsie and F. M. Ryan have exchanged positions as first operator of the Admiral Evans and Senator, respectively.

H. Jones has been transferred from the Senator to the Admiral Evans. A. E. Wolfe, of the Evans, is temporarily relieving in the Seattle station.

A. P. Neilson, a graduate of the Marconi School, has been appointed second on the Senator.

A. M. Greenwell, station manager of Astoria, has returned to duty after a pleasant vacation, relieving Bryant, who returned to the Celilo.

F. A. Lamorton has been transferred from the Victoria to the Mariposa, Stacey W. Norman, a new recruit, relieving him on the former vessel.

H. F. Wiehr has been placed temporarily on the unassigned list, after his narrow escape from drowning on the Admiral Sampson, and will return to duty on the Humboldt.

H. F. Barton has relieved A. E. Davidson as second on the Stetson, the latter having returned to college.

William Barclay, of the Pioneer, has resigned to accept a position in the Canadian Naval Service.

C. B. Cooper, chief operator, has been in California on a well-earned vacation. He returned to duty with renewed enthusiasm. He was accompanied by Mrs. Cooper and the "boy."

THE WIRELESS DIDN'T FAIL

An erroneous newspaper report, covering the burning of the excursion boat City of Chicago, on September 1, and alleging that the wireless apparatus failed, caused the Marconi Company to make an official investigation, in which it was proved that the equipment worked to full satisfaction during the entire course of the Lake Michigan incident.

The boat caught fire about twelve miles out of Chicago while most of the passengers were asleep in their cabins. The captain ordered the engine at full speed ahead, and forty-five minutes later ran safely into the government breakwater. The flames were subdued after three hours' fight by the fire tugs, assisted by streams from the excursion boat.

Arthur H. Hedlun, the Marconi operator on board, reported officially that the wireless had worked to full satisfaction.

WILLIVER COMMERCIAL GENERAL MANAGER OF W. U.

It was announced on September 10 that John C. Williver, former United States manager of the Western Union Cable System, had been appointed commercial general manager of the Western Union.

The Marconi Baseball Team

MEMBERS of the baseball team of the Marconi Wireless Telegraph Company of America are being congratulated on the excellent showing, which the nine made during the season just ended. The team, which was organized on May 3, 1913, to provide recreation for the Marconi men, has many admirers. Among those who take an interest in the organization is John Bottomley, vice-president, secretary and treasurer of the Marconi Company.

A game which attracted considerable attention during the past season was that with the Fort Hancock nine at Sandy Hook, N. J. The game was arranged by wireless, Sergeant M. G. Hart, of Fort Hancock, sending a marconigram containing the challenge to the Marconi factory at Roselle Park, N. J. George W. Hayes, superintendent of the Roselle plant, replied to the challenge on behalf of the wireless men. The result of the game, which was played at Sandy Hook, was a victory for the Marconi men who defeated the soldiers by a score of ten to one. In this game a total of eleven hits was made by the Marconi team, among them being two three-baggers and three two-base hits. Only one error was made by the wireless men.

The Marconi team defeated some of the best semi-professional nines during the season of 1914. Included among the clubs they have defeated are the following:

Babcock & Wilcox, at Bayonne, N. J.; Staten Island Ship Building Company's team at Port Richmond; Westfield Baseball Club at Westfield, N. J.; Rahway Baseball Club, at Rahway, N. J.; South Elizabeth Athletic Club, at Elizabeth, N. J.; Fort Hancock, at Sandy Hook. The Marconi team also played exciting games with the strong St. Patrick nine of Jersey City; the Caldwell Baseball Club at Plainfield, N. J., and the Lakeside Weston Electric Baseball Club.

The team won the Industrial Championship of Union County, N. J., for 1913, the final game being played at Elizabeth, N. J., when the wireless players defeated the champion nine of the Singer Sewing Machine Manufacturing Co., in an exciting game by a score of three to one.

In the accompanying photograph are

shown the players and officials of the Marconi Club. The names of those standing, from left to right, are as follows: Henry Kreill, assistant manager; P. J. Collins, manager; Fay Washburn, third base; Frederick Boettner, shortstop; Joseph Reichardt, pitcher; Roy Schuyler, pitcher; John Mason, catcher; Charles Beck, first base; Gus Kachelreiss, scorer; W. J. Bennett, secretary. Those kneeling are Frank Linehan, second base and captain; Frederich Wahl, left field; Charles Marsden, pitcher; Hans Decker, center field; Mike Tomasula, mascot.

CANADIAN NOTES

That the Canadian government is not taking any risks in guaranteeing the safety of the Canadian trans-Atlantic Wireless Company is evidenced by the extensive precautionary measures taken by the government to make the stations of that company immune from attack. When war was declared in Europe several cruisers, which had been in Mexican waters guarding German interests, were reported on the East coast near Cape Breton, where the wireless stations are situated. No time was lost, therefore, by the Dominion government in taking steps to protect the waterfront in the vicinity of Glace Bay and Louisburg. Heavy guns were mounted covering the approaches to the harbor, so that an attack from the sea would be fraught with dangerous consequences for an enemy's warships.

In view of the proximity of Glace Bay and Louisburg to Sidney where thousands of Austrians and Germans are employed in the coal mines, extra strong guards have been placed on duty, and wire fences charged with electrical current of a very high voltage erected around the stations. It is estimated that there are about 1,000 soldiers on duty at the two stations which have all the appearance of armed camps.

During a dense fog that prevailed on the Columbian coast, on August 17, the S.S. Prince Albert, belonging to the Grand Trunk Development Company, went ashore on Butterworth Rocks while crossing from Queen Charlotte Islands to Prince Rupert. When the fog lifted the vessel was found to be lying high and dry on the rocks, and it is feared that she will become a total wreck. The steamship's wireless equipment was instrumental in obtaining assistance, and all the passengers were saved. Many of them, however, suffered considerable privations during the several hours spent in the lifeboats, and were in a pitiable condition when rescued. It is hoped that the salvage operations now in progress will be successful in salving the cargo and wireless installation.

AMERICAN MARCONI CO. ASSUMES CONTROL

Among the vessels which are now sailing under the American flag, due to the new registry bill, are six ships owned by the Isthmian Steamship Lines. The wireless outfits on these vessels, which were formerly operated by the Marconi International Marine Company, are now operated by the Marconi Wireless Telegraph Company of America. The names of the vessels and their call letters are as follows: Bantu, KLM; Kentra, KLN; Santa Rosalia, KLO; Buenaventura, KLP; San Francisco, KLQ; Crofton Hall, KLR.

RESIDENT INSPECTOR IN NEW YORK

H. M. Short, of the Marconi International Marine Communication Company, has been appointed resident inspector for that company in New York. For a considerable time he has been an instructor in the wireless school in Marconi House, London. Before his departure for this country his associates presented him with a handsome cigarette case.

Tests of the Direction-Finder

A REPRODUCTION of a chart of the tests carried out with the Marconi-Bellini-Tosi wireless direction-finder during a voyage of the Royal George from Canada to England, prepared by the commander of the vessel, Captain F. J. Thompson, accompanies this article.

The position of the Royal George was determined on the chart by the crossing of the course of the ship and the compass bearing of Small's Lighthouse. When, in the case of fog, the light could not be seen, the position was determined by the crossing of the course with the wireless bearing of Land's End—a distance of about ninety miles.

The chart also shows some of the tests for locating a ship on the high seas. The bearings generally differed by one or two degrees from those shown in the chart, and this is explained by the fact that the course of a ship is never perfectly steady and that for some hours after having taken the point the position of a ship on the high seas is only approximately known.

The value of this instrument lies in finding the position of a vessel in heavy weather and in materially assisting the prevention of collisions.

The aerial system required for the direction-finder consists essentially of loops of wire of equal size suspended vertically and crossing each other at right angles. The loops ordinarily take the form of triangles of wire suspended by their top corners through insulators from a triatic or other fore and aft stay, or from a sprit, gaff, or bracket on one of the masts. Their horizontal base wires cross the ship at an angle of 45 degrees on either side of its center line, and at right angles to each other, the two bottom corners of each triangle being ordinarily made fast through insulators to stanchions at the side of the ship. Connecting wires are taken to the instrument from the centers of the horizontal base wires of the triangular aerials, which are split by an insulator at their point of intersection. The range of the installation suffers to some extent if these connecting wires are very long, in addition to which the possibility of injury to the wires decreases the reliability of the installation, and it is therefore advisable to keep the distance between the instrument and the center of the aerial system as short as possible.

The instrument indicates the angle which the direction of the station makes with the center line of the ship; that is to say, it shows the line on which the wireless transmitting station lies, but it does not show in what direction along that line. For example, it may indicate the direction twenty degrees off the port bow, but it does not distinguish between this direction and that which is diametrically opposite to it, namely twenty degrees off the starboard quarter. There is, however, hardly ever any doubt as to whether a ship is approaching or receding from a land station, and, indeed, in most cases there is only one possible way of interpreting the indications of the instrument, as by the reverse interpretation the ship would be found to be somewhere inland. If, however, there is any ambiguity two successive bearings taken of the same station while keeping the ship on a fixed course will place the matter beyond doubt, and will at the same time give the ship's distance from the station by the method ordinarily in use for that purpose. In the same way, the ship's position may be found by taking simultaneous bearings of two fixed stations. The useful application of the direction-finder is to determine whether the ship is on a course which will take it inside or outside a lightship or isolated lighthouse. A few signals from the lightship or lighthouse will settle the question as certainly as if the light were visible.

Similarly, when making a harbor, a few signals from a station in the harbor will show immediately if the ship has drifted to one side of the entrance. When trying to locate another ship while going slow in a fog, an indication of the direction-finder would show by a steadily increasing strength of signal if another ship were approaching, but would leave doubt whether it was approaching, say, on the port bow or overhauling on the starboard quarter, though a wireless inquiry as to her course addressed to the other ship would relieve the doubt at once.

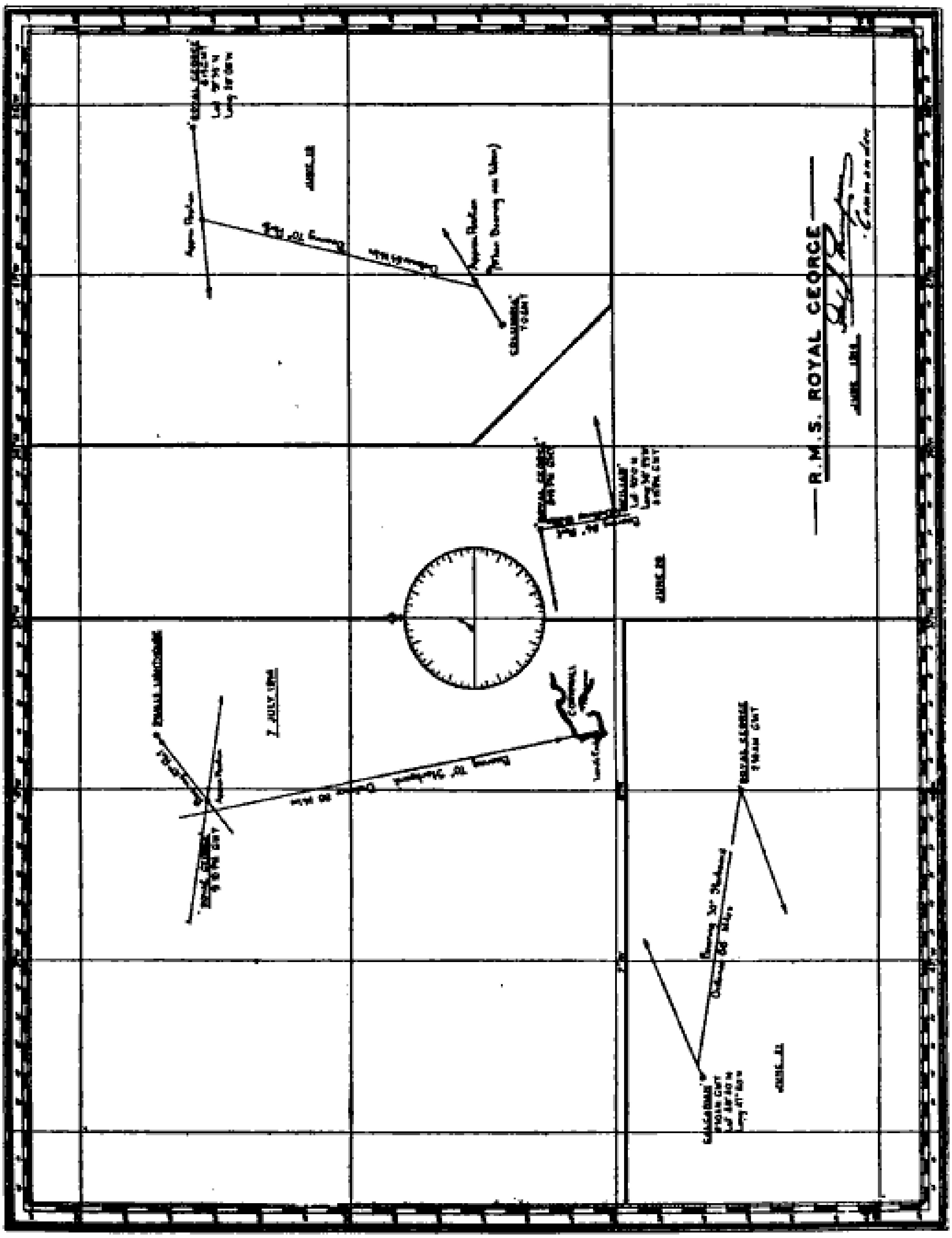


CHART OF TESTS WITH DIRECTION-FINDER ON THE ROYAL GEORGE.

Detectors Galore

Various Types Designed by Readers

IF "variety is the spice of life," there is more than enough relish in the choice of designs for detectors. The amateur who is undecided as to the type of "crystal holder" he should build will do well to read the contributions on the subject published in this article. THE WIRELESS AGE is constantly in receipt of descriptions of designs for detectors. It herewith presents a small number of those which it has received.

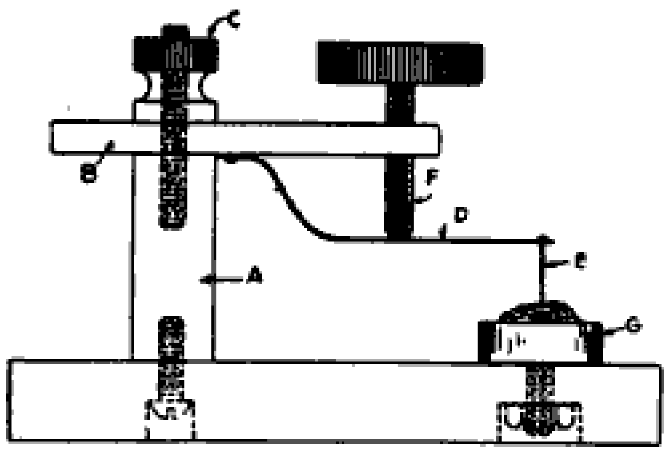


Fig. 1

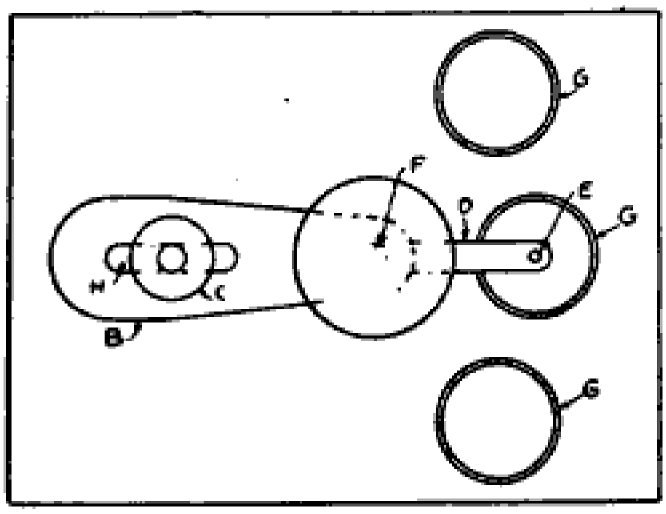


Fig. 2

This communication is from an anonymous correspondent:

A good detector, one that is easily adjusted and that will retain a good adjustment, is, I believe, one of the most essential parts of a receiving set. There are a great many detectors on the market today that are easily adjusted, but the manufacturers have, in developing this one feature, lost sight of the importance of good electrical connections between all parts of a detector stand. Many otherwise good receiving sets have been practically crippled by this one fault, so I am going to describe one that I made which gave exceedingly good results.

The accompanying drawings, Figs. 1 and 2, are made full size so that all measurements may be obtained by the use of the rule; however, in the drawing of the side of the instrument only one of the three mineral cups is shown, as the other two, if included, would make the drawing much more complicated. The drawings are quite clear and will need but little explanation. All machine screws used are 3-32 of an inch (the size found in the end of battery carbons). The cups, G, were taken from the ends of round battery carbons. The main feature of the instrument lies in the slot, H (Fig. 2), in the piece, B, which enables B to be slid back and forth on, as well as revolved, around the screw, C, thus allowing the pin, E, to be placed anywhere on the surface of mineral.

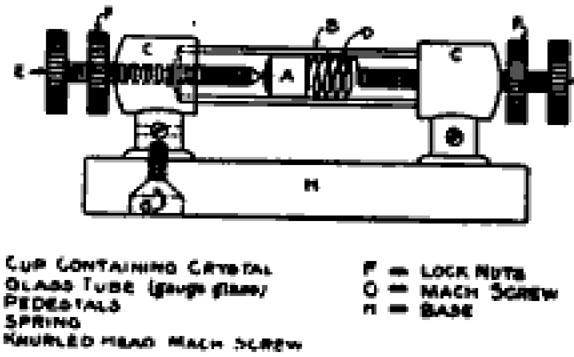


Fig. 3

The design is not bad and the construction is simple and entirely suitable for silicon, galena and other rectifying crystals.

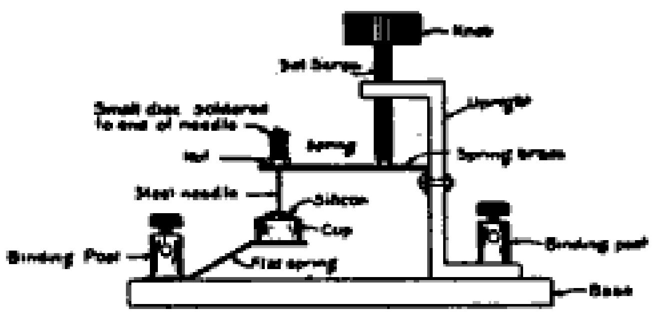


Fig. 4

Donald R. Hill, of Massachusetts, prefers to enclose his crystal in a tube, making the adjustments from the outside as shown in Fig. 3. He writes:

Enclosed find drawing of a detector which I designed and have used for a good many years and found to be very satisfactory. The base is of any material desired. The pedestals are nothing more than the holders for a

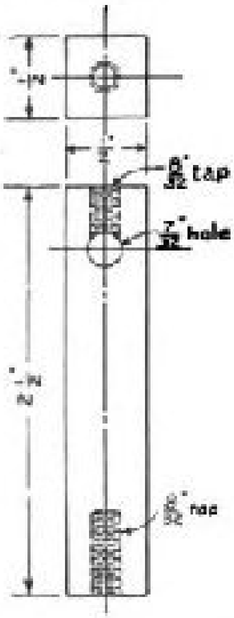


Fig. 5-A

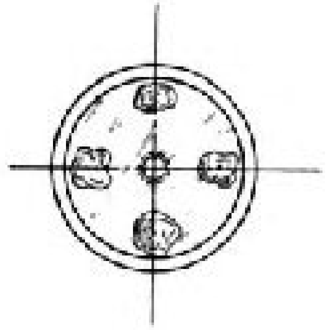


Fig. 5-B

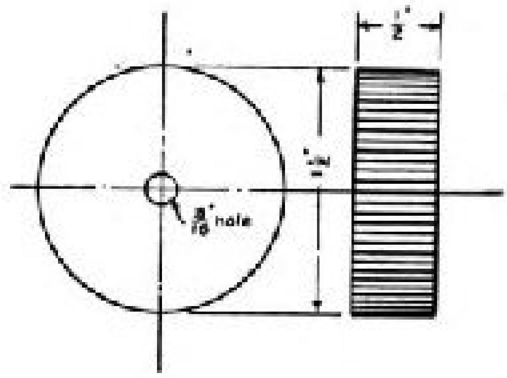


Fig. 5-D

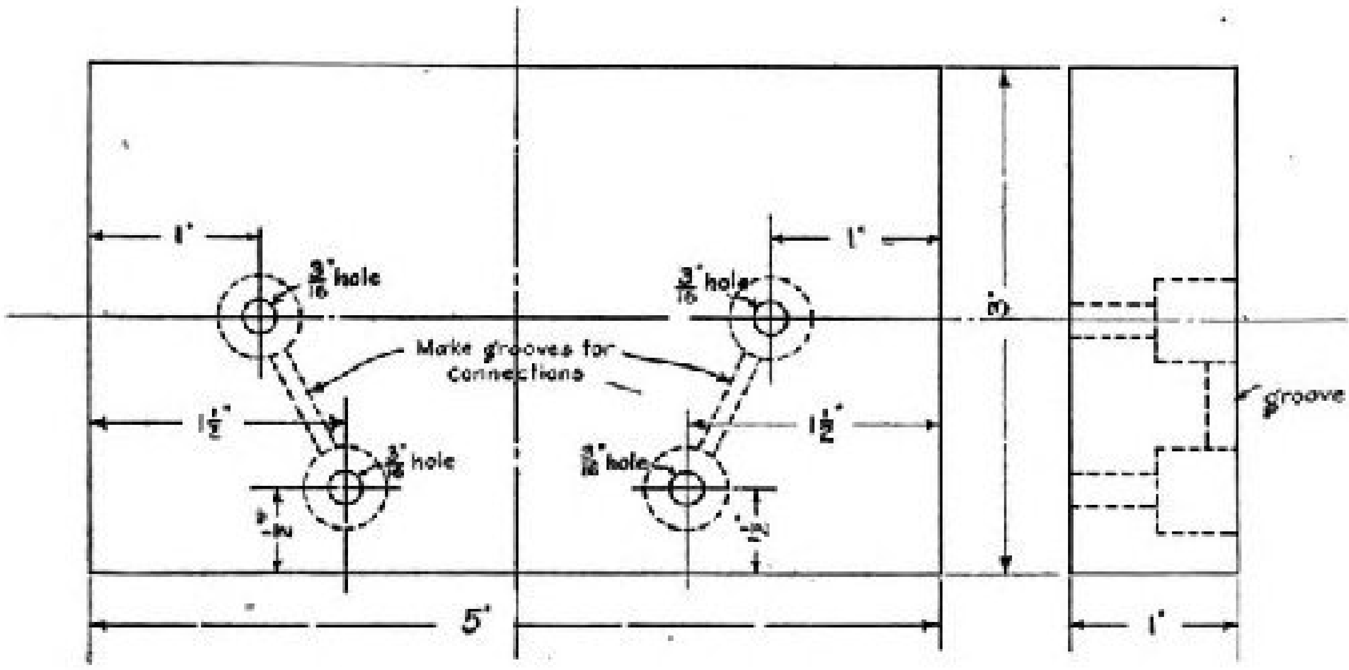


Fig. 5, Part E

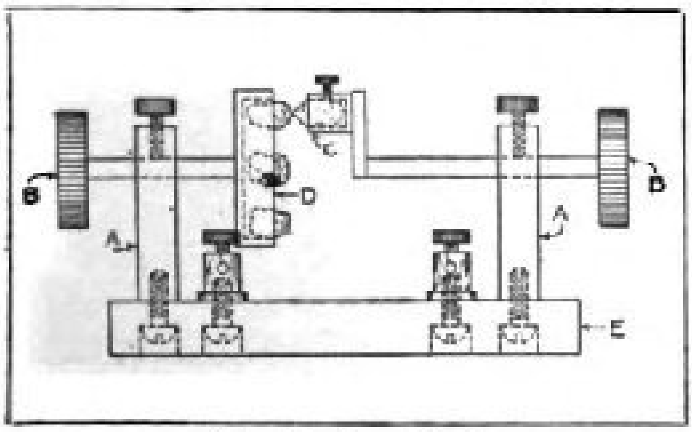


Fig 5 (Assembled)

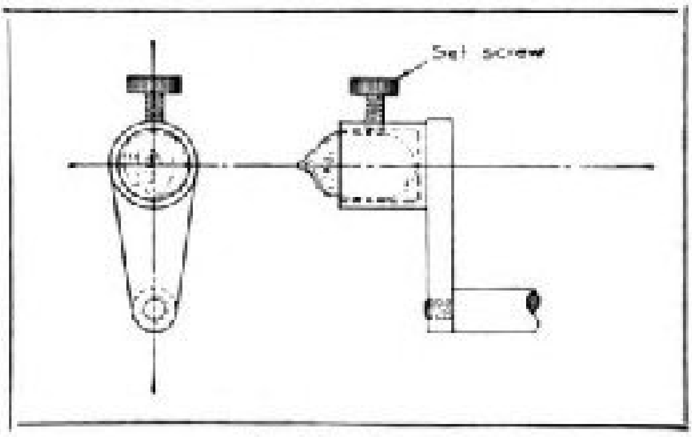


Fig. 5, Part C

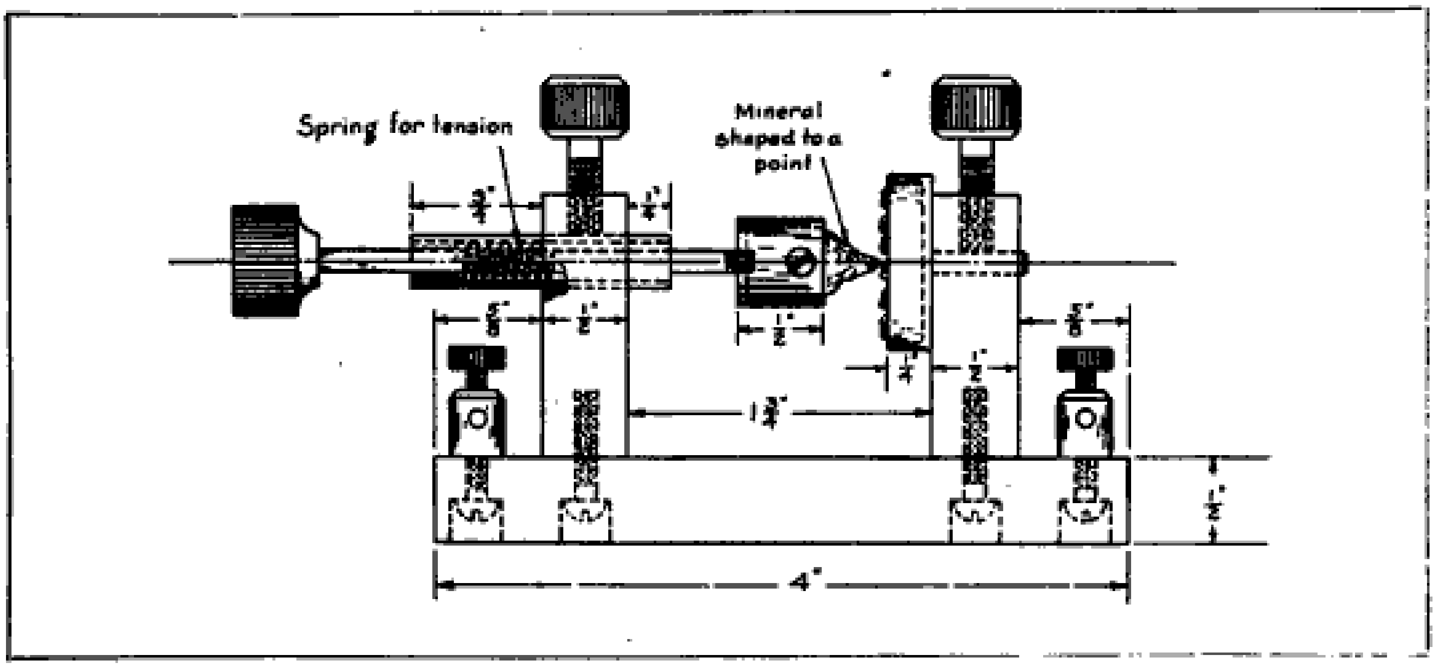


Fig. 6

water glass, such as used on boilers, and can be obtained to take any size glass desired. One-half inch is plenty large enough to hold a cup. The long screws can be obtained at a hardware store in any desired length, also the lock nuts. The cup should fit snugly in the tube and can be made from a piece of tubing, packing the crystal in tight with tin-foil. The crystal may be of any kind. I use silicon and find it very efficient. The spring can be made easily by winding about No. 22 gauge spring brass wire about a pencil. From the diagram one can easily see how the detector is assembled.

Enclosed in this manner, a crystal is somewhat protected from dampness, and is not apt to be handled by the fingers, making it insensitive. It is not quite so easy of adjustment as the one previously described, but should give results.

* * *

D. Tatley, of Canada, sends us a brief description of his design of a "holder" for silicon crystals. The design minus dimensions is shown in Fig. 4. He says:

The steel needle should slide freely through the nut and the cup for the mineral may be made from the end of a fuse. It should be movable on the flat spring.

Simple enough, we think, and there is no reason why it should not work.

* * *

Parker E. Wiggin, of Kansas, is

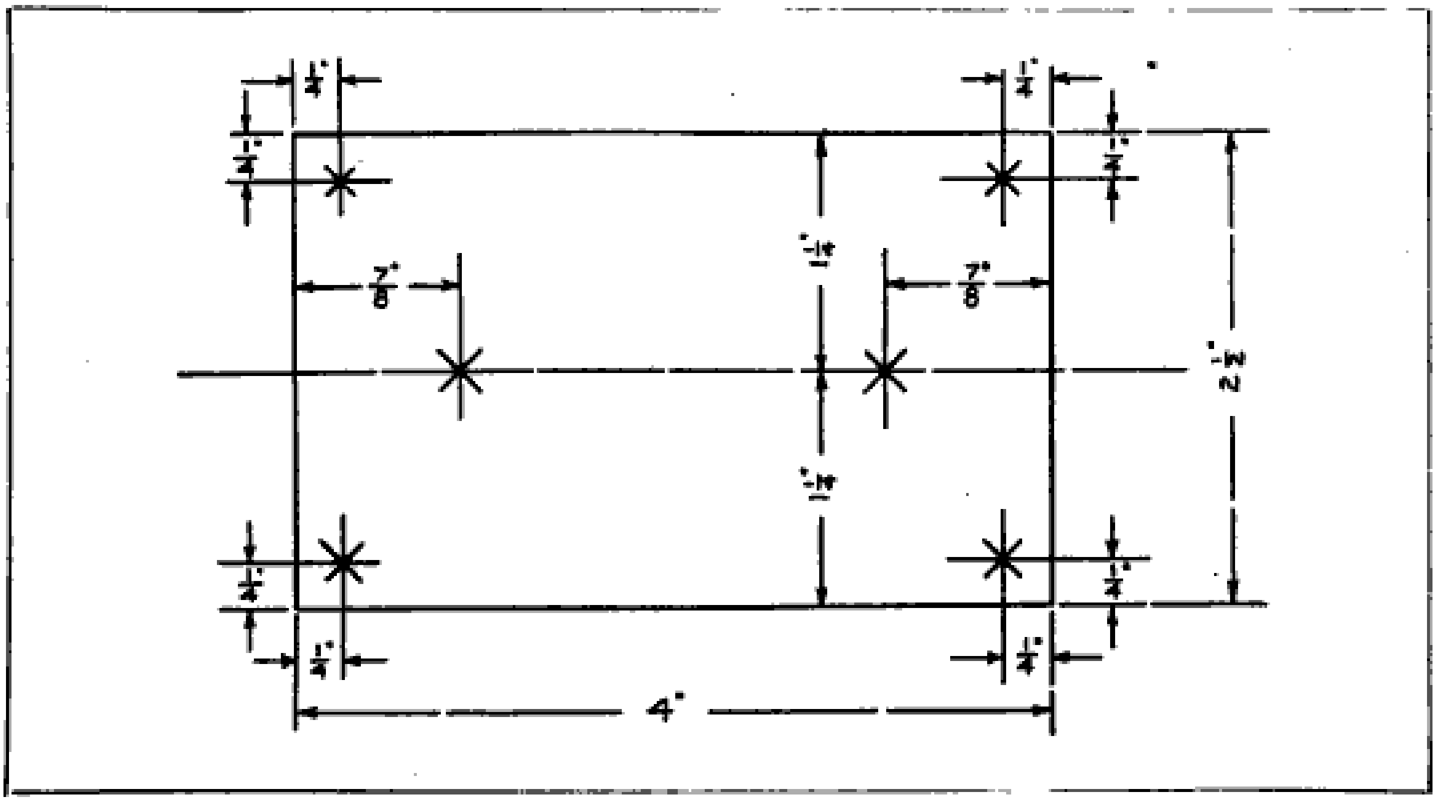


Fig. 7

satisfied with a perikon detector modelled after the drawings in Fig. 5. He says:

For the uprights procure a piece of ⅛-inch brass rod 2½ inches long. Three-eighths of an inch from the top drill a 7-32-inch hole and put an 8-32-inch tap in the top and bottom. For the base use a piece of marble 5 by 3 inches, or if desired, fibre may be used. For the large cup get a piece of 1¼-inch brass tubing ½ inch long and solder a piece of ⅛-inch brass on one side for the bottom. Drill a 7-32-inch hole through the bottom of the cup to take the adjustment rod. The crystal should be mounted in this cup with the amalgam used by dentists.

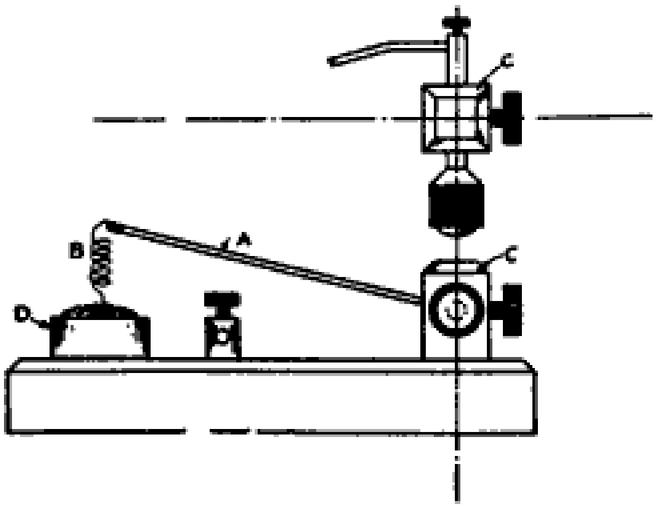


Fig. 8

The adjustment rod is 3 inches in length and has a hard rubber knob fastened on the end. The knob is shown in B. The cup for the smaller crystal is made the same way from tubing and is of ⅛-inch brass. The adjustment rod for this cup is 2 inches in length and has a hard rubber knob attached. After all parts are put together, procure some good zincite which is deep red in color, and some good chalco-pyrite, which is green in color. Polish all brass with emery cloth and you have a neat and efficient detector. Now mount 2 neat binding posts on the base. Connect one to one upright and the other binding post to the other upright.

The design shown is quite common and we believe is fully covered by patents of the originator, G. W. Pickard. It does not, however, allow the variety of adjustments obtainable in the original inventor's design.

* * *

John Edgar Finn, of New York, designs a perikon detector in accordance with the following description. He writes:

This detector is of the latest design in the perikon line, and when the parts are assembled, using care especially with the minerals and their setting, it should be a valuable addition to the amateur's station. The following parts are necessary to build the detector:

Two brass cups, a large one 1 inch by ¼ of an inch, and a small one ½ inch by ½ inch. These are for the minerals. A piece of hard rubber or fibre (hard rubber preferred) 4 inches by 2¼ inches by ½ inch—this is the base. Four binding posts, 2 adjusting screws with small rubber knobs on the end. One light spring (brass) for the mineral tension; one piece brass tubing 1½ inches by ½ inch. One piece round brass rod 2½ inches by ⅛ of a inch, threaded both ends. There parts can be purchased at a nominal cost at any electrical supply house, also the minerals, which I leave the maker to select and test as no 2 sets of these are alike.

Fig. 6 shows the detector fully assembled. Fig. 7 gives a bottom view of base. I advise that to get best results the metals should be set in the cups in Wood's metal, which probably can be purchased where the parts are bought. After the work is completed, connect up in the regular way, using a slight battery current controlled by a potentiometer.

* * *

Henry Ruither, of Massachusetts, suggests a galena holder modelled after the sketch in Fig. 8. No detailed explanation accompanies the drawing. It is sufficiently clear for construction, the dimensions being altered as desired. The slender arm,

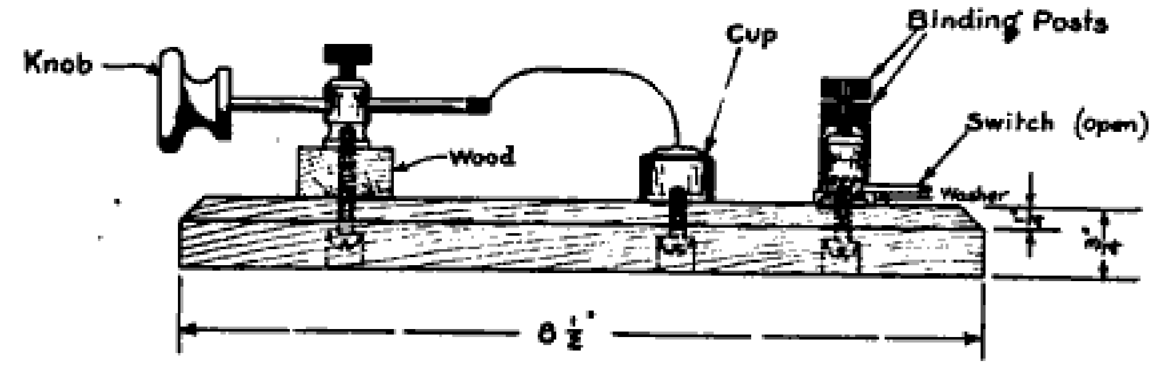


Fig. 9

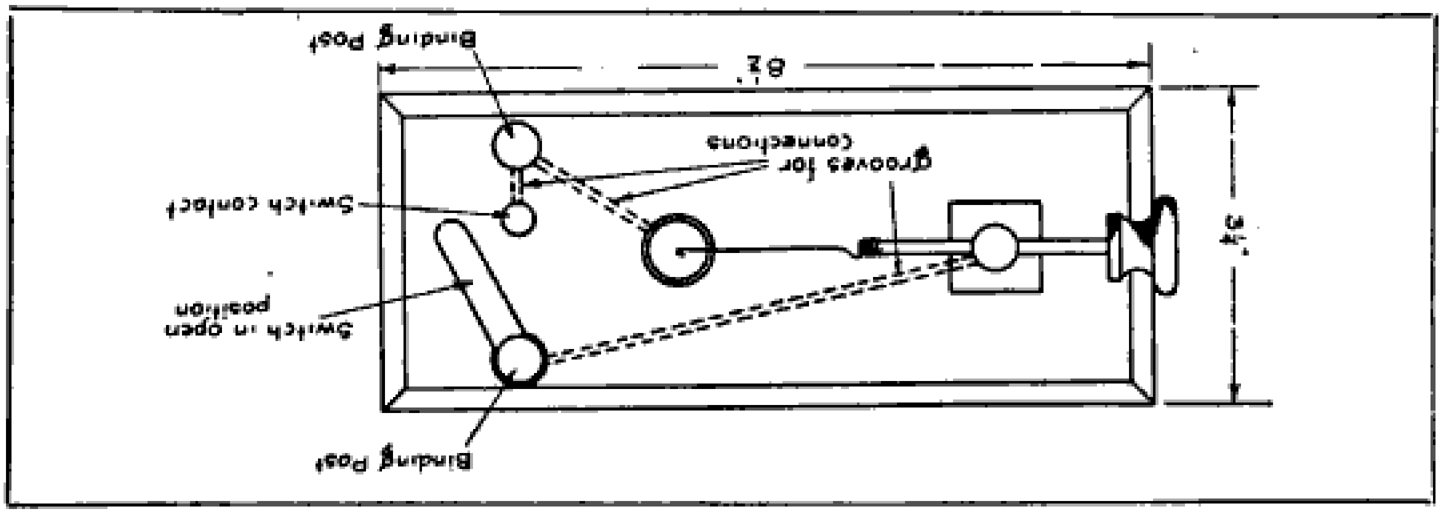


Fig. 10

A, may be made of No. 22 steel or phosphor bronze wire. The spiral contact B, is of No. 34 copper wire. The arm support, C, is of brass rod ⅜ of an inch or ½ inch square. The crystal cup, D, is ½ inch in diameter.

* * *

D. G. Fowler, of New Jersey, sends us a sketch of a design for a galena detector which we believe is less desirable than the one previously described. It does not seem to afford the variety of adjustment obtainable with other types, but still it should work.

An elevation is shown in Fig. 9, and a plan drawing in Fig. 10. He says:

A base should first be made of some hard wood about 8½ by 3¼ inches and ¾ of an inch thick. If the base is beveled, the appearance is much improved. An inch and a half from the end of the base, a small block of wood is placed, on which a binding post is mounted. A rod about 3 inches in length is put through the binding post and a wood or hard rubber knob fastened to it. A "feeler" or "catwhisker" should be fastened by means of solder or sealing wax to the other end. One and a half inches from the other end of the base, two binding posts should be placed as per the diagram.

Two inches from the binding posts, a cup is placed in the center of the base and is connected to one of the binding posts by means of a brass strip, while the other one is connected to the rod or feeler by means of wire in the base. A small switch may be placed between these two binding posts to short-circuit the detector when the sending set is being used. If the base is stained and polished and new binding posts are used, this detector will not only give good results, but will present a handsome appearance.

We prefer solder rather than sealing wax for fastening the whisker.

WAR DELAYS WIRELESS PLANS

Among the effects of the European war will be the holding up for the time being of the wireless telegraph schemes which some of the nations had planned. One of these schemes was that which had been prepared and was in course of execution to establish a chain of high-power wireless telegraph stations to connect Paris with the French colonies. Captain Brenot has published in La Lumiere Electrique maps of the location of the stations, which show that one main line will proceed via Tunis, Djibouti, Pondichery, Saigon, to Noumea, in the Hebrides. Another will go across Africa to Tananarise, Madagascar, and a third via Timbuctou, Martinique, across the Panama Canal to Marquises Island, thence to Tahiti, completing the chain to Noumea. The ranges vary from 1,680 kilometers (approximately 1,043 miles) to 4,000 (2484 miles) for most of the stations, but that between the Saigon and Noumea stations is about 7,500 kilometers (approximately 4,657 miles); the range between Martinique and Marquises Island is 8,500 kilometers (approximately 5,278 milse). Several of the stations are in operation, the largest being at Saigon. This requires 450 horse-power. The aerial is horizontally carried on eight steel masts, 120 meters high, isolated from the ground and spreading ten horizontal wires, spaced 180 meters and 870 meters in length. A large number of smaller stations are also described. Their power varies from five to fifteen kilowatts.

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

G. N. H., Trenton, N. J., asks:

Ques.—(1) What is the wave-length of an aerial 130 feet in length consisting of 4 wires of No. 14 stranded copper wire? The lead-in is 30 feet in length; the aerial is 50 feet in height.

Ans.—(1) The wave-length of your antenna is approximately 325 meters.

Ques.—(2) How far should I be able to send with a ¼-inch spark coil on an aerial of this capacity, using a small condenser?

Ans.—(2) You will find it rather difficult to excite an antenna of these proportions with a ¼-inch spark coil. The coil is too small to maintain a satisfactory spark discharge.

Ques.—(3) When will the new high power station of the Marconi Company at New Brunswick, N. J., go into operation and on what wave-length?

Ans.—(3) This station will be completed shortly. The wave-length has not yet been definitely determined.

Ques.—(4) What station sends at intervals every night from half past eight o'clock to fifteen minutes to nine?

Ans.—(4) We do not know.

Ques.—(5) Where can I purchase a call book of the wireless stations of the United States and a call book of the wireless stations of the world? Please give prices.

Ans.—(5) A call book of wireless stations of the United States may be secured from the Government Printing Office, Washington, D. C. A call book of wireless stations of the world may be secured from the International Bureau at Berne, Switzerland. A limited number of copies may be purchased from the Traffic Department of the Marconi Wireless Telegraph Company of America, 233 Broadway, New York City. Price $1.00.

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W. P. D., Binghamton, N. Y., writes:

Ques.—(1) Please inform me as to the wave-length of my antenna. It is of the inverted L type, 160 feet in length, 70 feet in height at one end, and 50 feet in height at the other end. It consists of 7 wires of No. 14 bare copper wire, spaced 2 feet apart.

Ans.—(1) The wave-length of your antenna is approximately 350 meters.

Ques.—(2) How far will I be able to transmit and receive with the antenna referred to and the following instruments: A Thordarson 1 k. w. transformer, Halcun rotary spark gap operated on a 110-volt current, condenser of ample capacity, oscillation transformer, two slide loose-coupler, 2,000 ohm telephones, condenser, 17-plate variable condenser, Blitzen rotary variable condenser and combination galena, silicon and ferron detector? What will be the range when a Murdock 200-meter condenser is added? What will it be when an audion detector is used instead of the crystal detector?

Ans.—(2) Your range for a 1 k. w. transformer would be approximately 100 miles; that is, if you operate at the full natural wave-length of the antenna. If you desire to operate on a wave-length of 200 meters your range will be considerably reduced, for you can only use a portion of the output of the transformer; also, a series condenser will be required in the antenna circuit. It is difficult to conjecture your receiving range. During the winter months at night you should be able to hear stations and ship over the entire Atlantic coast (using the crystal detectors). If you employ an audion your range may be doubled or tripled.

Ques.—(3) How many meters wave-length would I have to add to my 2,500 meter loose-coupler to hear Belmar and New Brunswick, and what will be their time of sending and their wave-lengths?

Ans.—(3) It would be impossible for you to arrange your 2,500 meter tuner to receive the signals of the trans-Atlantic station at New Brunswick, N. J., for the wave-lengths employed are far in excess of those ordinarily used.

Ques.—(4) Is there any formula by which I can figure my own wave-lengths?

Ans.—(4) See page 604 of the May issue of The Wireless Age.

Ques.—(5) What do NAA and others mean when they send dash, three dots, dash, and sometimes, three dots, dash, dot?

Ans.—(5) The first signal you refer to is the Continental "break" or "double dash" signal and is used commercially to separate the address from the body and the body from the signature in a wireless message. The second signal you refer to is the termination signal according to the London Convention, signifying that the communication is temporarily completed. It is also used as an "understood" signal, signifying that the receiving operator understands what the sending operator has intimated. You will find that many of these abbreviations are sometimes used rather loosely and are often interposed by operators in a careless manner without any meaning whatsoever.

* * *

P. P., Brooklyn, N. Y., writes:

Ques.—(1) Please give me your opinion of the distance that I may receive with a single wire aerial 1,000 feet long, 90 feet in height at one end, and 60 feet in height at the other, using a Murdock loading coil which, it is claimed, will tune up to 4,000 meters; a loose-coupler, the primary of which has 130 turns of No. 22 copper wire and is 4¼ inches in diameter; the secondary has 225 turns of No. 30 S. S. covered wire and is 4 inches in diameter; two variable condensers, one for the primary and one for the secondary. The capacity is .0005 mfds., galena detector, fixed condenser of .003 mfds. and a pair of 2,000 ohm telephones.

Ans.—(1) You have a badly balanced receiving outfit. In the antenna circuit you should be able to tune to a wave-length of 7,000 meters, but the secondary of the receiving circuit is considerably out of resonance with the antenna circuit. If you desire to receive an equal wave-length in the secondary circuit you should either double or triple the size of the secondary winding, or increase the capacity of the variable condenser in shunt to the secondary winding. There is no particular advantage in placing the variable condenser in shunt to the primary winding for long wave-lengths, and it is often a disadvantage in regard to the strength of signals.

Ques.—(2) Where can I purchase some back issues of The Wireless Age?

Ans.—(2) You can purchase back issues of The Wireless Age at the office of the Marconi Publishing Corporation, 450 Fourth Avenue, New York City.

* * *

F. D. U., Elgin, Ill., writes:

Ques.—(1) In your January issue there is described a triple audion amplifier which will give an amplification of 150 times its original strength of the wireless signals. We are wondering if you know of any type of sensitive relay that could be used with such an amplifier in order to control a local circuit?

Ans.—(1) You will find that any sensitive polarized relay of fairly high resistance on the market may be used in the local circuit of the audion amplifier. It should be arranged to work in the opposite direction as ordinarily employed; that is to say, the local circuit should be closed when the armature recedes from the magnet, which is equivalent to saying that when wireless signals are received on an audion detector the resistance of the local circuit of the audion is suddenly increased rather than decreased. The Brown amplifying relay may also be used. Information concerning it may be obtained from the Engineering Department of the Marconi Wireless Telegraph Company of America, 233 Broadway, New York City.

* * *

J. F. W., Roanoke, Va., asks:

Ques.—(1) What are the names of the cities on the Great Lakes that are given in the weather reports sent out from Arlington at night, some of which are the letters DU, CH, F, L, U, V, etc.?

Ans.—(1) This query is covered on page 921 of the August issue of The Wireless Age.

Ques.—(2) Is it a violation of the law to make copies of the weather reports from Arlington and show them to the public, or is it the same as commercial business?

Ans.—(2) We understand it is not and that this information is intended for general use. We cannot see how it can be considered a violation of law to make public these reports.

Ques.—(3) What does Sayville mean when he says "3" (American Morse) "Bi three mins.?"

Ans.—(3) See the answer to E. F. D. V.'s inquiry in this issue. When Sayville says "Bi for three minutes" he means that all ships should stand by for three minutes and tune to the 300 and 600 meter waves for possible distress calls.

Ques.—(4) My aerial has a wave-length of 345 meters. What size condenser can I put in the ground circuit to reduce it to a wave below 200 meters? Can I make it out of photo plates, 5 by 7, with tinfoil between, or can I make it by connecting telephone condensers in multiple and then in series with the ground to reduce the wave? The telephone condensers are of 1 M. F. each.

Ans.—(4) We cannot give you the exact size of the condenser to reduce the wave-length of your antenna to 200 meters because we do not know the capacity of the aerial. Your series condenser should be constructed of 5 or 7 photographic plates. Telephone condensers will be wholly useless.

Ques.—(5) Has The Wireless Age published any articles about the Arlington station, describing the various instruments and giving information as to the type of gap used? If this has been issued can we obtain copies of The Wireless Age containing this article?

Ans.—(5) No article has been published in The Wireless Age concerning the Arlington station. It is equipped with a Fessenden 100 k. w. set in addition to various types of experimental apparatus and also has a Poulsen arc transmitting set. A variety of types of receiving apparatus are in use.

* * *

W. A. C., Cherryvale, Kans., asks:

Ques.—(1) I am making a "loose-coupler" of the concentric cylinder type. Length of winding, 7 inches; outside diameter of primary, 5 inches; secondary, 4½ inches. I expect to use silk covered wire for both. What size should I use for each? Should it be single or double covered? I will use a sliding contact for the primary and taps for the secondary. How many sections should the secondary have? This coupler is to be used with tuning coil wound with double silk covered No. 20 wire. Loading coil wound with single cotton covered No. 20 wire.

Ans.—(1) We cannot reply definitely to this query as we do not know the range of wave-lengths over which you desire to work. For instance, if we knew the size of the aerial with which this tuner is to be used, we might give you a hint as to the wave-lengths to be expected in the antenna circuit. A primary winding of the dimensions you give should enable you to tune to very long wave-lengths with an antenna having a natural period of, say, 600 or 700 meters. If this tuner is to be used with crystal detectors, the secondary winding should be made of No. 32 either single or double covered wire (it makes no difference). It should be about 5 inches in length, with the sections divided up between the points of a 10-point switch. The primary winding should be made of No. 24 or No. 26 wire, either single or double covered. See the article on How to Conduct a Radio Club in the January, 1914, issue of THE WIRELESS AGE.

* * *

J. H. H., Philadelphia, Pa., asks:

Ques.—(1) Will the strength of signals be increased by adding wires to the aerial?

Ans.—(1) A proper answer to this query depends on other conditions surrounding your equipment. Increasing the number of wires in an aerial increases the capacity slightly and the wave-length accordingly, but decreases the inductance and the high frequency resistance. If you refer to the receiving aerial there is no distinct advantage in erecting an aerial having more than four wires.

Ques.—(2) Should the free ends of an "L" aerial be joined together?

Ans.—(2) Yes.

Ques.—(3) What crystals are considered the most sensitive?

Ans.—(3) There is considerable dispute on this point. At present the argument lies between cerusite and galena.

Ques.—(4) Is the perikon detector more sensitive than the silicon detector?

Ans.—(4) If the perikon crystals are fresh they have a greater degree of sensitiveness than the silicon.

Ques.—(5) What is the wave-length of an "L" aerial 30 feet in length and 30 feet in height with a 15-foot rattail?

Ans.—(5) The antenna has, roughly, a wave-length of about 185 meters.

* * *

T. C. B., Ridgewood, N. J., asks:

Ques.—(1) Please inform me concerning the following stations: WCH, WCI, NAZ, WS and DK. They are not listed in the Year Book. I have been hearing DK almost every night for over a month between half past eight and nine o'clock. His spark is musical, but rather shaky, and he seems to be sending in cipher on a wave-length of 600 meters.

Ans.—(1) NAZ is not listed; WCH, Boston, Mass.; WCI, not listed; WS, not listed; DK, not listed. DK is supposed to be one of the British cruisers at present operating along the Atlantic coast.

* * *

C. E. W., Allegan, Mich., Writes:

Ques.—(1) I am having trouble with my set. I cannot receive from any stations outside of town. I think I have as good an outfit as anybody can make. My receiving set consists of the following: Loose coupler, primary 8 inches in length, 5 inches in diameter, wound with No. 20 D. C. C. wire, 20 taps of ten each, 20 taps of one each. Secondary 8 inches in length, 4½ inches in diameter; wound with No. 34 S. C. C. wire; with 14 taps. Condenser, fixed. Telephone receivers of 1,000 ohms. Silicon and galena detectors, and a loading coil of 9 taps wound with No. 20 D. C. C. wire.

My aerial is composed of stranded copper wire. Cables have 4 No. 20 bare wire per each cable; length of aerial is 60 feet; has four wires 30 inches apart; height 75 feet from ground. Ground connection is to the heating system in my room. All joints are tight and soldered. Stranded wire is used throughout. I have heard stations all along the lakes and Atlantic coast with my receiving set when I have had it at another amateur station on a hill a half mile from my station. I am in the hollow, but my aerial is as high as his. I can only hear the amateur stations here in town and not a thing out of town. Where is my trouble? The valley I am in is not over 75 feet deep at its lowest place. The nearest commercial station is about 23 miles in an air line from me. My aerial is an inverted "L"—directional east.

I have had a wireles outfit since 1902 and think I know something about a receiving set. Therefore I can hardly wait to see what you will suggest to remedy my troubles.

Ans.—(1) It is rather difficult to answer why your outfit does not work in its location, but apparently the valley has an intense shielding effect on your aerial even though it projects into space as high as the aerial at your friend's station. Are you sure you have a perfect earth connection at your station? Your receiving tuner is very large indeed for receiving the signals from commercial stations working on a wave-length of 600 meters. Because of lack of knowledge of local conditions we cannot answer more definitely.

Ques.—(2) How large a condenser will I need for a 20,000 volt 1 k. w. transformer, using a rotary gap, wheel with 12 lugs, 4¾ inches center to center, or 2⅜-inch radius? Speed between 2,200 and 2,500 R. P. M. Current supply 110 volts A. C.

Ans.—(2) The capacity of the condenser to fit should be 0.01 mfds. This may be conveniently constructed by coating five plates of glass 14 inches square with lead-foil 12 inches by 12 inches. The glass should have a thickness of about ⅛ inch. If you desire to use series parallel connections and avoid the possibility of puncture due to excessive voltages, you will require ten plates in parallel in each bank and two banks in series. You will still have the same capacity, but the strain on the plates is reduced one-half.

Ques.—(3) Please tell me if a "loose-coupled" helix of the following construction would be "O. K." for the 1 k. w. transformer: Primary copper ribbon 3-32 inch thick by ¾ inch in width, wound pancake style, outside turn 11 inches; diameter of inside turn 3 inches; spaced ⅝ inch apart; seven turns: secondary copper ribbon 1-16 inch by ½ inch, spaced ¼ inch apart; outside turn 13 inches in diameter; inside turn 3 inches in diameter. The coupling is variable. My transmitting set is connected with heavy stranded copper cable.

Ans.—(3) This construction is entirely suitable if the spark gap is not open too far. If widened out, abnormal sparkling may take place between the turns of the primary winding.

* * *

L. H., Bennington, Kans., writes:

Ques.—(1) I met with failure in building a condenser of twelve 8-inch by 10-inch glass plates to each section or bank. The method was to place the foil in position on the first plate, the second plate, coated with orange shellac, being placed with the coated side down over the tinfoil on the first plate, and this operation being repeated throughout until the bank was completed. The shellac dried around the edges of the plates, preventing alcohol, used as a solvent for the shellac, from escaping from between plates, so that when high tension current was applied the plates cracked and were ruined. Please tell me how I should have built up the bank of plates.

Ans.—(2) Your method of construction is quite incorrect. Each plate should have been covered on both sides with tinfoil. The best method is to first coat both sides of the glass with beeswax or paraffin, placing them in an oven until the coating is thoroughly melted. The tinfoil should then be carefully pressed into position and placed in the oven for a moment. It should then be removed and when thoroughly dry given a good coating of shellac over the entire surface. A good grade of fish glue may be used for the first operation in place of the hot paraffin or beeswax. Numerous articles have appeared in The Wireless Age from time to time showing the method of construction of condensers. After the plates have been built up individually as suggested, they should be piled up in orderly fashion and simply taped together with ordinary friction tape. Lugs for connection are of course brought out from either side of each plate.

Ques.—(2) Please tell me the difference of transmission range between two transformers, each of 1 k. w. in-put, one delivering 10,000 volts and the other from 20,000 to 30,000 volts, condenser capacity and other conditions being the same.

Ans.—(3) For efficiency, the "condenser capacity and other conditions" cannot be the same; that is to say, with a change of voltage there should be a change in the capacity of the condenser. If the condenser capacity remains the same and the voltage is increased, the number of watts consumed by the secondary winding and condenser will be increased as the square of the voltage. This is readily understood from the following formula:

$$W = C V^2 N.$$

Where W = the number of watts C = the condenser capacity in microfarads.

V = the Kilo-volts of the transformer.

N = the cycle frequency.

Suppose then we had a capacity of 0.01 mfds. and a cycle frequency of 60 at a transformer voltage of 10,000; then the transformer and condenser consumes 60 watts. If, however, the voltage is raised to 30,000, by the same formula the watt consumption will be 540 watts. (This formula is based on the assumption of two sparks per cycle of current.) It cannot be stated definitely what increase of range could be expected with such an increase of voltage, for if the transmitting set was originally designed to be operated on a voltage of 10,000 with a certain value of capacity and the voltage was increased to 30,000 an abnormally wide spark gap would result. This would cause a very high decrement in the oscillatory circuit, and, therefore, even though the amount of power is increased, the advantage expected would not be experienced.

Ques.—(3) Please give explicit instructions for trussing a 120-foot mast 10 inches by 10 inches at center, tapering to 5 inches at either end, built up of planks one inch thick, spiked one on top of the other. Will it be necessary to use more than one set of guys which I have planned to be placed at the top of the mast?

Ans.—(3) We prefer not to truss a mast of this design. We see no necessity for it. With a good set of strong guys on the top and a lighter set at the middle, the structure should be self-supporting. A little more detailed explanation of your proposed design would not have been amiss and would have enabled us to answer more precisely. To lay out a complete set of designs for a mast for your purposes would require too much space. We believe you will find it less expensive to erect an ordinary wooden mast of standard flag-pole type of construction.

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A. L. G., Brooke, Va., writes:

Ques.—(1) For a few days about July 23rd I heard a station testing "V" on a very long wave-length (longer than that used by Glace Bay). The operator would start testing on the hour, continue about 30 minutes and finish by making CN and WII several times. Can you give me any information as to who WII and CN are and the wave-length used? The signals were quite loud and the spark was as pure as I ever heard.

Ans.—(1) WII is the Marconi high power trans-Atlantic station at New Brunswick, N. J. CN is the corresponding station at Carnavon in Wales, England. The wave-length used at New Brunswick runs up to 16,000 meters.

Ques.—(2) When do you expect the new Marconi trans-oceanic stations to be in operation and what is the wave-length to be used by the one at New Brunswick and in England?

Ans.—(2) These stations will be put into service as soon as completed. The final wave-length at New Brunswick and Wales has not as yet been determined.

Ques.—(3) When WSL is sending "press" on 2,800 meters I can also copy him on 600 meters. The signals are not very strong, but the spark seems to be higher than that used on the regular 600 or 2,800 meter adjustments. I am about 250 miles distant from WSL and cannot account for this unless the waves of WSL are absorbed by some other station in the vicinity of WSL, tuned to 600 meters and re-radiated; but as this does not occur at other stations I imagine this theory is wrong. Can you explain?

Ans.—(3) This has been noticed at many stations on the Atlantic coast. It is probably due to the fact that when the large set is being used at Sayville, the smaller antenna employed for ship work is forced into oscillation, due to its proximity to the large one, and a second wave having a period of 600 meters is radiated; or again the mast stays at the Sayville station may be thrown into excitation and re-radiate energy at a wavelength of 600 meters.

Ques.—(4) When NAA and NAR are striking noon time signals I often tune so as to hear them both. In all cases NAA's signals are apparently a small fraction of a second in advance of the signals from NAR. What is the cause of this?

Ans.—(4) This is due to the sluggishness of the relays used in the land lines and has been noted at many points on the Atlantic coast. It takes a certain time for the movement of the armature of the various relays, and if not in first-class adjustment they are apt to lag behind one another during the sending of the time signals.

* * *

J. T., Stone House, N. Y., asks:

Ques.—(1) What is the wave-length of an aerial 160 feet in length, 50 feet in height, composed of 6 wires with two lead-ins 50 feet in length?

Ans.—(1) The wave-length of your antenna is approximately 325 feet.

Ques.—(2) Is it possible to have a satisfactory earth connection by simply placing wires along the ground on rocky land?

Ans.—(2) If sufficient wire is laid on the earth efficient results will be obtained. This surface ground, however, should have a very large area, which may be made by laying a network of copper wires over the rocks.

Ques.—(3) How can I secure a ground sufficient for lightning when the nearest moist earth is 500 feet away?

Ans.—(3) If your "surface" ground has sufficient area to handle the energy of a fair-sized transmitting set it will also have sufficient capacity to handle lightning discharges. If it is desired to take extra precaution in this respect, in addition to the surface ground, a wire may be led to an extra earth plate terminating in the water.

Ques.—(4) Does the aerial need to be above the surrounding trees in order to transmit signals?

Ans.—(4) Better results would be obtained if there were no trees in the immediate vicinity of the station. If, however, these obstacles cannot be avoided, it would be preferable to have antenna erected at some height above the trees.

Ques.—(5) Will an iron pipe mast affect the receiving range of the station provided the aerial is well insulated?

Ans.—(5) It will not have as disastrous an effect upon the receiving range of the station as it will upon the transmitting range. Undoubtedly losses are incurred through this form of mast and it is preferable to insulate the iron pipe mast at the base. If, however, this cannot be conveniently done, then the antenna should be swung out at a considerable distance from the mast so that the incoming leads are not parallel with the mast.

* * *

C. V. S., Indianapolis, Ind., writes:

Ques.—(1) In the August issue you describe a multiple tuner. I wish you would explain it a little more fully as I do not understand how the coils work; that is, whether they slide inside one another or remain in a stationery position.

Ans.—(1) We believe that this was fully explained in the article accompanying the drawings, and a careful reading of it should make the operation clear. Winding G should be made on a form so that it slides inside of D. Winding A may also be placed inside of E or on the outside of E. If G and A are so placed that they may be turned at right angles to D and E respectively, you can readily understand that the degree of coupling is thereby easily altered. Just how near these windings should be to one another depends upon the value of coupling you desire to use. You should thoroughly understand that windings D and E shunted by a variable condenser, F, constitute an intermediate circuit, the wavelength of which is varied solely by condenser F. This circuit is for the purpose of producing selectivity and is interposed between the primary winding G and the secondary windings, A B C.

FROM AND FOR THOSE WHO HELP THEMSELVES

(*Continued from page 59*)

Regarding the detector used: If the audion detector is used, several variable factors exist which by a slight change will destroy the maximum sensitiveness. E is the symbol used for voltage. E_1 and E_2 refer to the batteries in the telephone circuit and to feed the lamp's filament. Since some audions are equipped with two filaments, it is desirable to know whether it is the left or the right filament; hence L or R.

In order to prove further that the record is a good one, we may take the power in watts and the distance. Then we can calculate the watts per mile (W. per M.). This factor will often tell when a person is doing good work.

Many other characteristics could be added, but this table has proven very useful for the accompanying circuit.

L. R. Jewett, Massachusetts.