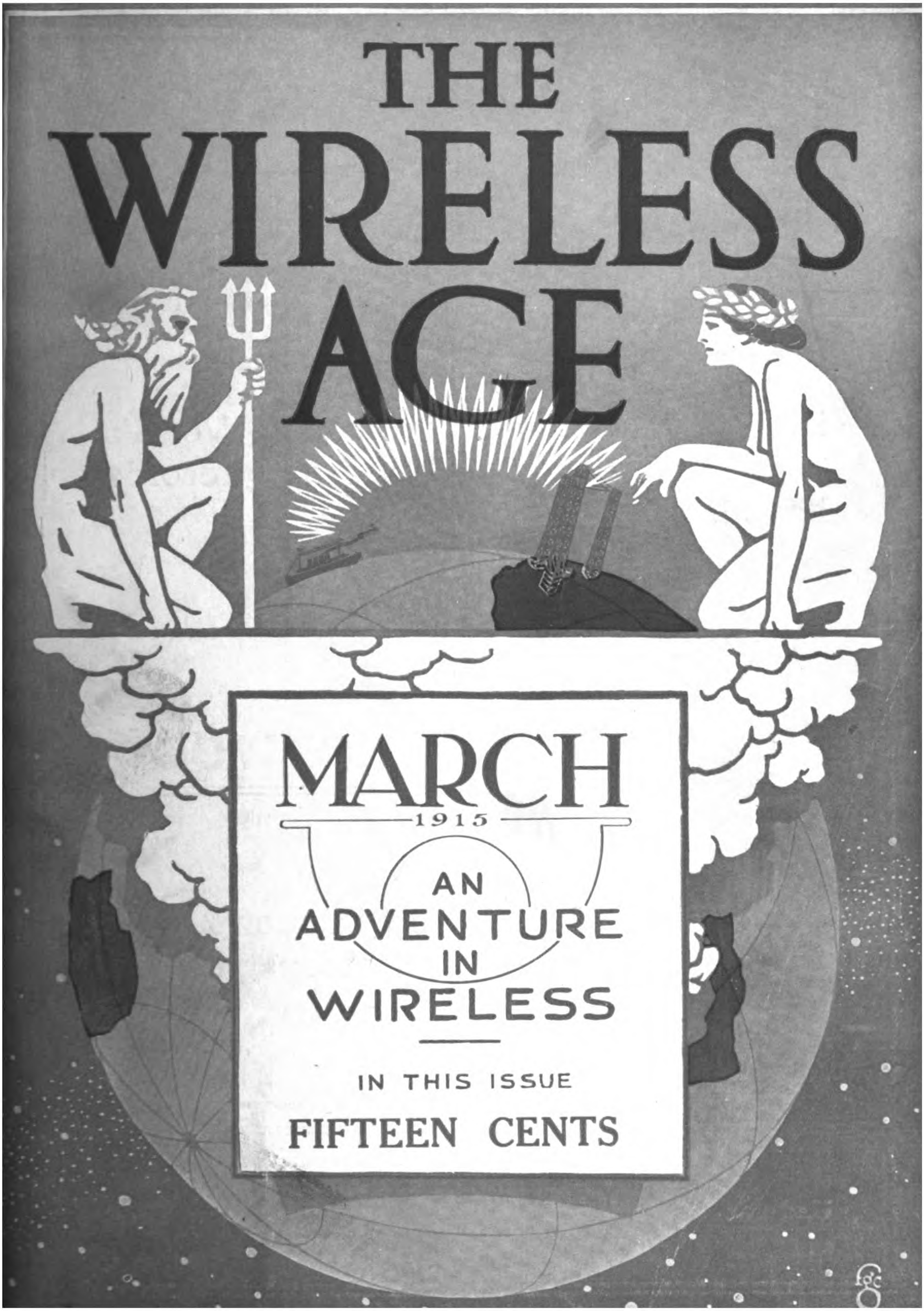
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MARCH
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RADIO COMMUNICATION

Incorporating the Marconigraph

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

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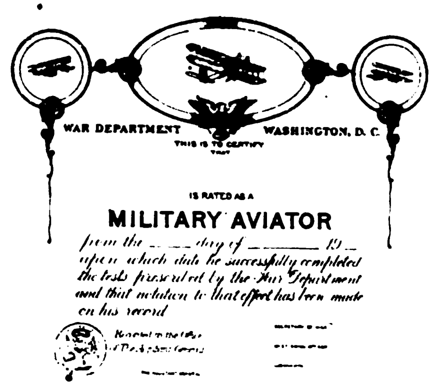

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THE WIRELESS AGE : : : : **450 Fourth Ave., New York**

THE WIRELESS AGE

MARCH, 1915

The Ownership of Wireless Equipment

¶ Should Steamships Own Their Equipments?

¶ Government vs. Private Operation

An Open Forum With an Introduction in Two Parts

Thinking, and even believing, is very far from knowing. Every thinking man does a certain amount of guessing. Particularly is this true when what we term a "popular" subject is under discussion. Opinions expressed—presumably based upon knowledge, exact, or very nearly so—often bring to the exponent a later realization that half of the substance fostering the expression was drawn from inexact knowledge, guesswork.

When conviction has been carried to hearers by this method it is almost inevitable that the speaker appraise his guess above its true value. The statement has not been disputed: it naturally follows then that the shrewd conjecture must have been a working example of a fact. The higher a man's intelligence the quicker he will recognize many instances of this kind. Offhand it may be considered that this is a harmless practice, hurting no one and adding interest to social intercourse. But it cannot be disputed that where opposition based upon exact knowledge is not encountered the speaker may sometimes convince even himself, temporarily; his conjecture may become a conviction representing his attitude on the subject.

This is one of the weak points in open discussion of an informal nature.

And that brings us to our present subject. To the best of the writer's knowledge the pros and cons of corporate or individual ownership of wireless equipments have thus far occupied the attention of interested individuals only in an incidental way; as part of business negotiations, perhaps, or a subject introduced in a social or sociable gathering.

This does not conform to the importance of the subject. If the proper co-operation can be secured THE WIRELESS AGE purposes a permanent record on the question, one which may be examined at leisure and the merits and demerits of both sides weighed carefully for the definite conclusion that lies in fact.

From the frequency of its informal discussion the topic should prove a live one. It is one of importance far above idle controversy, for it is a dollar and cents issue with steamship owners the world over and a factor to be considered in the projected American Merchant Marine.

It is hardly possible, and if possible scarcely desirable, that discussion of the subject be covered entirely by the staff of this magazine. Opinions and suggestions from outsiders are invited, wanted and needed to make this series what we wish it to be: a symposium of national significance and representative of the many interests concerned.

Part I.—Should Steamships Own Their Equipments?

WHEN a Parisian decides that he wants a telephone installed in his home he goes to a manufacturer and buys the instrument that suits his fancy. Then he makes out an installation application on a certain prescribed government form, affixes the stamp tax, secures a written authorization from his landlord, pays at the rate of about twelve cents a yard for underground wiring, twenty to fifty dollars for his instrument, twenty dollars for the first quarter's rental, another deposit for possible long distance and telegraphic tolls—and waits a week or more for someone to come and connect up the instrument. Perhaps the Frenchman's pride of possession compensates for the inconvenience and expense—but there are ten times as many telephones in the United States as there are in France!

In this country we get better service and better terms by renting our telephones; none of us have any desire to purchase our own instruments. Yet in wireless telegraphy there are users who believe something is to be gained through individual ownership of installations.

A Distinction Without A Difference

The telegraph and the telephone—our most familiar means of communication—are owned and operated by big corporations. Buying an individual telegraph key for the commercial man's personal use is an unthought of procedure; purchasing individual telephone instruments would be considered nothing short of folly. In this country we pay for our telegrams and they are sent; we use our telephone, get a bill for rent and tolls at the end of the month and there are no repair charges added at the end of the column.

With the wire telegraph and the telephone there can be no question that corporate ownership is the better plan. Are there any good reasons then for wireless coming outside the pale of procedure existent in other communication systems?

There are advocates of individual ownerships of wireless equipment, there are steamship companies which have purchased apparatus outright; there are others which now rent and have tried both; and still others mentally see-sawing between respective advantages. On the other side, there is the Marconi Company, which stoutly maintains a rental policy is the only one. It should be of interest to determine which is the best proposition.

A single wireless instrument is of course valueless; only as part of a system of other communicating links is it of any service. It follows then that the individual equipment must be considered in its full relation to other units which make possible the transmission and reception of coherent intelligence. The individual user, therefore, whether renter or owner, leans heavily on an organized whole. This we call a commercial wireless system.

That this system exists today and makes possible "messages received for transmission to all parts of the world"—to quote the familiar Marconi sign—is unquestionably due to the one condition which some have though irksome: rental of apparatus, instead of sale.

Suppose that quick profits had been looked for in the beginning and the building up of an organization considered a too laborious method of establishing a new and strange art—where would the individual owner be today? The apparatus on his steamships would be hopelessly out of date, and—on the supposition that progress ceases when profit ends—struggling along with coherer jamming when in crowded waters. Either that, or wrecked long since by unskilled hands.

What A Basic Business Axiom Accomplished

Upon Marconi's early established and maintained general policy of renting rests the steady growth in number and efficiency of shore stations to communicate with ships and improvements in the latter type of instrument that could never have come without constant supervision over its own property. With a sales policy it would have been much as if a man built a house in a wilderness and neglected to provide a communicating highway to the civilization center. Neighbors might have been secured for the new owner by selling other houses in this wilderness, but the purchases of all would be of little value without an easy means of communication with markets and bases of supply. A neighborhood of ships connected by ether-wave paths over the watery wilderness would have followed the direct sale of equipment, but each neighbor would have been of service to the other only in cases of emergency. The connection to the shore, to the bases of supply, was only made possible by the rental feature; and it was this shore connection that made wireless indispensable.

Perhaps the land connection might have been possible without the commercial company; the owners of the steamship equipments instead providing the funds?

Look to the wilderness community simile for the answer: Would the individuals subscribe to, build and maintain an expensive communicating link if the past had known none? if it required years of organized effort to make the public use it, and the public doubted that such a means existed? Add the final obstacle, that the individuals themselves knew nothing of construction and operation and it is readily seen what small chance there was for widespread communication ever being realized without a rental policy to pave the way to profit.

Trying to Steal a Ride on Progress

Wireless telegraphy owes its present commercial utility solely to one thing: the basic business axiom laid down by Marconi, that apparatus should not be sold and the owner left to work out his own salvation. Technical development, world-wide usage, uniformity of operation—everything that the art stands for today—find their foundation in this policy.

The ship owner of former days, had he purchased an installation outright, would have awaited the pleasure of some shore station to take his message, or it would not have been taken at all. Government regulation, the compulsory opening of shore stations to ship traffic—all this is new, less than four years old. When the Berlin Convention opened the doors to all, so to speak, steamship owners were asked to buy various types of wireless equipment. The individual ownership advocates had spent nothing to organize a system of world-wide utility, it looked as if patent license fees might be avoided by a few slight changes in construction, responsibility ceased when a sale was consummated, and with no allowance made for the expense of keeping the installation in continuous working order, an outright purchase figure could be made very attractive to the steamship man who neglected to consider operation expense and maintenance. The Marconi Company meanwhile had found the established rental rate unprofitable and sought to raise the figure. This other apparatus thereupon found some buyers, although the greater proportion of owners stood the raise.

A Surface Asset Becomes a Liability

At first glance the sales proposition may look like a good thing. Thus: A situation arising whereby the law has opened up communication to all, the outright purchase of an individual instrument from some independent manufacturer theoretically saves a certain proportion of the tolls. The charges on a wireless message being divided three ways: ship tax, coast tax and land line forwarding charges, ownership of the ship installation should permit a figurative pocketing of the ship tax proportion of the tolls.

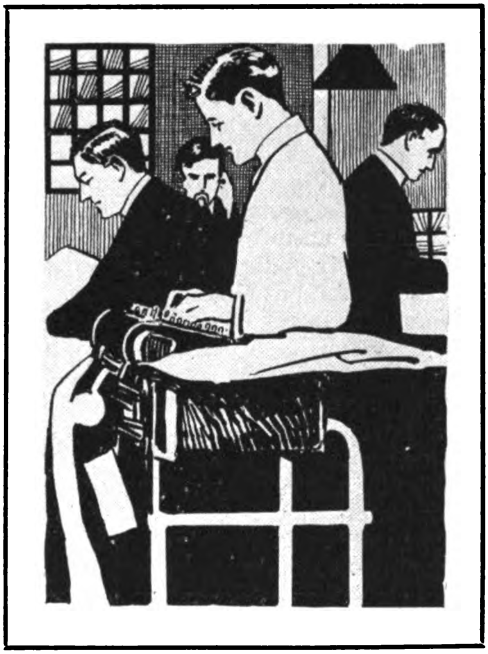
The natural conclusion is that if a sufficient number of messages can be secured from passengers considerable money might not only be saved, but some made.

But to offset the theoretical profit is a material expense. Every message transmitted calls for an accounting with the wireless company owning the shore station and the telegraph company which forwarded the message. Skilled clerical labor being necessary to do this, prospective profits from the ship tax proportion of tolls dwindle and. on small scale operation, paid communication becomes a liability instead of an asset.

To comply with the laws that govern public communication systems certain records must be kept. The sender of a wireless message fills out a blank, pays the charges and considers the transaction completed when the message has been transmitted and received. But the agency or organization which makes this possible has to keep records, apportion the charges and effect the distribution, adjust possible discrepancies in international accounting and follow up the simple task of delivering a message with the clerical work which is inevitably associated with any business drawing its revenue from the general public.

Some idea of what this detail comprises may be gleamed from the supplies carried by a Marconi ship operator; these include: abstracts, message blanks, proces verbal (or log), inspection report, cash statements and vouchers and requisition forms. Many permanent records have to be made and forwarded regularly to headquarters if continuous and satisfactory communication is to be expected.

Take what appears as the simplest part of the transaction, the message itself. Aside from the seven special classes of wireless messages, there are thirteen regular classes, or twenty in all. The regular messages comprise: ordinary paid message for delivery, ordinary paid message for re-transmission, government message for delivery, government message for re-transmission, master's service message for delivery, master's service message for re-transmission, franked message for delivery, franked message for re-transmission, press message for delivery, press message for re-transmission, telegraphic service message for delivery, telegraphic service message for re-transmission and ocean letter. Messages received from coast stations as well as those from the public must be written on the proper form and instructions and data properly filled in. When rates vary for different routes or various routes are available at the same rate the operator must arrange with the sender which shall be employed. He must know which countries do not admit code or cipher messages and the restrictions when they are admitted, must be able to distinguish between code words and combination words and make the proper charges; he must also be able to determine the separate charges for mixed messages of plain language and code and plain language with cipher groups. Without these classifications wireless message traffic would become hopelessly confused.



The necessity for uniform regulation becomes immediately apparent when ordinary conditions at sea are considered. If shipowners were possessed of their own plants and worked them when and how they willed the possibilities for efficient communication would be extremely small. Government regulation might control matters in crowded waters, but there is no government control that could be effective in mid-ocean. And on board ship there are no telegraph superintendents to whom an appeal may be made when in difficulties. The captain, too, for obvious reasons could not be expected to exercise supervision over this complicated branch of ship service. A central office or headquarters is an absolute necessity and fundamental economics leaves no question whether this should be under one control or scattered about the numerous shipowners' offices.

Unorganized communication between ships under the same ownership might be accomplished successfully, but what of communication between ships of rival lines or different nationalities? Without an international organization such as the Marconi Company the language difficulties, the widely varying customs of countries and nationalities and the differences in ideas of responsibility and discipline could never have been brought under control. The regulation of ship traffic by the various Marconi companies established in each country has built up a system of international clearing houses, expediting the exchange of wireless messages, simplifying the accounting, insuring uniform working conditions and materially reducing the expense of conducting the business as a whole. The universal character of present-day wireless communication could never have been possible if these matters had been left in the hands of competing steamship lines, nor would they be conducted as well or economically if controlled at this late day by a shipowners' organization or under international government direction. Increases in staff and working expenses would necessarily follow any other plan than the present corporate control, the burden falling on the public and shipowners.

The steamship owner who elects to purchase wireless equipment outright must first perfect an organization to carry on the business properly. Whether his fleet be large or small the executive head of the wireless department must be possessed of administrative and technical knowledge, understanding thoroughly the conduct of this method of communication in all its ramifications. The salary of this department manager is the first added item of expense.

Details That Multiply Expenses

Since it is obvious that the owner of one, two, or three ships could not reasonably expect by outright purchase to effect any appreciable saving—even a theoretical one—over rental charges it at once becomes plain that the manager's time would be exhausted by preparing regulations for the ship operators, acquainting them with new traffic methods and government requirements, issuing communication charts, supervising cash accounts and message apportionment of tolls, recruiting efficient operators and providing for eleventh-hour desertions and vacancies through illness, adjusting complaints with government inspectors and refund claimants on undelivered messages, effecting settlements with foreign ship and shore stations and supervising staff requisitions, salary and bonus requirements.

No time could be devoted to inspection of apparatus and determining what is necessary for proper maintenance. At least one assistant would be necessary to attend to this branch of the work and he would have to be an engineer or a practical man of wide experience. Thus a second salary expense would be incurred.

Where the ships visited foreign ports arrangements would also have to be made for inspection and repairs there, for which, of course, adequate payment would have to be made to some organization.

By employing only operators with engineering training these inspections might be done away with, but the saving would be absorbed by the added expense on the operating payroll.

Another expense, and a very material one in some cases, would be the charge for master's messages relating to matters of navigation. The ship which owned its apparatus would have to pay full message rates for every communication with vessels of other lines, both for direct working and for re-transmission. This would also apply to shore stations not under the same individual ownership.

Various other items of additional expense might be included here, but the ones just instanced will serve to determine that, taking it by and large, the passenger carrying vessels are better and more economically served by paying a flat rental sum. Aside from the investment of considerable sums in outright purchases, the expenses of inspection and repair, administrative salary charges, carrying reserve operators, depreciation and similar considerations, inharmonious working is a factor which would have to be given grave consideration both for the public's protection and owner's satisfaction. Under the Marconi Company's control, the burden of these problems is lifted off the shipowner's shoulders and universal wireless communication made practicable by an executive staff having the experience which qualifies it for the task.

Since many of the disadvantages originate with passengers' messages, it would appear that the cause of outright purchase is materially benefited where passengers need not be considered. Cargo vessels, for example, have the problems considerably simplified, it might be advanced. Government regulation is not so exacting, message accounting needs little consideration and expenses may be kept down in administrative quarters. But, as with the other types of vessel, depreciation and master's service messages still remain, inspections and repairs must be made and the supply of operators provided for.

The Rule Applied to Freighters

Service is the one vital consideration in the freight carrying trade. The value of wireless equipment lies in keeping owners and captains in touch with each other, saving perishable cargoes by quick relief and permitting changes in destination to take advantage of favorable market conditions. Association with organized operation and its efficient service thus becomes a particularly valuable asset.

Mention of cargo vessels serves to recall another condition which the individual ownership advocates must not overlook, whether the equipment is for cargo vessels or for passenger ships. Marconi is the inventor of wireless telegraphy and apparatus of other manufacture may involve the purchaser in legal complications.

Illustrating this point is the recent utterance of Judge Hough, of the United States District Court in New York, which forced a prominent steamship company to discontinue use of infringing apparatus and turned these shipowners to reinstatement of Marconi equipment on term contracts at the raised rental figure. When the Marconi Company had represented to the court that it had acquired and was now maintaining a large number of shore stations and that neither the competing wireless company nor the steamship owners had contributed to their cost Judge Hough maintained that the apparatus purchased was a deliberate attempt to evade patent rights and, furthermore, the Marconi Company's raised rental figure was a reasonable one. The opinion informed the co-defendants that the defence had taken "an infringing set of apparatus and so arranged or co-ordinated it as to avoid infringing."

Buying other apparatus then generally means trouble of more kinds than one; a long series of Marconi patent victories has well sustained the validity of this company's rights, and purchases from other manufacturers are almost certain to result in a court decision unfavorable to the steamship owner. Judge Hough indicated decided disapproval of such purchases in these words: "I am convinced that down to the present time the expense of operation (and of litigation) has been so enormous that complainant (Marconi Company) has received no fair return from the invention which under decisions now ruling I must hold to be of the greatest value and worthy of praise and reward."

Then it was noted that the defendant steamship company by law was "not bound to have wireless apparatus on its ships; it wants that apparatus for its own safety and profit, and I cannot say, and indeed do not think, that a hundred dollars a month is too much to pay for a device without which it is matter of common knowledge that the insurance premiums on a large and laden vessel would be greater by more than the amount of complainant's fees."

These pointed remarks from so high an authority cover a side of the question to which intending purchasers seldom give the proper reflection. Marconi created wireless and a wireless system; the company which bears his name is the rightful recipient of reward acknowledged by the courts and the people. With the Marconi rental charges upheld as reasonable the steamship owner is confronted with a question of ethics which is aside from the discussion of theoretical and actual profits obtaining by his outright purchase of infringing equipment. American men may have the bargaining faculty highly developed, but there are few that care to lend their names to a commercial transaction which might bring them in line for a bench denunciation as co-operators in questionable business practice.

Dollar and cents considerations are not the only ones in the subject under review, however. The humanitarian aspects of wireless telegraphy are deserving of mention in their very tangible relation to an art which echoes the modern commercial slogan: "safety first."

As an aid to navigation wireless has become indispensable, as a means for saving life and heavy salvage charges its performances are monumentally noteworthy. So many and so familiar to all are the striking instances that bear out this statement, the only mention that need be made in this connection is of the significant fact that wireless—Marconi wireless—has never failed. The apparatus has always been reliable, the men dependable.

Marconi men have never failed.

There is a world of meaning in that five-word sentence. Appreciation of the wireless operator's devotion to duty has been recorded graphically in many great ocean tragedies, but the records of those silent heroes who continuously rise to emergencies and are overlooked because a mishap has a successful outcome only serve to accentuate the universal readiness of every man in the service. What is known among operators as the Marconi Tradition was created and exists in preparedness. Thorough training is another benefit accruing from a rental policy.

Individual ownership of equipment would not permit the proper preparation of men to man the wireless keys. Key manipulation proficiency and mechanical training which might be acquired in general educational institutions could not include the thorough drilling in procedure for all contingencies and the exhaustive study of telegraphic duties and ship's discipline which is made a special feature at the Marconi School. With the constant change in regulations and new conditions arising in a transitory art, the proper training can only be secured through instructors of wire experience and in immediate touch with the practical developments which determine these changed conditions.

Of equal importance with the initial preparation is the system of distributing new regulations and operating information to those in active service. The Marconi Company distributes hundreds of new orders in the course of a year and thus covers an important detail through which the individual owner avoids the possibility of costly violations and is assured of uniform and efficient service.

Granting that the individual owner might have in his employ an official with the proper experience to determine the fitness of operators it is at once apparent that a cursory investigation and a license secured through more or less stereotyped examinations is not so reliable a guide as the long period of observation while the applicant is attending the Marconi School. Nor could the necessary reserve of available operators be otherwise maintained without considerable added expense to the individual owner.

Viewing the Problem on Human Aspects

The landline telegraph operator may be recruited from any class or age since the primary requirement is speed and accuracy in disposing of messages; a boy on a farm may by code practice alone acquire equal dexterity with the student in a telegraph school. In wireless telegraphy, however, the skilful key manipulator is far from being an efficient operator. Knowledge of his apparatus, the circuits and the elementary principles of electricity are required by law and employer. Where preparation requires constructive study it is safe to assume that imagination will be aroused, and with it, ambition. It is true that there are operators attracted to wireless service solely by the romance of the sea, and these are the ones that make a reserve supply a daily necessity, but the steady plodder toward the definite goal of ambition is representative of the majority and to this class must be credited the efficiency essential to the industry. The individual owner of equipment could not hold out the inducements that the worthy material find in an organization like the Marconi Company. The ultimate reward in the service of the shipowner would be employment as expert operator, for although executive positions might be won later in the steamship offices, wireless operating efficiency would not be the determining factor. In the Marconi service the operator has ever before him opportunities to qualify for promotion to positions of manager of a shore station, chief operator, inspector, engineer, traffic official or division superintendent. That the men filling these positions today have come up from the ranks in a few years serves to spur the operator's ambition and increase his efficiency.

To secure the same efficiency without these future prospects it is at once evident that the individual owner would have to establish initial salary compensation at a material advance, and this of course means added expense.

The operator problem is a tremendously vital one in wireless service and finds its logical solution in organization based upon long experience.

Replacing Old Equipment with New

Earlier in this article passing reference was made to the improvement in apparatus effected through the Marconi rental policy. Every so often those who are not familiar with the many details which in combination make up an efficient wireless service are moved to criticise all apparatus that does not include every refinement of the moment. When the design of the equipment on one ship is compared disparagingly with another because it is not the very latest production, the wireless service is not being considered—type and power of single installations do not constitute wireless service.

Unquestionably the latest equipment is desirable, but it is not always practicable to supply it. A good wireless set costs a considerable amount of money. Improvements are made not only from year to year, but from day to day. It is not to be expected that with every new development the Marconi Company can afford to replace equipment which is giving satisfactory service. The individual owner would not do this, nor would he consider it necessary to give the older apparatus the minute inspection and careful attention which the Marconi inspection system makes a matter of routine. A steamship man looks upon wireless equipment from a business standpoint; if he owned it by outright purchase and it complied with government regulations and was giving satisfactory service the announcement of some little improvement wouldn't be sufficient to make him discard it for a new and expensive set.

Individual ownership of equipment would not only have retarded the progress of the art, but would have lowered the standard of apparatus. Many steamship owners who were not required by law to install an equipment would have considered the heavy investment represented in initial purchase and have decided to get along without wireless. Others who were affected by the regulations and whose business was conducted on a small scale would purchase the minimum equipment necessary to comply with the law and view it as they do lifeboats, adequate for present use until the inspectors notify them differently.

The Reason for the Weeding-Out Process

The other side of the question reveals the Marconi Company making every effort toward continual improvement in service and equipment. Scores of new devices and alleged inprovements are being constantly examined and tested, discarded and adopted, according to proofs of efficiency. It is a business proposition; a service organization depends upon its reputation for continued patronage and would find it poor economy to continue with apparatus obsolete or inefficient when the whole system may be benefited by the gradual substitution of improved equipment.

Humanity's Debt and the Obligation

Having confined this preliminary discussion thus far to considerations of expense, convenience and utility to steamship owners, a thought or two on another phase of the rental policy should be acceptable. There is no deprecating the value of wireless, nor humanity's debt to Marconi. The organization which has been built up about his name and efforts is deserving of proper financial reward. Otherwise there can be no gratitude, nor, indeed, can there be any spirit of fair play. Those who showed their early faith by lending financial support, too, are entitled to a fair return on investments and the more permanent income represented in rental policy is the only one which can make this possible. Both inventor and investor have been extremely patient through a long series of court proceedings arising out of the cupidity of frenzied financiers and their get-rich-quick exploitation of wireless telegraphy. It has taken many years and many dollars to have the validity of Marconi's claims upheld by courts in all countries, and clear the field for proper development. Meanwhile, the parasites have been dissipated, some to jail and others to oblivion. But at what cost to progress!

Fifteen years ago the Marconi Wireless Telegraph Company was incorporated in this country and for the first three years of its existence so tied up in patent litigation that commercial advances were out of the question. In 1902 but four shore stations and four liners were being operated with the American equipment. Two years later only two ship equipments had been added, and up to three years ago there were operated but ten land stations and fourteen ships, five of which were yachts. Continuous patent litigation and competition at ruinous contract rates from wireless telegraph companies organized for looting had arrested expansion up to this point. Then the bankruptcy courts and the federal authorities closed in on these competitors, and clapping their moving spirits into jail left the field free for proper development.

In the three years which have since intervened the American Marconi Company has increased its ship and shore stations until the total now reaches approximately 500. Including the new trans-oceanic plants recently completed there are now 62 shore stations fully equipped, and messages transmitted in the course of a year run into millions of words.

The successful operation of a system of this magnitude and the advantages of international affiliations of equal strength have made the Marconi Company of to-day a great commercial institution, worthy of the boon to humanity it represents and typifying progress and ultimate reward to the loyal supporting public.

With its rental policy proven economical, its charges fair and equitable to steamship companies, and its service reliable, there can be no question that ship wireless equipments are better operated by one control than by individual ownership.

PART II—GOVERNMENT VS. PRIVATE OPERATION

SHORTLY after the conception of these initial articles a member of the editorial staff of The Wireless Age made a short sea voyage in an unofficial capacity. During the trip he engaged two fellow passengers in conversation and without any suggestion from him they gradually led the general discussion of timely topics around to a consideration of wireless telegraphy from the public's viewpoint. The magazine man did not disclose his identity or his connection with the subject under discussion. Except where pressed for an opinion he remained silent, content to add a word here and there when by supplying a trifling bit of information new impetus was given to what later developed into a controversy.

The two ship acquaintances were representative men. One was the sole owner and manufacturer of a widely known household specialty, the other a special investigator for a financial reporting agency.

Once the romantic and humanitarian aspects of wireless had been disposed of the talk took on a more commercial tone and the usual dissection of communication processes followed. The manufacturer was of the distinctly modern type, aggressive in problems of marketing, an experienced campaigner and an unusually deep student of production efficiency. The other was of a more judicial turn of mind with a broad appreciation of commercial factors by virtue of his calling.

In time they began to speculate on the effect of legislation on commercial wireless business and hazarded an opinion or two as to whether the effect was good or bad. They came to a deadlock finally when the manufacturer heatedly exclaimed: "I suppose it is the same with this business as it is with any other—too much Congress! Business should be let alone in this country. We make laws too fast. Granted that in the past a few big corporations abused privileges, does that mean the public mind should be filled with apprehension and every manufacturer be suddenly confronted with the fact that it's costing him more money to get business than ever before? Half of this commercial uplift is misdirected. Sanity in law-making is what we need.

"Busniess is dull. Why? Not because of the war. My factories are running night and day. But I am not making the legitimate profit. And simply because the Government is trying to run my business!"

The other did not agree with him. He believed big business did not suffer through supervision from Washington. And as the first speaker was equally positive that the benefits were over-

shadowed by the damage done, the argument waxed hotter and hotter. They were both strong men and staunch supporters of their respective opinions. Denunciations became more violent and suggested remedies more radical as they plunged deeper into the subject. Then, as suddenly as it had begun, both stopped short in the midst of the controversy. The slow smile that spread over the features of one was reflected in the face of the other.

"We have drifted rather wide of the mark," began the agency man, "you know, we started out to discuss wireless . . . Now here is a business in which I believe Government supervision, direction—ownership even. . . ."

And he went on to review what he considered the merits of federal control of wireless, along with the telegraphs and telephone. At first the manufacturer did not agree with him. Gradually, however, he recapitulated and under the other's tuition began to see positive benefits—not for his business of course, but, when he stopped to think it over, "quite a logical thing for wireless."

This, to the silent wireless man, was a truly amazing expression. Less than an hour before a highly intelligent manufacturer had been bitterly scoring the legislators because of interference with the conduct of his business That opinion he still held; and it was safe to say nothing could change it. Yet on the say-so of a chance acquaintance he had modified his views on the question of wireless solely through accepting as facts a series of half-truths which the other had picked up here and there.

There can be no question that the advocate of federal ownership was sincere. He was painfully so, with the ring of conviction in his voice that has ever made a little knowledge a dangerous thing. Which, to a man who knew the true particulars, and the accurate figures covering the details he mentioned, made it startlingly apparent how public opinion may hinge and actually be swung on little discrepancies.

If the speaker had been required to set his arguments down in writing he would have verified his details; but no record of his conversation was being kept, his opponent had little or no knowledge of the federal ownership propaganda and conjectures became convictions in the easy freedom of unrecorded speech. And what was the result? A fairly influential citizen was given the groundwork of what may later develop into a definite attitude on that particular subject.

The Most Successful Instance on Record

This rather lengthy preamble has been set down for two reasons: first, to illustrate the value of committing our present discussion to the printed word; second, as justification of the writer's opinion that government ownership is necessarily one of the considerations to be taken into account.

If the lay public gravitates unassisted to that phase of the subject in a general discussion of commercial wireless it is reasonable to presume that one of the first suggestions in a consideration of Corporate vs. Individual Ownership would be: Why not the compromise—government ownership?

Let us therefore consider this question first.

All good arguments are founded on

fact. The most obvious comparison in favoring federal operation of wireless is the British Post Office's management of the kindred industry, the telegraph. This is one of the most successful instances of government ownership on record, the one quoted by the writer's ship acquaintance and the inevitable basis of discussion when the subject is introduced.

For forty-five years the British Government has had this monopoly and, similar operation of wireless telegraphy not being known, its wire telegraph record is the logical basis for whatever conclusions may be drawn through comparison.

A message of twelve words is carried anywhere in the United Kingdom for sixpence (twelve cents), the minimum charge; additional words being charged for at a half penny each. Both address and signature are counted, however, and these, say American telegraph companies, average fourteen words. A ten-word message, as we know it, is therefore a twenty-four word one in England, costing twenty-four cents.

This charge is certainly below American figures, but there is of course the difference in distance of transmission to be considered.

All England is within about six hours' railway journey from London. The telegraph business is mainly between the large cities and there is no legal liability for errors or delay in transmission of messages. These two factors, and particularly because the traffic is what we would term short line business, greatly affect the rate.

To illustrate this latter point is the case of J. G. Smith and G. S. Mott who organized the Commercial Telegraph Company about thirty-five years ago, maintained service between New York and Philadelphia only, and found it profitable.

Seeking a parallel for present-day short line business between New York and Philadelphia the service between London and Manchester will be found just as good and cheaper than ours. But consider the difference in maintenance charges necessitated by a service throughout the three and one-half million square miles of the United States as against that of England proper, with one-seventieth of that area or acreage less than the single state of Alabama.

Foreign Rates and Comparisons

How important this matter of distance becomes is revealed by a careful examination of the tables of rates not only in England but throughout Europe. The figures are misleading in ways other than the word count.

In an address recently given before the National Civic Federation in New York it was pointed out that a message going any appreciable distance in Europe passed through more than one country and the rates as given were "split up" on cost; that is, a single message passing through two countries is counted as two; if it passes through three countries it is made to count for three messages. If this same condition prevailed here it would be much as if a message from Massacusetts to Pennsylvania counted as three messages, with the state cost divided so that the rate appeared as one-third of what it really was. Taking the charge for address and signature into proper consideration again and glancing at communication conditions over longer distances we find that for the 1,000 miles between Stockholm and Paris the message rate is 72 cents, while from New York to Chicago, about the same distance, the 10-word rate is 50 cents.

On the whole, then, it is possible that exhaustive investigation would reveal the cost of telegrams to the active trader is really higher in Great Britain than in the United States.

For the sake of argument, however, let it be granted that telegraphing is cheaper than with us. Because less money in charges is passed over the counter it does not necessarily follow that the public finds telegraphing cheaper in the end.

The British Post Office report for the yearing ending March 31. 1913, shows that the loss for the twelve months was $5,723,940. The following year it was a little more. The year before it was over

six million dollars. An average of the last few years shows an annual loss of five millions.

Yet it is reported that under the former private ownership the system showed an average annual profit of $1,600,000.

Since the British nation took over the telegraphs in 1870 the loss is estimated at $200,000,000.

Some contend that this loss—which the taxpayers have to bear—is more than offset by the cheaper rates.

But are the rates really cheaper?

And if they are who is benefited? The bulk of the message is sent by the bankers, the merchants, the manufacturers—about 10 per cent. of the population!

The government-owned system pays no taxes. The private corporation does.* Not only does the privately-owned system pay its stockholders dividends from profits, it furnishes a source of revenue to the government in place of being a very material drain on the nation's treasury.

Take it from another viewpoint: In England the annual expenses of the telegraph system are thirty to forty per cent. more than gross receipts. This means that the charges for a message pay for only two-thirds of the service. The public treasury—the taxpayer's money—has to make up the one-third difference.

This condition remains after forty-five years' experience, during which time the message traffic has increased nearly tenfold. The post office has grown up in the telegraph business and still loses money on every message it sends. The American telegraph companies, on the other hand, show a profit as private corporations, charge little if any more for service, even under immeasurably greater geographical problems, and are a source of revenue to the nation instead of a burden.

Consider also that Great Britain's operation of the telegraph is the shining light held up by advocates of government-owned systems. Admitting all their favorable contentions—which most emphatically should not be done—it is still rather difficult to see how even this theoretical success is any guarantee of Great Britain's, or any other country's, success in wireless, an infinitely more difficult business. The monumental fiasco attendant upon government operation of the British telephone contrasted with its amazing success under private control in the United States would furnish a fair comparison, if the details were not too painful for disclosure.

In all of England's experience with publicly-owned means of communication, therefore, there is nothing to base an argument on for government ownership in the United States.

Small Likelihood of Government Wireless

Government-owned wireless systems for ships are unknown as yet, and will no doubt remain so, for it is reasonable to suppose that the legislators of many nations have recognized that where governments operate telegraph systems after years of experience and show a loss while private ownership shows a profit, wireless, a new business and a difficult one, would prove many times more unprofitable under federal operation.

*U. S. Department of Commerce, Bulletin 123 (1914), gives latest available figures, the year 1912 showing land telegraph systems paid in taxes and interest, $2,740,827.

In association with the type of citizen mind that leans blindly toward government ownership is the much-abused and greatly misunderstood word "monopoly." With the hysteria of the muckraking days still fresh in the memory of the people anything bearing a resemblance to control of an industry is vaguely condemned as a subject for federal intervention. Even though a rational period has since come and discredited indiscriminate attack much of the old "down with the big fellow" spirit still obtains with the light thinkers.

Monopoly's Relation to Efficiency

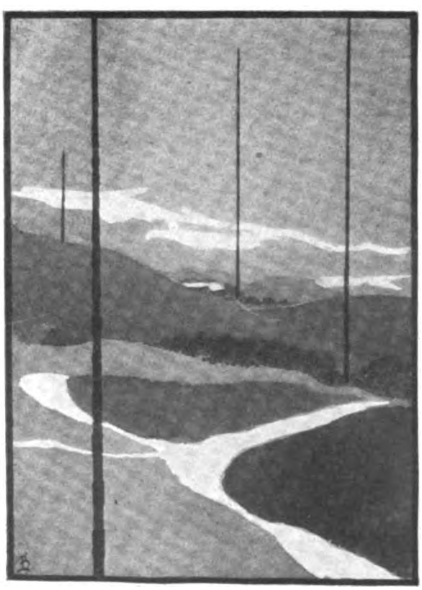
Certain, if not all, public utilities—under which heading wireless logically belongs—are natural monopolies. Full appreciation of this statement can only be arrived at by a lengthy economic dissertation, which has no place in this article, but consideration, from a service point alone, of that thoroughly dependable social and business asset, the American telephone, will supply more than sufficient material to settle the question. And an incidental trip to any important city in Europe will end forever any doubts as to the undesirability of government ownership and the merits of monopoly control in private hands.

Monopoly in a publicly used communication system invariably produces efficiency. The very largest corporation and the keeper of a country store are much in the same position: both have to please their customers. Otherwise the public will buy as little as possible, and there is no money in that. Whether it is a can of tomatoes or a wireless message the purchaser expects prompt delivery of exactly what was ordered, and if he does not get it more money will be spent for the same thing only when it is absolutely necessary.

Service pays. Big business recognizes that. The increasing popularity of the telephone in this country carries a heavy lesson to other nations. New York City has more telephones than six European countries taken together—Austria, Italy, Belgium, Norway, Denmark and the Netherlands. Chicago has more telephones than the whole of France. New York City equipment alone is only 200,000 short of the number of telephones throughout the whole of Great Britain and Ireland. The telephones of the civilized globe added together total about 14,000,000. More than seventy per cent., or 10,000,000, are in the United States.

Americans consider the telephone indispensable, other nationalities look upon it as an aggravation. Its popularity is attested by the growth in this country to the staggering number of 10,000,000 instruments in use to-day, against 650,000 fourteen years ago. In point of equipment England stands to-day exactly where we stood in 1900.

Any American business man who has had occasion to travel on the continent knows how infinitely superior our service is, how much better it is operated under private control than are those run by governments. Monopoly is no longer the bugaboo it used to be. It is gradually becoming recognized that it makes for better service. An industry controlled by a private corporation must make money or go out of business. Taxpayers will not make up the deficit. Good service means growth, poor service stagnation. And because the public utility's profit is proportionate to its popularity the constant aim is for progressive support, secured only through continuous betterment. It is now generally recog-



nized that the size of the corporation is not necessarily a menace. President Woodrow Wilson reflected the new order of thinking when he said: "I am not jealous of the size of any business. I am not jealous of any progress or growth no matter how huge the result, provided the result was indeed obtained by the processes of wholesome development, which are the processes of efficiency, of economy, of intelligence, and of invention."

And it is with exactly this—wholesome development through efficiency, economy, intelligence and invention—that the Marconi Company has qualified for commercial preëminence in the field of wireless communication.

What This Article Means

In the foreword to the article finished just above an invitation was extended to every person interested to give their views on the questions it covers. It is the intention of THE WIRELESS AGE to publish the best of the arguments on both sides, with or without comment as the contribution demands. No one is barred from participation and a place will be found in the open forum for every presentation which has something to say. This does not mean that all communications received will be published, irrespective of value. Only those that argue the question with sincerity and are based on careful study or practical experience—that reveal sound reasoning and a viewpoint—will be considered. Shipowners, commercial wireless men and those in government service, scientists and economists are especially invited to consider the subject, addressing Open Forum, THE WIRELESS AGE.

At the Front With Wireless

The fight between the forces of the Germans and the Allies for possession of a station in German New Guinea—An Operator's story of the naval battle off the Chilean coast—Other details of the European War

THE wireless station on Kaiser Wilhelm's Land was one of the chief bones of contention when a large Australian and French force invaded German New Guinea. A comparatively small number of men under the command of Dr. Eduard Haber, formerly governor of the colony, blocked the plans of the invaders for a day, but they were finally compelled to retreat. This was the story told to a newspaper reporter by Dr. Haber when the latter arrived in New York City recently.

He had only arrived in the colony from Germany in April, and was on a tour of inspection when the wireless caught him far away in the wilderness and spluttered forth the word war. The wireless station on Kaiser Wilhelm's Land was in communication with four other wireless stations scattered on outlying islands which, in turn, reached a station on the Australian mainland. On September 2 the station at Mauru went out of commission and shortly after that the station at New Pommerania. Dr. Haber gathered from this that something was the matter and that the allies might be approaching.

His surmise was correct, for from Rabul, where the seat of government was located, a battle fleet was sighted at four o'clock in the morning of February 11.

When it approached, the residents of Rabul noticed one Australian dreadnought, three cruisers, six torpedo boats, two submarines, one troop ship, which carried, as was later ascertained, 2,200 Australian marines; one French cruiser and a galaxy of transports and coal ships.

This fleet cast anchor and a demand was made for the surrender of the German colony. Dr. Haber defied the invaders and declared that he, as German governor, had no authority to surrender anything. Then they demanded possession of the wireless station. This request, too, Dr. Haber refused. He then prepared with his hundred native Germans and several hundred native constables to repulse the attempted landing of the marines.

The Ruban forces were at first successful, but as they had no heavy artillery and were not even equipped with machine guns they had to give up in the end. So, leaving half of his complement of native Germans in Rabul to look after the women and the official papers, he hurried with about a hundred natives and fifty Germans and went to the wireless station on Kaiser Wilhelm Land with a view to saving it from capture and possible destruction.

Dr. Haber's men held this for a day, but when reinforcements arrived to attack them they had to retreat. They intrenched themselves in a section of the country which was barren and practically unexplored, keeping up an incessant fire with their rifles to convey the idea that they were in large numbers. After a time the Australian commander asked for a parley and, acting on the belief that Dr. Haber's force was considerable, agreed to guarantee safe conduct to all officials of the colony to Germany without a binding promise that they were not to fight after reaching the fatherland.

Further details of the sea fight between British and German war ships off the Chilean coast in which the Good Hope and the Monmouth of the English fleet were sunk are contained in a letter written by Maurice Scott, wireless operator on the British auxiliary cruiser Otranto. It is in part as follows:

"We sighted smoke about 4 p. m. and, having heard loud German wireless signals, knew it was the enemy. Our squadron formed into battle array, and it was a fine sight to see our ships, each flying two white ensigns and the Union Jack, going into action. The enemy had two armored cruisers of a bigger and much superior type to the Good Hope, and two light cruisers. Our guns were so small as to be out of range, and the Glasgow tried to bring her small guns into action. Firing began at 7:15, and after ten minutes the admiral signalled for our skipper to go, saying it was the best thing we could do. We were a big target and gave them an easy range-finder. It was, of course, useless for us to go close in; we should have gone under with the first shell.

"They fell all around us those first few minutes and it was a miracle we were not hit. Our three put up a splendid fight, and it nearly broke the captain's heart and, in fact, that of everyone on board, to see them beaten, being unable to do a thing. Both the Good Hope and the Monmouth took fire and we fear both are lost with all hands. The Glasgow had three holes put in her, but escaped with four wounded.

"It lasted fifty minutes, and no one can possibly imagine who has not seen it how awesome and ghastly it was. Sir Christopher Cradock was our admiral, and I shall never cease to respect the way he went into action. He was a Yorkshireman. The merchant cruisers were, of course, not meant to go into battles like that, but it was awful to have to run away from the others and leave them to it. I would love to be in the scrap when the Scharnhorst, Gneisenau, Leipzig, and Dresden are sunk. It's an awful thing to wish from the humane point of view, but we would like to get our own back for the Good Hope and the Monmouth."

Newspaper dispatches from Corunna, Spain, relate that a man on the French line steamship La Champagne which recently arrived in that port from Mexico planned to blow up the ship, but his plot was frustrated by a wireless message of warning sent to the vessel. The man suspected of being responsible for the plot, was arrested by officers of the steamship. He is believed to be a German. The officers declared that they found five dynamite bombs in his trunk.

The use of wireless apparatus in German waters by merchant ships except in case of distress has been forbidden by the German imperial marine authorities, according to an announcement made in Washington. Ambassador Gerard at Berlin has cabled that the rules governing wireless provide that after a vessel has entered German waters and taken on board a German pilot that vessel is under the control of the German authorities and the radio apparatus is to be locked and not to be unlocked until the German pilot is discharged after passing Rotorsand Lighthouse. In port wireless apparatus is to be partially dismantled and certain parts of it turned over to the German authorities until the vessel is ready to leave.

A Tribute to a Co-Worker

E. J. Nally, vice-president and general manager, Marconi Wireless Telegraph Company of America, has received a reply to his letter to Loren A. Lovejoy, which was published in the February issue and commended the operator on his devotion to duty in the wreck of the steamer Hanalei.

Mr. Lovejoy says: "It is needless for me to try and say how much I appreciate such letters, and am only too sorry that my assistant and co-worker, Mr. A. J. Svenson, is not here to share them with me, as a braver and truer boy never pressed a wireless key. I cannot commend him too highly for his work and behavior during those trying hours, and if there is a place in heaven for men of his type who show such unselfishness he will surely reach there."

WIRELESS IN AERIAL STRATEGY

At a meeting of the Aeronautical Society of America, held recently at its headquarters, No. 20 West Thirty-ninth street, New York City, E. E. Bucher delivered an address on the wireless phase of aerial strategy in war. This was followed by an open debate.

S O S By Flash-Light

William V. Moore, second operator

How the appeal for aid, spelled out in the darkness by Waale, wireless man on the wrecked oil ship Chester, was received by Operator Moore on the Philadelphia which rescued the crew of the tanker

First Officer Lyon

J. Edward Jones, first operator

THE disadvantages of being without wireless telegraphy on the sea and the advantages of having radio men at hand when the waters are reaching out for their prey are illustrated in the accounts of the wreck of the oil tank steamship Chester. The Chester, with her superstructure destroyed by the waves, drifting where it pleased the seas to hurl her, was not equipped with wireless. She did have among her officers, however, one, Waale, who holds a cargo grade wireless certificate. All of the signal lights except one having been saturated with water, it devolved upon him to send out the S O S by flash-light.

While the Chester's men were waiting and hoping for rescuers to appear the steamship Philadelphia was making her way unknown either to her commander or to that of the tanker toward the wreck. And through good fortune the steamship reached a point within a few miles of the Chester—so near in fact that the officers of the former saw Waale's S O S spelled out in the darkness.

On the Philadelphia were Marconi Operators Jones and Moore. The latter, summoned to the bridge to respond to the signals of Waale, received the messages which told of the hopeless fight the Chester's crew had made against the sea, and informed the men on the wreck that the liner would "stand by." And she did "stand by," the entire ship's company of thirty-three men being transferred safely to the Philadelphia. First Officer Lyon was in charge of the rescue life-boat when it made its second trip to the Chester. He is known among wireless men as the inventor of the cerusite detector.

Laden with a cargo of oil, the Chester, owned by the American Petroleum Company, left New York on January

23 bound for Rotterdam. She had been out of port only a few days when she ran into rough weather. Then a tank bulkhead burst, the pressure of the oil opening the decks. But it was not until February 2 that Captain Herman Segebarth, the commander of the vessel, and his men began to have any misgivings regarding the safety of themselves and the ship. On the afternoon of that day the waves increased in size and one of them—a giant roller—swept over the vessel, leaving a train of damage in its wake.

On the bridge at the time were Second Officer Jacobus W. Waale and a quartermaster who was at the wheel. They were caught up in the deluge which the hatches had been demolished and the oil was pouring out of them in large quantities.

As the day waned conditions on the tanker became worse. The bunkers having been flooded, the engines were stopped and the vessel fell into the trough of the sea, listing so heavily to port that her rails were in the water. Darkness found her tossing about at the mercy of the waves and the members of the ship's company wondering how long she could withstand the terrific pounding of the seas.

In this emergency Captain Segebarth turned to Waale for assistance. The second officer held a cargo grade wireless certificate and was therefore familiar

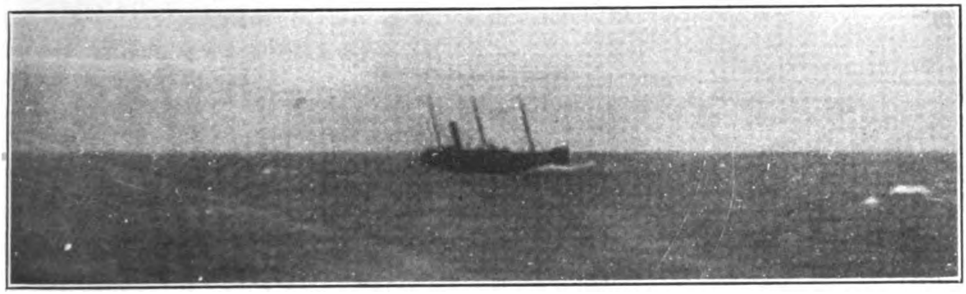
The Philadelphia, whose timely arrival at the scene of the wreck was the salvation of the tanker's crew. She, too, met with heavy weather, having encountered severe storms when she was only a few days out of port

In this photograph the members of the crew of the Chester are shown after they had recovered from their trying experience on the storm-racked vessel. They were snapped by the camera on the decks of the Philadelphia, one of the men being pictured with a cat, which claims the liner as its home, clasped in his arms

threatened to hurl them over the sides. Captain Segebarth, who was in the chart room when the wave struck the vessel, was shot to a point not far from the second officer and the quartermaster. After the men had regained their feet they took account of the damage and found that almost everything on deck, including the life-boats, had been swallowed up by the waters. Three men were thrown from their bunks and injured.

Captain Segebarth gave orders to pump out two of the oil tanks in order to keep the seas from wreaking their full fury on the Chester. The men were spared this task, however, for some of with the Morse signalling code. The little band on the wave-battered craft looked to him therefore to bring aid by sending out S O S by flashlight.

All that night the Chester was driven by wind and wave, while Waale directed the rays from a lamp over the waters, ever spelling out S O S. but there was no response to his appeal nor to the one signal light that remained undamaged by the water. Dawn broke with no signs of rescuing craft in sight. Flag signals of distress were hoisted, but they were unfurled in vain and night again found the vessel drifting about aimlessly. Again Waale sent out the flash-light signals, while the ship's company waited



A photograph of the Chester which was taken as the Philadelphia steamed away. The wrecked ship was set on fire after her crew had been rescued in order to do away with the danger of other craft coming into collision with her

anxiously for a reply. But none came. And finally the men on the Chester were compelled to abandon hope almost entirely. They knew that the vessel was on the northern route—a path which is used by few vessels at this time of the year—and that only good fortune would put them in the way of another ship. But Waale, despite the desperate odds which the Chester's people were facing, continued to flash his signals over the trackless waste. This was the situation on the tanker early on the morning of February 4.

In the meantime the American Line steamship Philadelphia was making her way across the Atlantic bound from Liverpool to New York. She, too, met with heavy weather, having encountered a severe storm when only a few days out of port. The weather conditions were such in fact that the liner on one day steamed only sixty-six miles. Her average rate of speed is 450 miles a day.

The Philadelphia was in the mid-Atlantic on the northern steamship route about one o'clock on the morning of February 4. Captain Arthur Mills, her commander, had chosen this path instead of the southern course in the hope of avoiding the weather conditions reported to prevail on the latter route. It was while the Philadelphia was feeling her way through the night under an overcast sky that a light so small that it seemed no larger than a spark was sighted. As the liner neared the light it became evident to her officers that a vessel was signalling the Philadelphia. Third Officer Ellis had some knowledge of the Morse code and after a while he was able to make out the letters S O S.

In charge of the Marconi equipment on the Philadelphia were First Operator J. Edward Jones and Second Operator William V. Moore. Jones was going off duty when Captain Mills telephoned to the wireless cabin from the bridge, asking him to attempt to establish wireless communication with the craft. So Jones sent out a general call—CQ—and followed it up with the query: "What ship is that abeam?" Those on the Philadelphia were not aware, of course, that the vessel with which they were attempting to communicate was the Chester and that she had no wireless.

Captain Mills and his officers in the meantime were making preparations to respond to the signals of the Chester by means of the Philadelphia's Morse lamp, Moore being summoned to the bridge to operate the light.

"What is the matter?" was the first message he flashed. It was almost thirty minutes before he received a reply. Then, Waale, from the rocking deck of the Chester, responded that "We are a wreck." He also repeated the S O S call several times. Little by little those on the Philadelphia gained a rough idea of the plight of the men on the Chester. The Chester had no boats, Waale signalled to Moore, in response to the latter's question. And finally, in answer to the query of the Philadelphia's operator, "Do you want to be taken off?" came a jerky, nervous "Yes," every flash of Waale's lamp seeming to emphasize the hopeless predicament of Captain Segebarth and his men. To these signals Moore responded that the Philadelphia would "stand by" to take off those on the wreck.

It was not an easy rescue to effect, however. Tremendous seas were running and Captain Mills, fearful that his ship would be imperilled by the drifting hulk, kept the steamship a mile and a half away. It was a matter of conjecture, too, whether a small boat could live in the rough waters. So Captain Mills called for volunteers to go to the wreck in the port emergency life-boat. Chief Officer Candy and five seamen jumped into the craft from the boat deck and, one more man being needed, another seaman volunteered. Considerable skill was displayed in the launching of the boat. The men in charge of this task waited until the Philadelphia rolled heavily to port with the waves before lowering it from the davits. Then, by degrees, it was slid toward the water, and thirty minutes after the call for help had been received it was on its way toward the dancing light which indicated the position of the Chester.

As the life-boat pulled away from the steamship, Moore again flashed his lamp, signalling "Boat now leaving. Look out for it." From Waale's lamp came a few flickers, acknowledging the message.

In the small boat Candy's crew battled with the waves for a long time before they were able to get within hailing distance of the wreck. First they went to the stern of the ship and then to the windward, finally arriving at a position on the lee side. All of the rescued men were compelled to jump into the sea, from which they were pulled into the life-boat by means of a line. This was fastened to the life-belts of the wreck victims and, with the Chester's people holding one end of the rope, and the other in the hands of Candy's men, the members of the tanker's crew, one by one, plunged over the side. In this manner twenty-two men were transferred to the life-boat.

The pull back to the Philadelphia was no less full of peril than the trip to the wreck. The seas washed into the boat, some of the men being constantly engaged in bailing. The rescued huddled in the bottom of the craft until it reached the steamship when they jumped for the rope ladders thrown over the sides. This method of getting them to the decks of the vessel was found to be perilous, however, for some narrowly escaped being crushed between the life-boat and the steamship as the two were lifted on the crests of the waves; others mounted the ladders only to be blown about by the wind at imminent risk of losing their grip on the ladder and falling into the sea. It was found necessary, therefore, to fasten a rope around each man and pull him to the deck.

But eleven men, including Captain Segebarth and Waale, still remained on the Chester. The boat of which Chief Officer Candy was in charge had been gone two hours, only making the trip and effecting the rescues by the exercise of the most skilful seamanship. It was now half filled with water and the stories told by Candy's men of the difficulties and dangers encountered on the trip gave those on the Philadelphia a vivid idea of what it meant to be afloat in the mountainous waves in a small craft.

There was another call for volunteers, however, and First Officer Lyon went in charge of the boat. It met with much the same battering from the seas that it underwent on its first trip. Lyon found that the Chester was still listing heavily and was standing high out of the water. Captain Segebarth and the others were waiting for the boat, but before they left the Chester they set the vessel ablaze in order to do away with the danger to other craft. This having been accomplished, the boat set out for the Philadelphia. The trip was perhaps more hazardous than the pull back to the steamship made by Candy's men, for the life-boat was now so wracked and pounded by the seas that she was hardly seaworthy. So, after it had reached the Philadelphia and the last man had gained the decks of the vessel, the boat was dropped astern where it was broken into pieces by the screw of the steamship.

The liner then proceeded on her voyage, a cloud of smoke marking the position of the Chester. As the Philadelphia steamed away a wireless message was sent broadcast telling of the location of the wreck and warning the commanders of east-bound steamships regarding it.

The Nigger

By C. H. Claudy

THE chief stood in the bow and spat into the gray-green water below. The sky was an angry glare to the west, and the air was hot and humid. Above, a feeble star tried to shine through a murky haze, and failed. To the east the horizon was barely visible, a clean black line against the purple of a sky that said nothing aloud, but whispered of evil things to those who read the signs of trouble at sea. In the engine room was the only sound in the ship—the steady chug-chug-clank, chug-chug-clank of the two engines. The glass was down—way down, although the chief knew this only by inference. Nor did he care greatly. It was the captain who was caring, and who watched the mercury dropping, dropping—slow, it is true, but still dropping—and who saw, with more than the usual anxiety which a falling glass has for a careful skipper, the strongly marked concavity of the surface of the mercury, which bodes ill for ships not strong of heart and stout of timber and brace.

The chief stood in the bow and spat into the gray-green water below. It is a peculiar combination of circumstances which can throw a five-hundred-ton tramp into the hands of her chief and one uneducated nigger for an engineer's force, but the circumstances had occurred. The Minnie Woolworth—"Woolly" for short—never had but two engineers, in spite of her two compounds, for her owners were the saving kind, and two engineers instead of three saved not only salary, but "hash" for one. Nor had there ever been any occasion when the two were not ample for the work. A tramp runs on no schedule, she gets where she is going the best way she can, and whenever she can, saving coal by the law of necessity, which loads the bunkers with only enough to get there plus ten tons margin, and which prescribes two knots under the possibility of the screws as a result. Beck, the chief, and Andrews, the second—who had somehow managed to learn to work the dinky little coherer wireless set with woeful irregularity of signals—stood watch and watch, and thought it little hardship.

But now here was Andrews tied in a hard knot in his berth with something he called cramps (the captain was deadly afraid it was ptomaine poisoning) and as much good as a jellyfish as far as standing watch was concerned. Wherefore the Nigger had been called from the stokehole and took his place every third watch—while Beck was standing eight hours with four hours below.

The Nigger was lazy. He was a product of the West Indies, a man of immense physical strength, with the poetry of the beasts of the jungle in his lithe strong body, his swelling muscles, and the clean clear bronze of his skin. He was a typical, happy, careless child of his race, living only for to-day, for the next meal, the next sleep, loving the sunlight like a cat, and hating the wet and the cold as do the transplanted children of the Line. Somewhere he had picked up a knowledge of engines and steam. He could throttle her down if a sea made the big slow screws spin like pinwheels, could watch her water and her steam, and give orders to the stokehole with unnecessary pride, could pack a valve or oil a bearing as well as Beck himself. But he could not read nor write; and, when it came to even such ordinary tasks as taking a card or setting an eccentric valve, he was as much at sea as any one who has never learned anything of engineering but by observation and absorption.

Still, he was the only man in the stokehole who knew even so much, and when the captain had a despairing talk with Reddy, boss of the grimy stokers, the Irishman indicated the Nigger as the only alternative to putting into the nearest port. Perhaps it was that the Nigger was so lazy and Reddy was anxious to get his room!

There were reasons why putting into port and trying to get another second was not to be thought of. There was a cargo waiting the first tramp which would take it at Oyapok, and the "Woolly's" owners were not men who loved to spend coal on a light ship and get no return for it. Captain Holroyd took a chance, and the Nigger went to the engine room.

And so Beck stood in the bows and spat at the gray-green water below, and looked at the reddening afterglow, smothering up in the clouds, and smelt half a gale a-coming, and wondered sleepily about the glass, and decided it was none of his business, and spluttered a little at his disgust of being shipmates with "a rotten, stinking nigger, who doesn't know a stuffing box from a box of sardines," and finally made his way to his bunk, where he turned in all standing.

Meanwhile, Old Ocean was slowly making up its mind that something was going to happen. The afterglow faded into a ruddy smoke, then into a purple matching the east; the clean-cut horizon faded out; the lone star was no more, and an odd little lift under the bows mingled with the slow, stately, mighty swell that up to now had been as regular as a pendulum. Somewhere, off to the south and east, something was brewing. At eight bells it was as dark as pitch. The glass still sank into itself, shrinking from the coming storm. Had there been regular wireless service on the Minnie Woolworth, a regular station and a commercial operator, she would have heard long before of storm warnings set, and of a hurricane coming up the coast; but whoever heard of a set of saving owners installing proper equipment to let a tramp captain have the news? The old second-hand set, bought at a sheriff's auction, and the self-taught Andrews had been plenty good enough; lots better equipment, in fact, than some had.

But the unheard wireless warning was not needed now. Five senses and the glass had shown him what was happening. He did not know when, or how, or exactly where, but even a lubber could have told from the hot feel of the air, and the deadly murkiness of everything, and the twitching, uneasy breathing of the water, and the oily, greasy, slippery way it slapped at the bows, ran hungrily along the rail, and hissed off into the wake . . . something was going to happen.

Down in the engine room the Nigger was fast asleep. He was stretched out on the seat, his head against a feed pipe and his feet straggling along the grating. Unlike his race, he slept lightly, and a single peal at the jingle would have waked him. He knew the captain wasn't coming down, he knew Beck was asleep, and he trusted to luck not to be caught.

"For why I not get um sleep?" he argued with himself. "Hit foolishnuss, dis a-yere stayin' wake when noffin for um ter do. Day ole engines runnin' erlong as smoof as er greased pole—Hellum wid um regulashuns. Didn't ship for no engine-eer nohow!"

But he was caught. And it bears heavily on what happened, and shows that even a black man, of no education, but once removed from savagery, may have that germ of manhood in him which puts others before self, and stands to help the greatest number to their greatest good in spite of personal consequences, whether personal liking be at stake or no. For Beck caught him napping, and kicked him soundly, and cursed him until even the Nigger's ears burned and the whites of his eyes showed, and he cowered away from the dominant white race and the blazing white man's eyes.

"You black hound!" said Beck, not mincing his words. "You spawn of Hades, sleeping on duty, are you? I'll show you how to sleep when I sleep. Here I am taking eight hours to your four, because I can't trust you for five minutes—and you, with eight hours to sleep in, and better grub than you ever had in your lazy, good-for-nothing life, have got to curl up like a cat and let my engines go to the devil while you rest your precious chalky, nigger eyes! Get out of my engine room, you loafing misbegotten son of—of— Oh, *get out* before I take a spanner to you!"

By all of which it may be seen that Beck was somewhat annoyed. And Beck reported to the captain, *via* the speaking tube; and the mate, at the side of the man at the wheel, and the captain came down two steps at a time, and threatened the Nigger with terrible things, among which irons for days in the hold and no water, and stringing up by the thumbs, were the mildest and the only two printable threats of the lot. For this was a man's ship, and a man's job, and short hands make ugly tempers and hard work, and the thin veneer that towns and owners and papers to sign and a little money to spend smears over a seaman, of none too high a class, slips like a forgotten cloak from his back when the sea is purring threats in his ears, and danger stares over the rail with unwinking eyes, and one man's dereliction of duty may mean the lives of all. This was no time to sleep, and the captain knew it—but he knew, too, the limits of a man's endurance; and should he punish the nigger now there would come a time when Beck could no longer keep his eyes open; when sleeping on duty would be his portion, not with, but against, his will, and then, if danger had leaped the rail and stalked among them, and if the glass had been proved a true prophet . . . then might the just punishment of one man bring death to them all.

So the captain did nothing but lash with his tongue, and that he used less oaths and more big words was no comfort to the Nigger. It is just as much of an insult to call a man something he cannot understand and to mean it, as to call him by the lowest epithets in the language with all of which he is familiar. When the captain's anger had spent itself, and something in the huge frame of the scowling negro, who could so easily have done for them both with one mighty hug of his terrible arms, raised a smile to Holroyd's face, he ended with calling him a "blasted parallelopipedonical pachydermatous anachronism." The Nigger's eyes flashed, and he half raised his fist—then dropped it, racial subserviency too strong for his anger.

It had been like this for the three days he had served. Something was always wrong. He was cussed and kicked, and kicked and cussed for something left undone or something done wrong, all the time. Now it was too much steam, now not enough. Now it was a waste of oil; now it was the engines grinding themselves to splinters with none at all. Now it was a tool out of place; now all the spanners so put away they couldn't be found. And the Nigger grinned and thought little of it part of the time, and sulked and planned revenge the rest of the time. "For why dey raise such um Cain 'bout it? Didn' haf to haf me engine-eer, did dey? Tink dis a-yere nigger jus' lak dirt under um feet! I fix um! Some day sompum goin' happen in dis a-yere engine room! Uh! Huh!"

And something did happen, but it was not the Nigger who made it happen, nor the Nigger's idea of revenge. That it was revenge at all . . . but let the sea work out the story.

At eight bells, midnight, the Nigger woke up, from habit, and was frightened. There was a horrible sinking feeling to the ship as she let down between two hollows and staggered up a slope again, a horrible murky dripping nastiness to the air, a feeling of oppression and closeness about him. The Nigger was frightened. He crept along, holding tight, until he got to the engine room.

"Wha—what's a-gwine happen, Massa Beck?" he said.

"God knows!" said Beck shortly. "Nothing but a gale, I reckon. What you scared at? Want to come in and go to sleep again, you good-for-nothing cur?"

"Ain' gwine sleep no mo', Massa Beck; jest want ter stay an' git wahm!"

"Get warm! Get *warm!* Why, you lying skulker, you're dripping with sweat now! Get warm, indeed! You're scared!" And Beck turned his back.

And then it happened. With a howl as of ten thousand devils in agony, with a screeching, yowling smother of noise

He whirled the wheels and shut off and on the steam to save the lives of the men above that blotted out speech and clank of engines and chug of pumps as a passing train blots out a baby's lisp, the wind was upon the "Woolly." And ahead of the wind, or with it, or behind it, came a wave—not a swell, not a comber, but a gigantic elevation of water, stirred up mayhap by the hurricane, perhaps by some subterranean volcano . . . but there, anyway. A tidal wave by itself is enough to strike terror to men's souls at any time. A real South Atlantic coast hurricane is enough for a big ship with a full crew to handle and live it out. . . . But both together!

Holroyd saw the wave just a second too late. He rammed his helm hard down and called for all the speed there was in the port engine, and Beck jumped clean over the high-pressure cylinder to get to the throttle. The Nigger fell on his face and dug his bare toes and his hands into the grating, and held on for dear life. But the effort that the Minnie made was not enough. It saved her from utter destruction. At a slant she took the wave and began to climb, but a good part of its force took her on the beam. And it was as if a million tons of weight had been attached to her keel. A million tiny, devilish hands dragged and pulled at her, and a million million drops of water, each falling with its fraction of an ounce of force, pushed her back on her haunches and made her make sternway with both screws going like mad, deep under water. A shriek from the stokehole, barely heard in the din of water told of some poor devil thrown against hot iron. The air was full of water—in the wheelhouse, every glass in splinters on the floor, the water washed the blood of the cut hands and faces away before it fell. Overhead was nothing but flying spume and wind and water; the line of demarcation between sea and air was lost, and the two joined in a smother of hellish white water that seethed and hissed and bubbled and came on board and tore things loose and carried them away. All the boats went . . . the after deckhouse was in splinters and a mile away: there was wreckage everywhere.

Then the starboard rail went, and carried the vangs of the big derrick with it; the boom swung twice from side to side, then tore away, splintered the starboard side of the engine room, snapped the shrouds of the mast like threads, and it, too, went by the board. Now none of these things were vital . . . all could be remedied, and with a mast or without it, the engines should do the trick. Holroyd thought this like a flash and was comforted, even while his hair raised as he sensed, rather than saw, the following wave of the monster that was now beneath him. But Holroyd didn't know that the crash of the boom in the engine room had split the floor grating, and that poor Beck had dropped through it where it broke and opened, and that it closed on him and crushed him as he went through, and that his life went out with a choked-off snarling scream, too quick for the sudden agony to reach full speech.

And in the engineer's shoes stood the Nigger . . . the worthless "spawn of Satan." The Nigger was dazed. Things had happened too quickly for him. There at his feet, his head and shoulders above the grating, his feet and body below, was Beck, the man who had cursed him, dead of a fearful death. The terrific motion of the ship made his head swing back and forth, a horrible sight, and the Nigger could fairly hear him saying "You—spawn of —!—you—spawn of —!" with every sickening roll and nod of the head.

Slowly the blood left his face, his knees shook beneath him, and a nasty pasty pallor replaced the bronze of his clear black skin. The Nigger was terrorized. Sharp across his terror-crazed brain rang the tube bell. Habit was stronger than fear.

"Aye—aye, sir," he called.

"Full speed starboard," came the word.

The Nigger turned slowly, the terror still on him. Then, perhaps it was merely latent manhood, perhaps it was some atavistic memory of great savage ancestors who fought to the last ditch and fought again while they died, who never gave up to any odds, and who looked at death with a laugh, and at torture with a song . . . perhaps it was merely obedience to the great impulse in all humanity to do the best we can for those whose lives are in our hands.

The Nigger responded. The "spawn of hell" grabbed at the wheels and spun them, and the Minnie began to turn.

Then began a long, long fight. The mast and the boom were over the side and tailed along as a drogue at the wrong end, pulling the vessel around and making her starboard engine work double tides. Men were hacking with axes at the wreckage. . . . It cleared with a jerk. The starboard engine raced at that moment and the port nearly threw her beam to the seas. Those seas might not have done much, but the wind would have torn her to ribbons and put her so deep with Davy Jones that not even her name would remain!

Like a flash the Nigger shut off steam on one and turned on more at the other. He seemed alert and alive and vital. The fear was gone. His color was back, his knees no longer shook.

"Think um sea gwine make us 'fraid, huh?" He talked to himself. "Hellum wid um sea. No ole sea nor win' ever blow gwine mak dese a-yere engines go back on um."

Every two or three minutes one engine would race. The Nigger had to stop it, and stop it quick. "Lose um screw and we all git hellum shore enuf," he whispered. "Would, would yer?" This to the port engine, racing her vitals out. Whirl went the throttle, off went the steam, and a sighing sob from the cylinders told of the fact. Then, the next minute, on went the steam, the cylinder heads pounded wtih the blow, and off went the engine again. Thus for three hours. On, off. On . . . off. . . .

And then the final act, in this scene of death and destruction, the last unpretty touch to an unpretty tale. Strained beyond endurance by the racking, and possibly weakened by the blow of the boom, a joint in the main steam pipe gave way—not utterly, but enough to flood the engine room with steam.

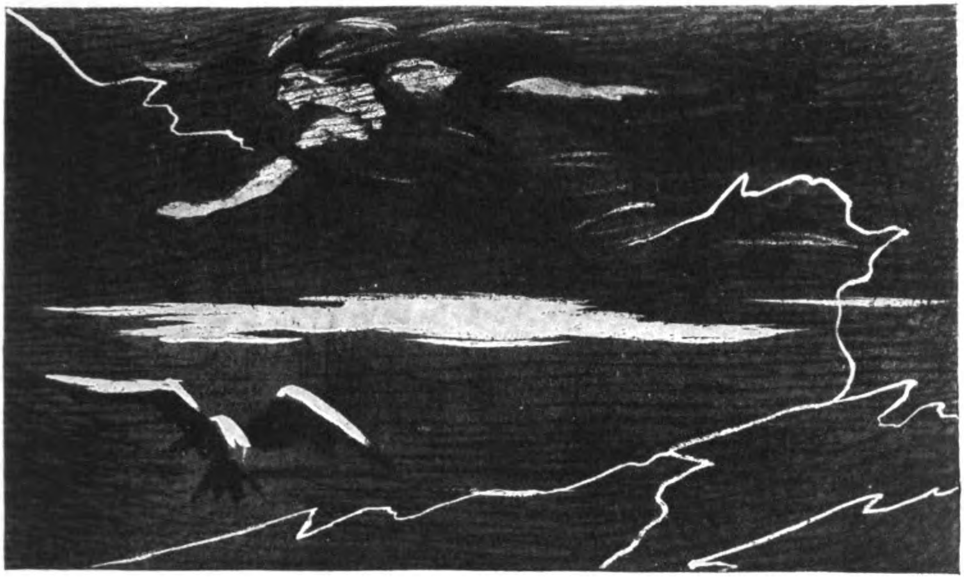
Do you know what that means? It means, if it is bad enough, that the men in the engine room cook to death; the most horribly agonizing death a man can die, and it is a death a man cannot run away from; for while life lasts the engineer must stick to his wheels, that the ship may live.

. . . The steam came not with a rush, but with a whisper, and it filled the room slowly. It got hotter and hotter. And its force just missed the throttle on the port engine. Had an angel passed, he might have heard a Nigger's prayer; he would have heard a Nigger's moan. Had Davy Jones, who seeks a sailor's soul for the watery inferno he inhabits, looked in, he would have slunk ashamed at the sight of a man in the pride of his sleek, great strength, standing alone, and cooking alive, while he whirled the wheels and shut off and on the steam that saved the screws and the lives of the men above. And every time he throttled down, the steam came harder through the break, filling the room, vicious, seething, cruelly killing. . . .

Half an hour later the wind fell as it had come. The captain staggered, rather than walked, to the engine room to see how Beck fared. As he looked into the cloud of steam which came through the open door, the engines gave a shuddering sigh, and stopped. The steam was gone. Without waiting to inquire why, Holroyd had a drag rigged, and hove to on the sea, now getting up mountain high. When he got back to the engine room, the steam was gone. Beck, shriveled, crisped, showed half above the grating.

The black hound, the spawn of Satan, the Nigger, stood upright, his eyeless sockets looking straight at the bell, the ring of which he would never hear. One hand was upon one throttle, one hand upon the other. Holroyd's face was a face of suet as he gazed. Then, as if he had but waited for the captain to see that he had done his duty, the enormous frame tumbled, sank to the floor, and his half-fleshless arms encircled the head of the man who had cursed him for a cur.

"God—God—*God!* said the Captain. . . . "The Nigger!"



THE WIRELESS GHOST

Ghosts there are of the crying winds, and ghosts of the weeping rain,
And ghosts there are of the dead, dear days, which cannot come again!

Warlocks there be, of the witches' tale, which haunt the house of sin,
And spirits restless of their quest for loves of the might-have-been!

But, o'er the heart of helpless earth and the pulse of prostrate sea,
There hangs a Soul of Silentness, who laughs in his dumb, dread glee!

He drives the blind acoustic cloud o'er a sea as still as oil,
He shakes the Dead-Spot vacuum in an airless, deaf turmoil!

He reads unread marconigrams, which reach no mortal ear,
He knows the deadly pocket-hole, where the lost calls disappear!

His is the toll of the foundered ships, that missed the muffled bell—
Toll of the derelicts which drift, unmanned, twixt Heaven and Hell!

O, ghosts there are of the crying winds, and ghosts of the weeping rain,
And ghosts there are of the dead, dear days, which cannot come again!

Warlocks there be, of the witches' tale, which haunt the house of sin,
And spirits restless of their quest for loves of the might-have-been!

But, o'er the heart of helpless earth and the pulse of prostrate sea,
There hangs a Soul of Silentness, who laughs in his dumb, dread glee!

K. D. M. Simons, Jr.

BISHELL

An Adventure in Wireless*

By Frank Parker Stockbridge

AT one o'clock in the afternoon of Wednesday, December 31, 1902, Samuel S. Chamberlain, managing editor of the New York Morning Journal, called me into his office and handed me a newspaper clipping. It was a three-line item from the morning's paper stating that Guglielmo Marconi, the inventor of wireless telegraphy, would leave Glace Bay, Nova Scotia, on the following Monday for Cape Cod, where he was to establish the first trans-Atlantic wireless station on United States soil.

"Mr. Hearst wants the first wireless message sent from the United States to England to be a message from himself to the editor of the London Times," said Mr. Chamberlain. "Please arrange it."

I knew nothing about wireless except what I had read in the newspapers, and that was principally advertisements. One of the largest advertisers was the American Marconi Company. I called at this office and saw John Bottomley, then general manager.

"We can do nothing to help you," he said. "Nobody but Mr. Marconi himself can be of any service to you in this matter."

At the nearest railroad office I found that if one wish to get to Glace Bay before the hour when it was announced Marconi was to leave he must catch either the 5 o'clock train for Boston or the 7:30 for Montreal that night. I looked at my match—it was 3 o'clock. There was no time for deliberation. I telegraphed to my home in Brooklyn, directing the packing of all my heavy clothes, then called up a relative who was in touch with the electrical affairs.

"Who in New York knows Marconi best?" I asked.

"T. Commerford Martin, editor of the Electrical World," he replied.

"Will you call him up and tell him I am all right?"

"I will," replied my uncle. Then I went back to Mr. Chamberlain's office.

"It will take a lot of money to pull off that stunt for Mr. Hearst," I told him. "I'll have to have it right away, or it won't do any good at all." I explained my plan briefly. Without a word he turned to his desk and wrote an order on the cashier for the money. After converting the order into currency I called Mr. Martin on the telephone.

"I want a letter of introduction to Marconi," I told him. "Come right over and you can have it," he answered.

"Here is the letter," he said, handing it to me as I entered his office. "You will find Marconi a most agreeable and companionable fellow."

"Does he speak English?" I asked timidly.

"As well as you or I," replied Mr. Martin. "He is half Irish, you know. His mother was a Jameson of Dublin, one of the famous family of distillers, and he was educated in England."

There was relief in this information, for the idea of trying to persuade a foreigner who did not have a complete grasp of my only language had been looming up in my mind as one of the difficulties in front of me.

"I'll tell you what I will do," added Mr. Martin. "I will send him a telegram that will pave the way for you, and will have some other friends of his wire him, too."

There was barely time, after I had thanked and left him, to eat a hasty supper, meet the messenger who brought my

* Courtesy Modern Pub. Co.

bag over from Brooklyn and catch the Montreal express.

This was Wednesday, and at midnight on Friday, exactly on schedule time, the train pulled into the station at Sydney, Cape Breton. Glace Bay and Marconi were only fifteen miles away.

The clerk of the Sydney hotel came from behind the desk to show me to my room. As we walked up the stairs I asked if I could not get a room with bath.

"We have only one room with a private bath," replied the clerk, "and that is occupied now by a gentleman who is going out on the 6 o'clock train in the morning. He is a New York man, too, by the way, and perhaps you know him. His name is C———."

"What is his first name?" I demanded.

"I think it is James," he said.

"Please," I begged, "go downstairs and hide the register until after Mr. C——— leaves."

The name was that of the star reporter of a rival New York paper. Only one possible errand could have brought him to Sydney—to get a "story" about Marconi and possibly to do the same thing I had been assigned to do for the Journal. It was not impossible, however, to find out whether he had done any serious damage so far, by the simple process of calling up the two telegraph offices—the Great Northwestern and the Canadian Pacific—and inquiring whether they had carried any "press matter" for New York in the last few days.

"No press stuff filed for New York this week, except bulletins by local correspondents," was the reply from each, and my mind was relieved temporarily. It was certain, then, that C——— had not telegraphed anything about Marconi to his paper, and whatever he had sent by mail could not be used before the Sunday edition. There was still time to "take the edge off" in that event. With this comforting thought I left a call for 6:30 and went to bed.

In the morning C——— had departed according to schedule, without suspecting anything. After breakfast I called up Mr. Marconi on the telephone. "Come right over," he explained as soon as I had identified myself. "I had a splendid telegram from Mr. Martin about you and I have been expecting you. You can get a trolley car at 9 o'clock."

Three-quarters of an hour later we were seated before the log fire in the comfortable living room of the little cottage at Glace Bay which formed the headquarters for the wireless experimenters. I presented my letter of introduction, but he waived it aside. "It is enough that you are a friend of Mr. Martin's," he said. "You can have anything you want if you will only tell me what it is."

Three-quarters of an hour later we were seated before the log fire in the comfortable living room

"Everything," I replied. "I want to know what you have done here, what you are doing and what you intend to do. When are you going to Cape Cod? Also, how much of an interview did C——— get out of you?"

"He didn't get much," he replied. "Who is he, anyway? He seemed to consider himself a person of some importance and was surprised that I had never heard of him."

It did not take long to discover an intensely human personality in the distinguished young inventor. Much more the Englishman than the Italian in appearance, with his fair hair, blue eyes, pink cheeks and little blonde mustache, his English had not the slightest trace of a foreign accent. He talked freely and enthusiastically about his work, his methods, the success of his trans-Atlantic transmission and plans for the future. He predicted a time when a rate of one cent a word from continent to continent would prevail, and pointed out the lines along which he expected the science to develop.

Then, wrapping himself up in his leather jacket and fur cap, he led the way to the laboratory and operating room. This was a one-story building, set between the four great latticed towers from which the aerial wires were strung.

"Your friend C——— did not get this far," he said as we crossed the windswept bluff and entered the little building. "Better be careful in here," he added, as we threaded our way along the narrow passage. "There are pretty heavy voltages here, and I wouldn't want you to be hurt. Better keep a foot or two away from any of the apparatus, for I have known a spark to jump nearly two feet."

To one who had never seen a wireless installation and knew nothing practically about the science of electricity it was a noteworthy introduction to have Marconi himself serve as master of ceremonies, explaining with painstaking simplicity the uses of all the apparatus.

"Let's see if we can raise Cornwall," he said, stepping to the huge sending key, a lever of wood fully three feet long. "Better put your fingers in your ears," he added, as he pressed the key. The advice was good, for the noise was deafening. I can liken it to nothing but a machine gun being fired so rapidly that the sound is almost continuous. Huge sparks jumped from the knobs of the immense Leyden jars that filled the center of the room, and illuminated the place like flashes of lightning. "Crash! Crash! Crash!" Four or five times Marconi repeated the signal, three short, sharp, staccato "dots"—the letter "S" in the Morse code.

The silence was tomblike as the noise stopped. Marconi turned from the sending key and picked up a telephone-like receiver, mounted on a headpiece.

"You may watch the tape while I listen for an answer," he said, indicating the receiver tape, similar to that used in the earliest telegraph installation on land. Marconi stood, patiently, with both ears covered by the receivers.

"There they are!" he cried a few minutes later, smiling joyously, and the tape confirmed his statement. The needle pressed upon it for an instant, lifted, pressed again, once more lifted and again impressed a dot. Then a pause, then a dash, then another dot.

"- - - — -." "SN," it read, the telegrapher's code for "I understand."

"The wireless works very much better at night than by day. This is the first really clear signal we have had from the other side in the daytime," said Marconi, tearing off the strip of tape and handing it to me. "You may like to keep this for a souvenir."

As we left the laboratory the inventor led the way down to the bluff that gives the name of "Table Head" to this outlying corner of North America. As we stood on the very brink of the precipice, facing eastward, 1,700 unobstructed miles of ocean lay between us and the coast of Ireland. The smoke of a steamer, hull-down below the horizon, was the only thing visible except the tossing waters.

"Freighter, probably, sailing the great circle route to a British port," was Marconi's comment. "It was not much beyond where she is now that La Bourgogne sank, with the loss of almost all her passengers, less than five years ago. Had she been equipped with wireless telegraph apparatus she could have summoned aid from Sydney, from Newfoundland or from other ships that were close to the Grand Banks at the time. The day will come," he continued, his eyes glistening, "when every ship will carry wireless, when every port will have its wireless station. When that day comes there will be no more such catastrophes as the wreck of La Bourgogne. If my invention never accomplishes anything else than to save the pasengers and crew of one ship it will amply pay me for all the money I have spent on it."

His words came back to me with renewed force a bare seven years later, when the passengers and crew of the Republic were saved only because their vessel was equipped with wireless. As I read the newspaper account of that rescue I knew how Marconi must have felt when he learned of it.

After making a few hurried snapshots I caught the next trolley back to Sydney, promising to call on the inventor again on Monday, for he had told me that the newspaper dispatch was incorrect and that, instead of leaving on Monday, it would probably be a week or ten days before he was ready to start for Cape Cod. An hour later a 1,200-mile telegraph wire was connecting Sydney direct with the office of the Morning Journal and, with the aid of a typewriter borrowed from the local newspaper office, 5,000-word interview with Marconi was "filed" in the New York office in ample time for the Sunday edition. Then I went to bed and slept the clock around. The following Wednesday the New York Sunday papers reached Sydney. Marconi was as pleased as a boy to see that interview displayed under big headlines on the first and second pages, while C——'s "story" was buried on the inside of the "editorial section" of his paper.

During ten pleasant days spent at Sydney, visiting Glace Bay nearly every day, no word was said about the real object of my visit. The psychological moment had not arrived. One night there came a telephone call from Marconi. "I am ready to start now," he said. "I am going out on the early train tomorrow morning." I joined him at Sydney, first sending this telegram to my paper:

"Wire me at Truro, Nova Scotia, on board southbound train, the following message, without addition or comment." Then followed the message I wanted to receive there. Sure enough, at Truro a messenger brought me a dispatch. "No bad news, I hope," said Marconi. "Not at all," I replied, handing him the telegram. It read this way: "Would it be possible to arrange with Marconi to let first trans-Atlantic message from Cape Cod station to England be a message of congratulation from William R. Hearst to editor London Times." The inventor read the message twice. Then, while I held my breath, he handed it back to me, smiling.

"It might be arranged," he said, and I found myself breathing freely again. "Of course, if President Roosevelt should want to send a message to the King of England it would have to go ahead of everything else. But I have no such desire and shall not suggest it. Mr. Hearst's message can certainly be second, and probably the first. Your paper has treated me very nicely."

On the last stage of the journey to Cape Cod we were accompanied by several Boston newspaper men, who were very curious to learn my status with the party. Finally they concluded I was the inventor's secretary, and Marconi did not disabuse their minds of this impression.

When we arrived at the Marconi towers at South Wellfleet the impression was heightened by Marconi's apologetic manner in informing me that, because of the unexpected presence of one of the engineers of the American Marconi Company, he would not be able to put me up at the cottage, but that I would have to go to the hotel at Wellfleet, where the Boston men were also to stop. It was difficult to maintain the role, but I made daily trips to "The Towers" and always brought back some news for the Boston reporters, which they accepted as official, coming, as it did, from "Marconi's secretary."

The problem of getting news to New York from Wellfleet was a difficult one. There was but one telegraph wire on Cape Cod, the railroad wire, and the operator at Wellfleet was also the station master, freight agent and general man of all work. He could send a ten-word commercial message without going to pieces, but when some of the Boston newspaper men tried him out on press dispatches he threw up his hands. It happened, however, that one of their number—Jack Taylor, of the Boston

Globe—had been for years a press operator before he became a reporter, so he volunteered to handle the key for all the others, provided they all gave him a chance to get his "story" in first, which was a very satisfactory arrangement all around.

It would have been possible to go to South Wellfleet and take a chance on the operator there, but there would have been the constant risk that Taylor might be in the Wellfleet office hearing any dispatches sent from there. The telephone was the only recourse. The only public telephone in the village was in the booth in the postoffice. The booth was far from sound-proof, but the postmaster kindly gave me a duplicate key to the postoffice, so I could use it at night, when there was no one around to listen.

All attempts to talk to New York by telephone from Cape Cod proved unsuccessful. I spent hours in the postoffice the first night, trying to make my office understand me, but it was hopeless. I could talk with Boston very well, however, so it was arranged with the manager of the Postal Telegraph Company in that city that I could dictate my dispatches to an operator, who would at once send them by telegraph to New York. By this plan we figured the loss of time would not be more than a minute or two.

There was a wait of a week or more at Wellfleet for Marconi to get the apparatus adjusted to trans-Atlantic work. Every night I would slip away from the newspaper men in the hotel, go around the corner to the postoffice, lock myself in and in the dark—for I did not dare to show a light—telephone a news "story" to the telegraph office in Boston, receiving at the same time any messages my offices had sent for me.

One evening, after supper, Marconi telephoned: "Can you come over right away?"

It was a particularly dark night and the wind was blowing across the Cape at about 40 miles an hour. The four-mile drive to "The Towers" seemed ten.

"We shall get it across tonight," said Marconi as I entered. "The instruments are very well adjusted and we got a signal across to the other side a little while ago. We have been receiving their signals for two or three days. I think that some time between now and midnight I shall be able to get that message out for you. What do you want to say in it?"

I saw no reason to preserve my incognito any longer, and told them

It did not take us long to draft a dispatch addressed to the editor of the London Times congratulating him and the English people on this new bond of communication between the two great English-speaking nations, and signed "William R. Hearst."

To have waited at "The Towers" until the dispatch was sent would have meant the loss of valuable time, so it was arranged that I should be in the postoffice all the rest of the evening, where Marconi promised to call me up as soon as he had the news I was waiting for.

The curiosity of the Boston newspaper men when I got back to Wellfleet was satisfied by the news that signals from the other side had been received, which news they promptly wired to their papers. While they were sending their dispatches from the railroad station I was getting telephone connection with my Boston operator. I sent a "bulletin" to the Journal, advising that the wireless message would probably be sent soon. Then I sat down and waited in the dark, not daring to smoke. It seemed like hours before the telephone bell rang—just the faintest little tinkle. Marconi himself was on the wire, so jubilant and excited he could hardly speak.

"I have just got your message across," he said. "We got perfect communication about an hour ago. Mr. Bottomley sent me a wire tonight, saying that the President wanted to send a message to King Edward. We sent that and Mr. Hearst's message and got a return signal that they had been received. Mr. Hearst's message was sent the longest distance a wireless message has even been transmitted, for the President's message was picked up by our station at Cape Race and relayed from there, while Mr. Hearst's went directly across the ocean."

It seemed an interminable time after I had hung up the receiver before "central" responded again and gave me the connection with Boston. At last I got the operator in the Boston telegraph office and was just about to ring off after dictating my dispatch, when he said: "Wait a minute. Here is a message for you, coming from New York. I'll read it to you. It says: 'Good work. We received cable acknowledgement from London Times before we got your message.'"

An even more interesting sequel came the next day, when the Boston reporters began to get telegrams from their papers, asking how it happened they had let the New York Journal pull off a trick like this under their very noses. They came to me to find out whether it was true, and if so, how it was done. I saw no reason to preserve my "incognito" any longer, and told them. They were "sore," of course, over having been "scooped," but they were all good fellows and recognized the fact that any one of them would have done the same thing had he had the chance, so there was really no hard feeling about it.

A year or so later I was introduced one day to the managing editor of the paper with which C—— was connected. "You're the fellow who got that Marconi story, aren't you?" he asked. I admitted it. "Well," he said, "if it isn't violating the confidence of your office I would be very much obliged if you would tell me how on earth your paper ever found out that C——had gone up to Glace Bay in time to send you after him." I kept my face as straight as I could and replied gravely that to give him that information *would* be violating an office confidence.

I have never had an opportunity to meet Mr. Marconi since, for every time he has been in this country I have been in the West. I shall meet him again some day, I hope, and when I do I intend to tell him what he may not yet know—that the only reason I went up to Glace Bay was to get that one dispatch sent for Mr. Hearst.

IN THE SERVICE

SHORE-TO-SHIP DIVISION

To have visited practically every seaport on the North and South American coast from Boston, Mass., to Buenos Aires, Argentina, is no mean mark of distinction in itself. And to have travelled over this space as a wireless operator with his eyes on the scene before him and the news of the world hundreds of miles away buzzing in his ears by means of the radio apparatus makes the experience doubly interesting. So it doubtless proved to Robert Irving Young, manager of the Marconi station in Tampa, Fla., during the five years that he spent in the wireless cabins of various craft engaged in the coastwise, West Indian and South American trade.

The early history of Young begins in Bridgeton, N. J., where he was born twenty-five years ago. His initial work in telegraphy was done on the Philadelphia & Reading Railroad. After devoting two years to this employment he resigned in order to begin the study of wireless. He was not able, however, to give his full attention to acquiring knowledge of the art, for he was earning his living by working a "split" trick for the Postal Telegraph-Cable Company—that is he was employed for a few hours in the morning and about the same length of time at night, enabling him to have his afternoons free for the study of wireless at the station at the Bellevue-Stratford Hotel in Philadelphia. This station communicated with a station at the Waldorf-Astoria in New York City.

Having qualified for duty as a wireless man, the early part of 1909 found him located in the field of practical radio telegraphy—a field in which he has been continuously engaged since. His assignments include service on vessels of the Merchants and Miners Transportation Company, the craft plying between Philadelphia and Wilmington, the Creole of the Southern Pacific Line, the Saratoga, of the Ward Line and a detail in the offices of the Marconi Company in the Woolworth Building, New York City.

Young has been detailed at the Tampa station since May, 1913. One of the events in his daily work worthy of mention occurred about a year ago, when a steamship in the Pacific Ocean, 2,000 miles south of San Francisco, lost her propeller during a destructive storm. The operator on the vessel forwarded a message to the owners through the Tampa station in less than an hour after the accident, giving full details of the mishap and assuring the steamship company that a United States cruiser was proceeding to the assistance of the hapless craft and would tow her to the nearest port.

The station over which he exercises control is located on the coast about ten minutes' ride from Tampa by trolley car. Surrounded by palm trees, it is on the edge of the water, the tide on some occasions sweeping up to the very doors of the station.

Tampa is a station of not a little importance in the Marconi chain of shore-to-ship links and Young's duties in consequence are manifold. He has been called upon frequently to flash messages far out on the Gulf of Mexico, his success in this feat of transmission having given him a name for establishing long distance communication.

Marconi Defended As Inventor of Wireless

Under the heading, "Don't Take Away from Marconi the Glory of His Wonderful Invention," L'Italia, an Italian newspaper, of San Francisco, recently published an article of more than two columns in length upholding his fame as the inventor of wireless telegraphy. The defense was inspired by the publication in a San Francisco newspaper of a statement attributed to Professor Edgar Lucien Larkin, director of the Lowe Observatory in Southern California, to the effect that "Wireless telegraphy was not invented by any one investigator: many helped." This statement was made in response to an inquiry by one Giovanni Multini. L'Italia said that Professor Larkin gave a brief history of wireless telegraphy, going back as far as the year 600 B. C., mentioning the scientists who have had something to do with electricity, up to those who dealt with electrical waves . . . giving credit to Marconi merely for being the perfecter of a system of wireless telegraphy.

The article, published by L'Italia is in part as follows:

"Professor Larkin is right when he states that many helped in the discovery of wireless telegraphy, but to this phrase he should have added, nevertheless, that the real inventor of wireless telegraphy was Guglielmo Marconi. The greatest inventions and discoveries of men have all been preceded by various tentatives of other savants, often of different nationalities; but there is always one out of this many who alone is inspired by a spark of genius which makes the discovery or invention an accomplished feat benefiting humanity.

"Such was the case of Marconi. Probably he could not have reached his goal without the studies of those immortal predecessors mentioned by Professor Larkin, but after having given due merit to them, let us not hesitate in admitting that Marconi was the inventor of wireless telegraphy. The world acknowledges him as such and the world is right. Nobody had ever heard of such a wonderful thing as wireless telegraphy before Marconi gave the astonishing announcement that he had succeeded in transmitting wireless messages for a short distance in his native city of Bologna. He did so, not availing himself simply of the studies of other scientists, but by his genius.

"In further support of our statement that Marconi was the exclusive inventor of wireless telegraphy we have but to recur to the late decisions in favor of the Marconi wireless telegraph patents in actions against the De Forest Wireless Telegraph Company and others. The British courts and the High Court of France also decided in favor of the Marconi patents against other claimants.

"How can anybody, after the foregoing, still hesitate in affirming that Marconi was the inventor of wireless telegraphy? It was principally due to his detector and antenna that Marconi laid the foundation of wireless telegraphy which immediately became the great wonder of the modern age. And Marconi, and no one else, was not only the father of this discovery, but also the perfecter and, allow us to say, the nurse who through an endless series of painstaking experiments, brought the marvelous discovery from its infancy to its glorious achievement of to-day when it makes the air speak across land and sea.

"What Marconi has done is known to all: Over 3,000 men-of-war and merchant ships are now equipped with his system of wireless telegraphy by which many thousands of people have been saved from inevitable death through sea disasters. Throughout the world Marconi stations are now to be found everywhere, and through them the air and ether surrounding the earth are daily and nightly pervaded with electrical waves which carry clearly and correctly, the messages of the people of all countries. Professor Larkin cannot deny all this and cannot deprive our good countryman Giovanni Multini, of the satisfaction that it was his great compatriot, Marconi, who really invented or discovered wireless telegraphy."

It has been announced in a dispatch from Rome that King Victor Emanuel of Italy signed a decree on December 31, appointing Guglielmo Marconi a member of the Italian Senate.

How to Conduct a Radio Club

By E. E. Bucher

Article XI.

THE junior radio experimenter sooner or later becomes possessed with the desire to own a piece of apparatus which is to a certain degree not understood and which, outside of the practical radio field, is not known by a particular name. A new word has been coined to designate this device, which is known among practical wireless men as a "variometer."

Some amateurs are of the opinion that the "variometer" is some form of the rotary receiving tuner. Others are not certain what it is, but believe it to be of little value in their work. No distinct definition for the "variometer" has so far been advanced. The principle on which it works, however, is well understood in the electrical field.

The "variometer" may be defined briefly as follows: It is a device for the production of a variable value of inductance without the use of multiple point switches or sliding contacts. It consists of two coils having a fixed value of inductance, connected in series with each other and so mounted that the mutual inductance between them may be progressively varied from a nearly zero value to a maximum value. That is to say, the coils may be placed in magnetic opposition or in magnetic attraction.

The action of the "variometer" will be better understood after looking at Figure 1. Here the coil, AB, is wound in the opposite direction to the coil, CD. The latter coil telescopes into the coil, AB, and for "variometer" requirements should be mounted so that it can be pulled in or out of AB to any desired distance. The coils, AB and CD, are connected in series as shown.

If current from a battery is supplied to the two coils, as in Figure 1, then the magnetic lines of force produced by each coil will take the path as shown. It is at once evident that these lines of force are in opposition. Hence if the coil, CD, is placed entirely inside of the coil, AB, the resultant magnetic field is of nearly zero value and the self-induction of the unit as a whole is practically nil.

Furthermore, it is plain that if the coil, CD, is drawn out of the coil, AB, the magnetic opposition decreases and the self-induction of the unit as a whole becomes of gradually increasing value. It is clear, also that if alternating current is supplied to the two coils, the actions are similar to those just described except that the polarity of the magnetic flux from the coils reverses with each reversal of current. Thus a variable inductance element is produced which allows extremely close variations to be obtained. Further consideration of Figure 1 will reveal that if the B end of the coil, AB, is connected to the D end of the coil, CD, (in place of the connection shown) the magnetic fields are no longer in opposition, but flow in the same direction. Hence, if the coil, CD, is gradually moved into AB then the total mutual inductance value is progressively increased, the maximum being attained when the coils coincide.

"Variometers" need not necessarily take the form shown in Figure 1, but may be constructed after the general design shown in Figure 2. Here the winding, AB, is in circular form; inside of it is placed the winding, CD. The coil, CD, may be rotated on the axis as shown. When the planes of the two coils coincide in one position, the coils are in opposition; but when the coil, CD, is turned completely around, the self-inductance of the two coils is additive.

Again, the "variometer" may be of the type shown in Figure 3. Here the coil is wound in the form of a flat spiral, likewise coil CD. The latter coil moves on the pivot L, through the arc as shown, and when CD is directly opposite AB the inductance value of the unit is at a minimum. This value may be altered by mov-

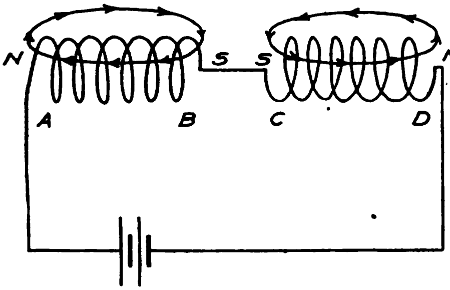


FIG. 1.

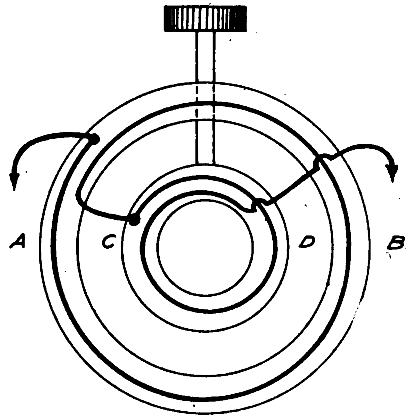


FIG. 2.

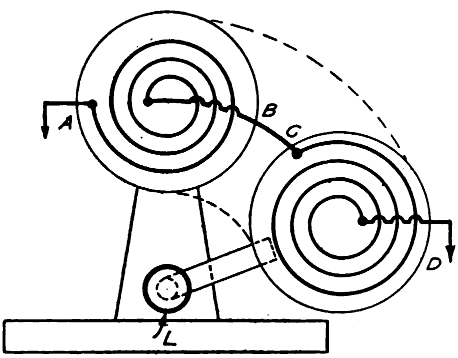


FIG. 3.

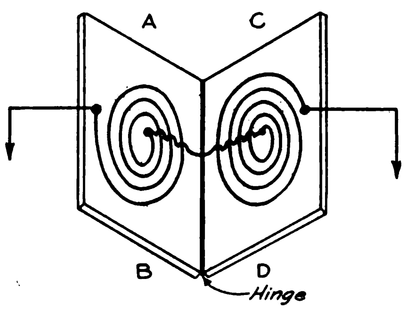


FIG. 4.

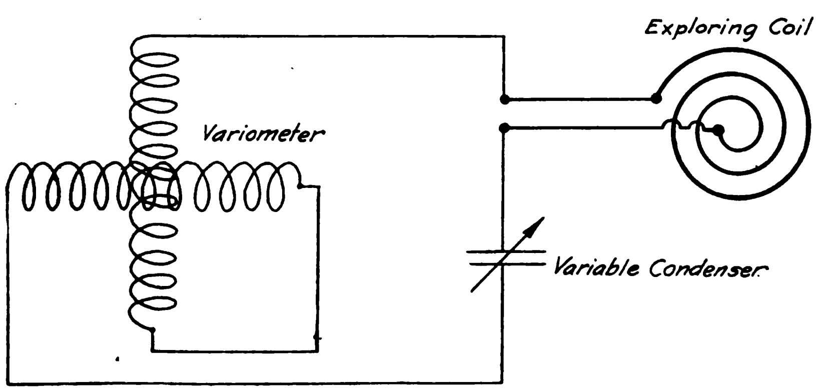


FIG. 5.

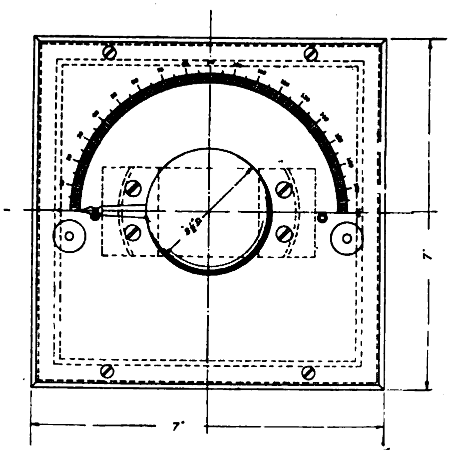


Fig. 6

ing the coil, CD, away from the coil, AB.

"Variometers" are occasionally constructed on the hinge principle, as per Figure 4. In this case the degree of coupling between the coils, AB and CD, is varied as desired by swinging the coil CD, on the hinge. In radio telegraphic circuits "variometers" are of use when extremely fine variations of the inductance value are required. They are often employed in the open oscillatory circuit

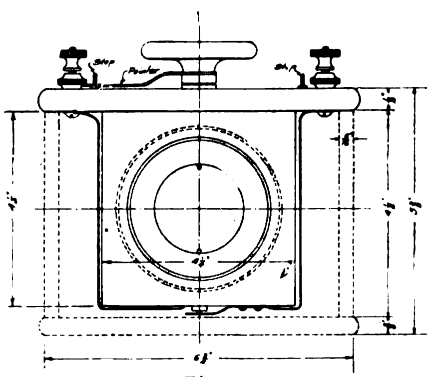


Fig. 7

of the transmitter, particularly when a spark discharger of the quenched type is included in the condenser circuit. They are occasionally inserted in the closed oscillatory circuit for variations of the inductance values and are sometimes used as the coupling element for transferring energy from the spark gap circuit to the aerial wire.

The "variometer" is again useful in the antenna circuit of a receiving tuner, particularly in the type employing multiple point switches on the primary winding or on the loading coil which do not give close enough adjustments of the inductance value. It allows intermediate values of inductance to be obtained between the "taps" which in some cases is extremely desirable.

The "variometer" is also often employed as the variable element of the wave-meter, being connected in shunt to a condenser or several condenser units of fixed value. If used for this purpose a small coil known as the exploring coil is connected in series for purposes of coupling the wave-meter to the circuit under measurement. This arrangement of the circuit is shown in Figure 5. To

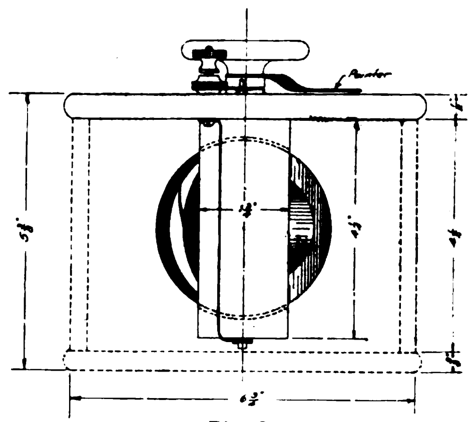


Fig. 8

those familiar with the wave-meter it will be readily understood how the wavelength of the meter is varied as the coil of the "variometer" is turned on its axis. There is an objection to the use of the "variometer" in a wireless telegraph circuit in that it is productive of energy losses when any other but the maximum value of inductance is employed. A little time devoted to careful consideration of the device will show that when the coils are placed in opposition the energy flowing through them encounters the D.C. ohmic resistance of the entire coil. It may, therefore, in some instances be more desirable to use a single coil of the proper value of inductance rather than the "variometer." The resistance losses will be less, to say the least.

The design for a "variometer" as shown in Figures 1 and 2, may be em-

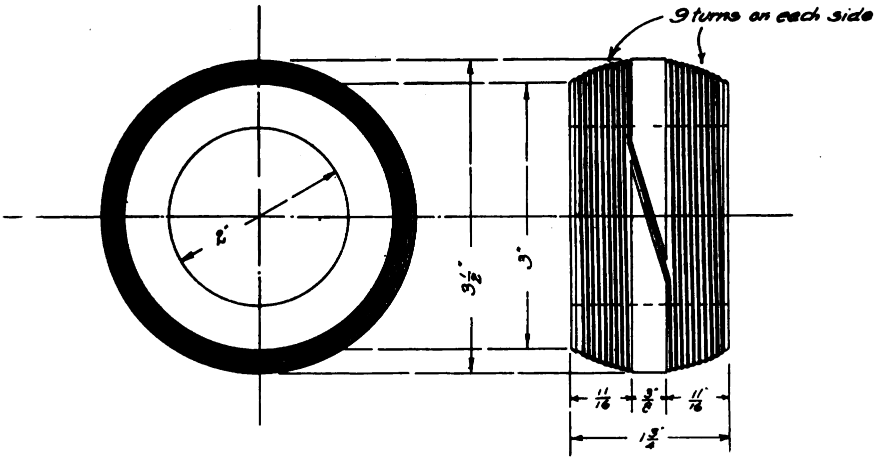


Fig. 9

ployed in the receiving apparatus of a wireless telegraph set, while the types indicated in Figures 3 and 4 are often used in connection with the transmitting apparatus.

Amateur wireless stations located in the vicinity or within the range of stations using undamped energy require a variable element giving extremely fine values of inductance in the antenna circuit. For this reason the construction of two different sizes of "variometers" will be briefly described.

Many amateurs who are somewhat familiar with the "variometer" are under misapprehension as to the maximum and minimum values of inductance to be expected. Some believe that it will take the place of a loading coil, which is quite incorrect. A "variometer" designed after the general idea in Figure 2 will not give a large range of inductance values, but is intended to be employed as a variable element to give the necessary fine adjustment between the "tap-offs" of a loading coil.

The first "variometer" to be described is suitable for the variable element of the wave-meter, while the second "variometer" is intended to be used in the antenna circuit of a receiving set when receiving from stations employing the longer wave-lengths. A top view of the first "variometer" is shown in Figure 6 which is drawn to scale and gives the general over-all dimensions of the lid, the knob for turning the inside coil, the binding posts for connection, and the placing of the 180-degree scale. A front elevation is shown in Figure 2 with the relative dimensions of the inside and outside windings. It will be observed that the inside winding (ball winding) is supported by a brass rod which at the bottom rests on a brush for making contact with one terminal of the ball winding. Another brass rod extends through the top of the coil into the hard rubber knob on the top. This rod is connected to the second terminal of the ball winding, and the final connection from this rod to the binding post is made by a brush underneath the lid (not shown).

The ball for the inside winding and the support for the outside winding are turned from a piece of hard maple on a wood-turning lathe. The support for the outside winding is gouged so as to allow the ball to move freely.

A side elevation of the "variometer" is shown in Figure 8 where the ball winding is partially turned on its axis. A detail of the ball itself is given in Figure 9. showing the general dimensions and the placing of the windings.

While it may not be clear from the drawings, it should be thoroughly understood that the ball for the movable winding has a flange on both edge so that when put in place the winding is at a level with the top of the flange. The same statement applies to the inside winding which is gouged out for the same reason.

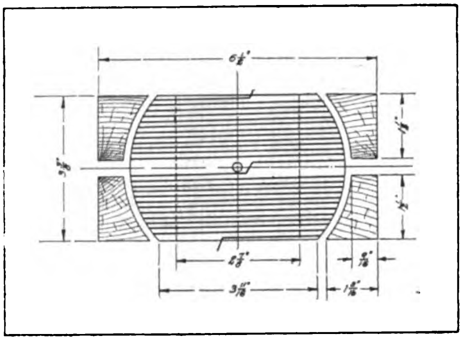


Fig. 10

There are two windings on the ball as shown, consisting of nine complete turns of No. 18 D. C. C. annunciator wire. The stationary winding is also split into two sections so placed that they are directly opposite the movable winding (in the 0 and 180-degree position). The stationary winding is also made of No. 18 D. C. C. annunciator wire.

It may be of interest to experimenters to know how this inside winding is put into place. This is accomplished in a very simple manner by turning out a

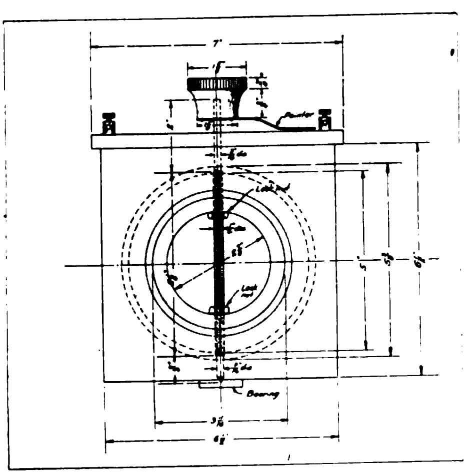


Fig. 11

wooden ball split in the center which just fits inside the stationary winding. This ball is split so it can be wedged. The stationary windings are then wound on the ball; the inside of the stationary support is then covered with two or three coats of shellac. Before this shellac dries the winding on the ball is slid into place and is firmly pressed against the sides of the stationary support by means of a wedge driven into the split of the ball. These wedges are allowed to remain in place until the shellac is thoroughly dry, when they may be removed. It will then be found that the stationary winding is firmly in place and it may be given a coat of shellac on the outside to further insure against the possibility of the wire coming loose.

One terminal of the stationary winding is connected directly to a binding post mounted on the top of the box. The

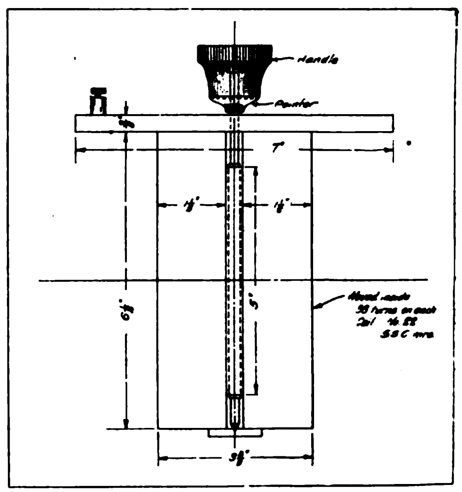


Fig. 12

other terminal of the stationary winding is connected to a brush which is in contact with the rod supporting the hard rubber knob. Connection is made from this rod to one terminal of the ball winding, the second terminal of the ball winding being connected to the second binding post by means of the brush at the bottom, as shown in the sketch.

The "variometer" as described, when connected in shunt to a variable condenser having a capacity value of .001 microfarads gave, in the 180 degree position, a wave-length value of 675 meters, and in the 10-degree position a wave-length of 180 meters. The amateur constructing a "variometer" of this type who also has available a fixed condenser of .001 microfarads capacity will have a wave-meter just suited to his requirements. When connected in shunt to a condenser having a capacity of .0005 microfarads, in the 180-degree position, it gave a wave-length adjustment of 460 meters, and in the 20-degree position a wave-length of 145 meters.

It may be of interest to know what effect this "variometer" will have on a circuit which already has been adjusted to a definite wave-length. It was connected in series with a circuit having a wave-length of 600 meters and afforded a maximum value of wave-length of 860 meters and a minimum of 630 meters. When connected in series with a circuit already adjusted to 300 meters it gave a maximum of 435 meters and a minimum value of 315 meters. As stated before, this "variometer" is suitable for the variable element of a wave-meter and it is not quite as efficacious for the variable element in an antenna circuit as the second "variometer" about to be described.

It is important that the inside and outside windings move closely to each other in order to secure the greatest possible maximum and minimum values of inductance. A "variometer" suitable for use in the antenna circuit of a receiving set when receiving from stations using the longer wave-lengths is shown in Figures 10, 11 and 12.

Figure 10 is a plan view looking down from the top, giving the dimensions of the ball and the support for the outside winding. Both the support and the ball are made of hard wood and, of course, must be turned out on a wood-turning lathe.

The ball for the inside winding, at its greatest diameter, measures 5 inches, gradually tapering to 3 11/16 inches at both edges. While the ball is shown as being hollow, it may, if desired, be made of solid wood. The ball has two windings which are separated to allow the brass rod to pass through. It is wound full to the edge with the No. 22 S. S. C. wire. To facilitate the placing of the stationary winding, the support is split into two sections which also has the effect of giving the inside windings and the outside windings similar dimensions, and therefore nearly similar inductance values.

The supports for the stationary winding are turned from a solid, square piece of wood and of course must be gouged out on a wood-turning lathe. The two halves of this frame may be fastened together by the top and base of the box or strapped together by a brass strip as desired. The outside winding also consists of a number of turns of No. 22 S. S. C. wire. The stationary winding support and the ball should have a slight flange (not shown) to assist in holding the windings in place.

The inside coil is held in place by a brass rod 8 inches in length, tapered at the bottom where it rests on the brass bearing, B. This bearing may be made to suit the builder. The rod has a diameter of 3/16 of an inch from the end in the hard rubber knob to a distance of 2 inches; for the next 5⅛ inches it has a diameter of ¼ of an inch and is threaded as shown; for the remaining ¾ or ⅞ of an inch, it has a diameter of 3/16 of an inch, and is tapered at the extreme end. The nuts, N and N-1, hold the ball for the inside winding in place.

The windings for the outside coil are put in place by the same method as described in connection with the "variometer" previously referred to, the wood first being shellaced and the windings then pressed into place. A 180-degree scale may be fastened to the lid and pins placed in the latter to limit the movement of the ball winding. A hard rubber or wooden knob having the general dimensions shown may be affixed to the rod. Refinements such as the complete case, the binding posts, scale, etc., may be constructed to suit the builder. Flexible leads should connect the inside winding with the outside winding.

When the "variometer" just described is connected in series with an antenna circuit already adjusted to a wave-length of about 7,000 or 8,000 meters it will alter this value about 450 or 400 meters.

If the amateur experimenter employs the first described "variometer" in connection with a wave-meter, he should use the connections shown in Figure 5. The exploring coil may consist of three turns of No. 18 D. C. C. annunciator wire wound on a form 4 inches in diameter. The connecting leads to this coil may be 2 feet in length.

(To be continued)

From and For those who help themselves

Experimenters' Experiences.

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

FIRST PRIZE, TEN DOLLARS

An Improved Receiving Transformer

This is a description of a receiving transformer that is very easy to operate and gives first-class results. It will be rather inconvenient for the amateur who has not a lathe to make one of similar design, because of the difficulties of turning out the knobs, etc. The majority of the work can be done on a lathe in a wood-working shop.

The construction is as follows: First, cut the base out of hard wood; it should have dimensions of 18½ inches by 5⅝ inches by ⅞ inch. Next make the coil heads A and A-1 ½ inch in thickness and 6 inches in diameter. Cut out the center of the coil head A-1 so that the opening will have a diameter of not less than 4⅝ inches. Then cut a groove about ⅛ of an inch in width and 3/16 of an inch in depth in one side of each of the coil heads so that the outside edge of the groove will have a diameter of 5 inches. These grooves are for the purpose of holding the tube for the primary winding in place.

Now secure a cardboard tube 6⅞ inches in length by 5 inches in diameter (outside) and wind it with No. 22 enamelled wire, beginning ⅜ of an inch from one end of the tube and stopping the same distance from the other end. I advise the use of enamelled wire because more can be wound on the same space. It is also easier to make a path for the slider and finally it gives a much better appearance than the ordinary silk or cotton covered wire.

After this tube is wound place it in the grooves in the coil heads and then fasten the heads to the base by countersinking them about 3/16 of an inch.

Next get two pieces of hard wood, ½ inch by ½ inch, (B and B-1) 7½ inches in length which are to be used as supports for the sliders. These should be fastened on the coil heads as shown in the drawing. The necessary dimensions for construction will be found in the drawing.

C and C-1 are bearing blocks for the slider rod, D; the knob, E, must fit loosely on the rod, D, so that there is no danger of both sliders turning at once. A piece of No. 8 copper wire, G, serves to conduct the current to the binding post, H. This wire must rub on the slider arm, F. A piece of springy brass, will serve the same purpose as G. The rod D, has a square end on which is fastened the knob, I, to hold the arm, F-1, in place. The primary coil is now complete and we are ready to construct the secondary winding.

Make the coil heads, K and K-1, K being placed entirely inside the tube and K-1 having a flange projecting over the outside of the tube as shown. Make another tube for the secondary winding, 4½ inches in diameter (outside) and about 7 inches in length, winding it with No. 28 enamelled wire, taking off taps as indicated. The number of taps to be used will depend on the number of contacts that can be placed on the coil head, K-1. Bore a ¾ inch hole in the coil head, K-1, in which is to be placed the slider mechanism, U, also shown in Figure 3. Bore a ¼ inch hole in K for the rod O. The brass rod O which is ¼ inch in diameter and 17½ inches in length is supported by the piece, "S" and the coil head, A. Another view of the support T is shown in Figure 5.

The slider arm, N, has a square hole in the end that fits on the square part of U which in turn is fastened to the knob L. A small rod, Q, is fastened between the coil head, A-1, and S. The brass strip, R, rubs on this and keeps the coil from turning.

One end of the secondary winding is connected to the brush, R, which rubs on the rod, Q, Q in turn being connected to one of the binding posts. The other connection is from the arm, N, to the brush, M, which rubs on the rod O, O being connected to the other binding post.

A tuner of this construction has been found very satisfactory indeed in operation and gives a neat appearance. It gives a range in wave-length up to and somewhat beyond 2,000 meters.

EDWARD C. SCHURCH, *Montana.*

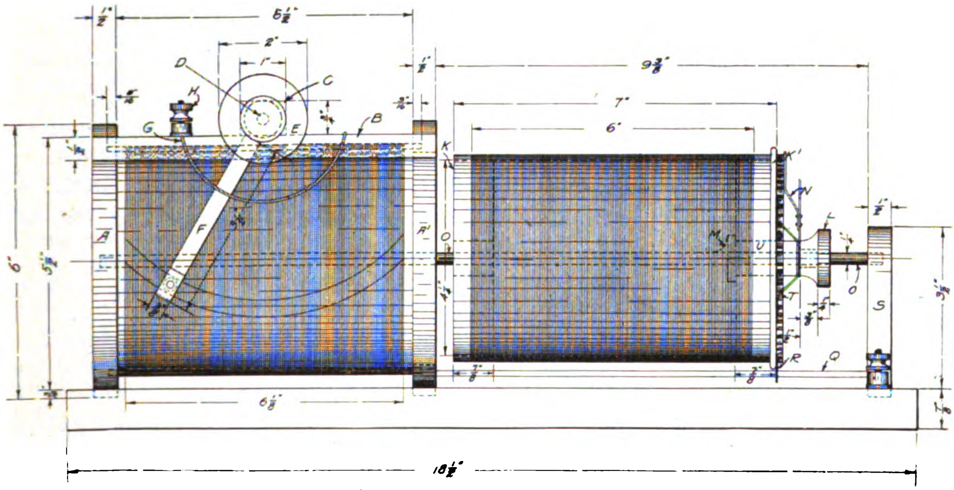


Fig. 1, First Prize Article

SECOND PRIZE, FIVE DOLLARS

An Amateur's Hot Wire Ammeter

The hot-wire ammeter has become a necessary part of the amateur's equipment, but the selling price of this instrument is generally prohibitive to the amateur's pocketbook. I have written a description of an ammeter suitable for the experimenter's use, which is simple of construction and costs practically nothing, as the parts may be found around the average amateur's station. A general idea of the construction of my design is given in Figure 1. The case is made of ¼ inch mahogany, well shellaced both inside and outside. The top and bottom pieces are 1¾ inches by 5½ inches; the back 4½ inches by 5½ inches, and the ends 1¾ inches by 4 inches, and 1⅜ inches by 4 inches, respectively. After these parts are assembled a strip ⅛ inch square and 4 inches in length should be tacked on one side, as shown. Next, tack a similar strip on both the top and bottom pieces. This strip should be 4¾ inches in length, leaving a space of 1/16 of an inch. A second strip should be 5 inches in length.

A piece is then made, as per dimensions, at A, Figure 2. This is to hold the glass case in place. The method of stringing the hot wire is further shown at B, Figure 1. The thumb-screw, C, is intended to take up undue expansion of the wire, and bring the pointer back to the zero position. The nut through which the adjusting screw passes (F, Figure 3), should be soldered to the brass strip conecting the binding posts. The movement for the mechanism is taken from an old clock, and is screwed to the back of

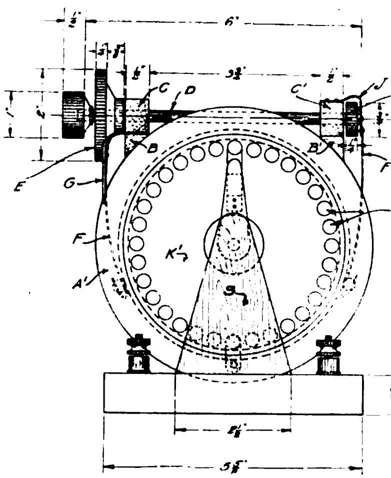


Fig. 2, First Prize Article

the case. For an indicator, solder on the shaft of the wheel, a No. 28 copper wire as at E, Figure 1, and directly opposite on the periphery place a drop of solder as a balance.

A piece of No. 30 wire sufficiently long and having a loop twisted at the end, has one end slipped over the hot-wire and the other end over a small steel pin projecting from the top movement. The dial is raised from the base of the glass by two small pieces of wood, 1/8 of an inch in height, and the indicator is allowed to pass under, which, of course, greatly facilitates the reading.

The operation of this apparatus is as follows: The current passes through the wire and expands it; the tension of the hair spring, therefore, takes up the slack, thus moving the indicator along the scale. Care should be taken that the tension of the hair spring is not so great as to prevent the wire contracting and bringing the pointer back to zero. The "hot-wire" should be of No. 32 or No. 34 German silver. A few turns of it should be wrapped about the adjusting screw. If the experimenter has access to a standard ammeter he may calibrate this instrument by comparison.

FRANK O'NEILL, *California*.

NOTE.—Amateurs intending to construct an instrument of this type should take particular care to select a hair spring having great resilience and lightness.—TECHNICAL EDITOR.

THIRD PRIZE, THREE DOLLARS

A Receiving Tuner of the Pancake Type

The following is a description of a receiving tuner of the pancake type which I have constructed and with which I have obtained excellent results. It is intended that this tuner should be employed with an aerial at least 150 feet in length and 50 feet in height.

It will be observed from the drawings that the primary winding is stationary on one end of the brass rod, D, while the secondary winding slides over the rod, D, so that the coupling between the two

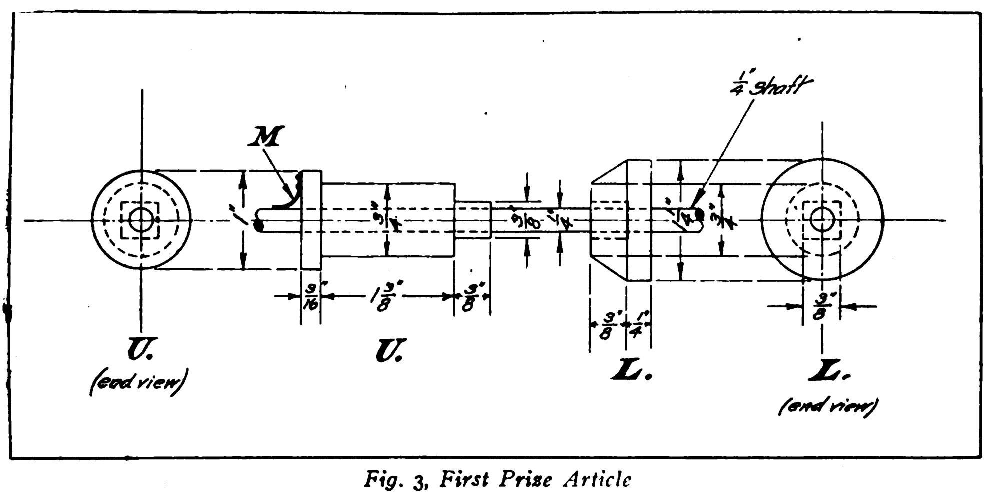


Fig. 3, First Prize Article

windings may be varied as desired. The secondary winding is also built on a swivel so that the coupling between it and the primary winding may be adjusted by simply turning the secondary winding at right angles.

The primary winding has 100 turns of

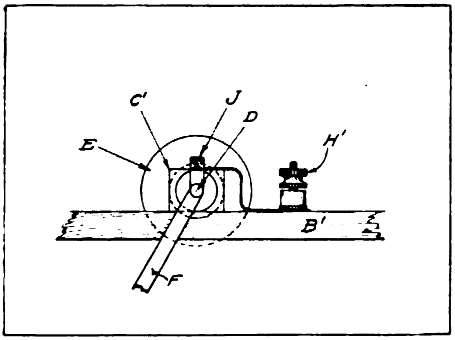


Fig. 4, First Prize Article

No. 20 green silk covered wire, the secondary winding 150 turns of No. 24 green silk covered wire. "Tap-offs" are taken from the primary winding to a multiple point switch having 20 points. A similar number of "tap-offs" may be taken from the secondary winding.

The turns for both the primary and secondary windings are started from the outside edge of the disc and not from the center. The discs for supporting these windings may be made of hard wood such as maple or, if desired, of hard rubber.

That portion of the discs on which the multiple switches are mounted is slightly raised, as shown in the sketches. This is intended to facilitate the bringing out of the taps from the windings. The construction of this tuner should readily be understood from the drawings which are made to scale.

J. F. Serex, *California*.

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

An Efficient Receiving Tuner

The receiving set I am about to describe is the most compact and efficient I have ever used. I believe the drawings furnished are clear enough not to need a special description, but for those who may desire to construct a similar instrument the following dimensions are given:

1 cardboard tube, 4¼ inches in diameter by 6 inches in length; 1 tube, 3¾ inches in diameter, by 5½ inches in length; 2 end pieces for primary winding, 6 inches by 6 inches by ½ inch, 2 end pieces for secondary winding, 3½ inches in diameter; ½ dozen contacts and switch for secondary winding; 2 3/16-inch round brass rods, 16 inches in length for secondary winding; ½ pound No. 24 enamel wire for primary winding, and ½ pound No. 36 S. S. C. wire for secondary winding. The base for the receiving tuner should have dimensions of 18 inches by 8 inches by ½ inch.

It is intended that the same case should hold the variable condensers, the fixed condensers and the battery. The case, therefore, should be made of the proper size to get the above-mentioned instruments into it.

The detectors used are of the Perikon and Silicon type mounted on a sheet of hard rubber on the side of the primary winding of the receiving tuner. Switch A selects the detector to be used, switch B varies the voltage of the battery, while switch C cuts the battery in or out of

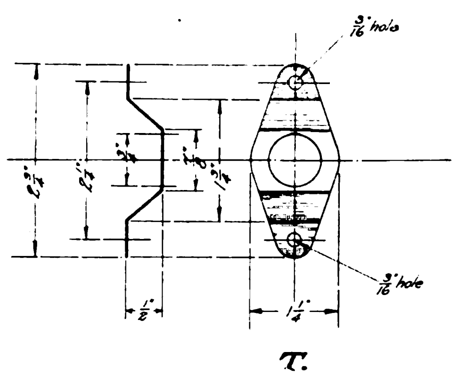


Fig. 5, Second Prize Article

the circuit. Five flashlight batteries were found to be just suited to the above set, while the variable condensers for the secondary winding were of the small Murdock type.

The experimenter may employ any standard method of wiring up his tuner, but I prefer the diagram of connections given in Figure 2.

The set as described is especially

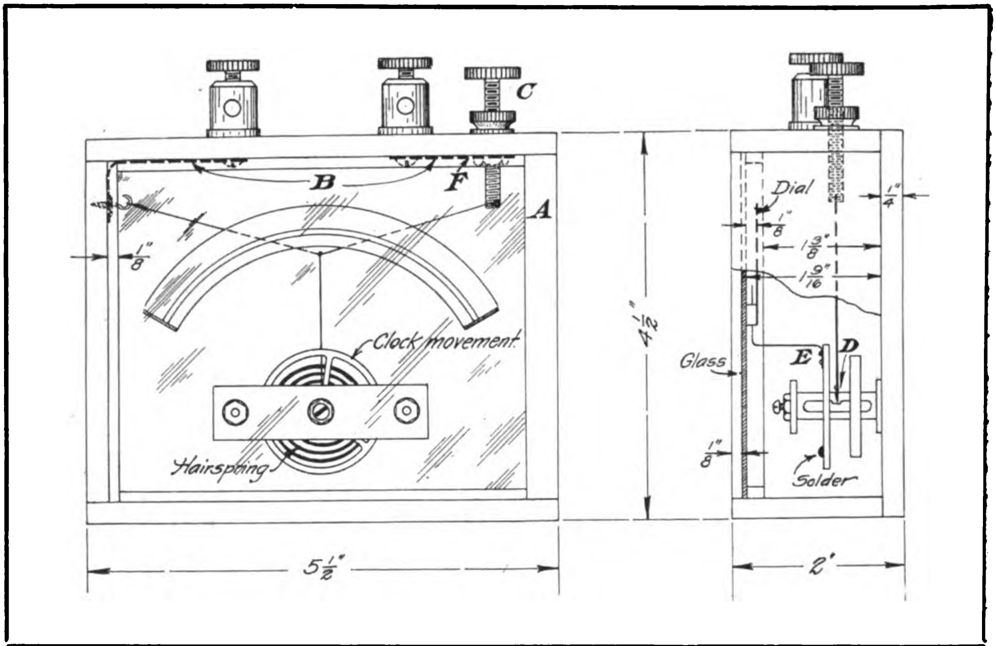


Fig. 1, Second Prize Article

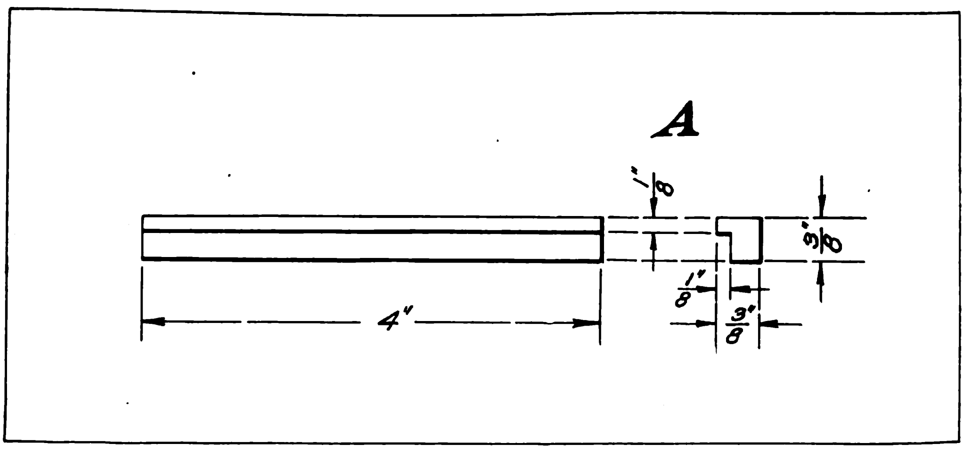


Fig. 2, Second Prize Article

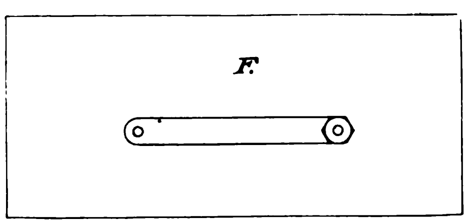
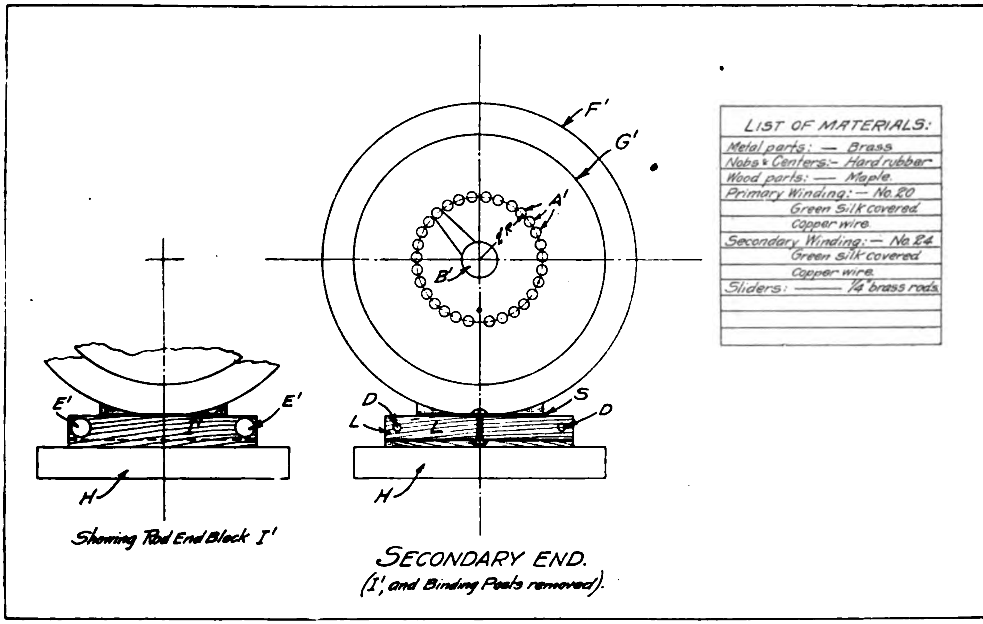


Fig. 3, Second Prize Article



Drawing, Third Prize Article

adapted for portable work because of its compactness, and is therefore recommended to the Boy Scouts. I have found it an easy matter to receive signals from the government station at Arlington, Va., on a portable aerial 60 feet in height by 50 feet in length composed of 4 No. 14 wire strung on 9-foot spreaders. Furthermore, I have repeatedly copied Colon, Panama, with this set on my permanent aerial which is 80 feet in height and 100 feet in length. It consists of six stranded copper wires strung on 15-foot spreaders.

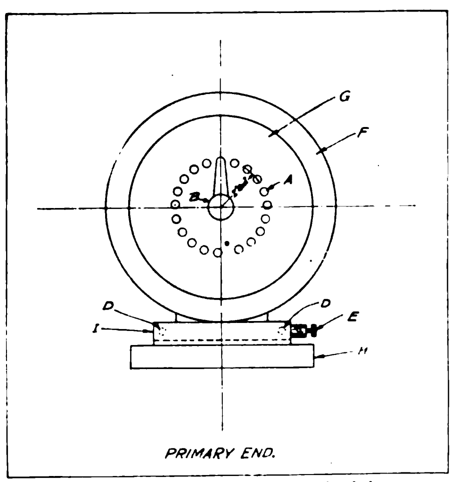
BAYARD D. ALCORN, *New Jersey.*

NOTE.—We cannot understand why our contributor has connected two such condensers in series unless the capacity of either one is too large for the purpose. Furthermore, we are of the opinion that better results will be obtained if the head telephones are connected in shunt to the fixed condensers rather than across the terminals of the receiving detector.—TECHNICAL EDITOR.

HONORARY MENTION

Connections for Results

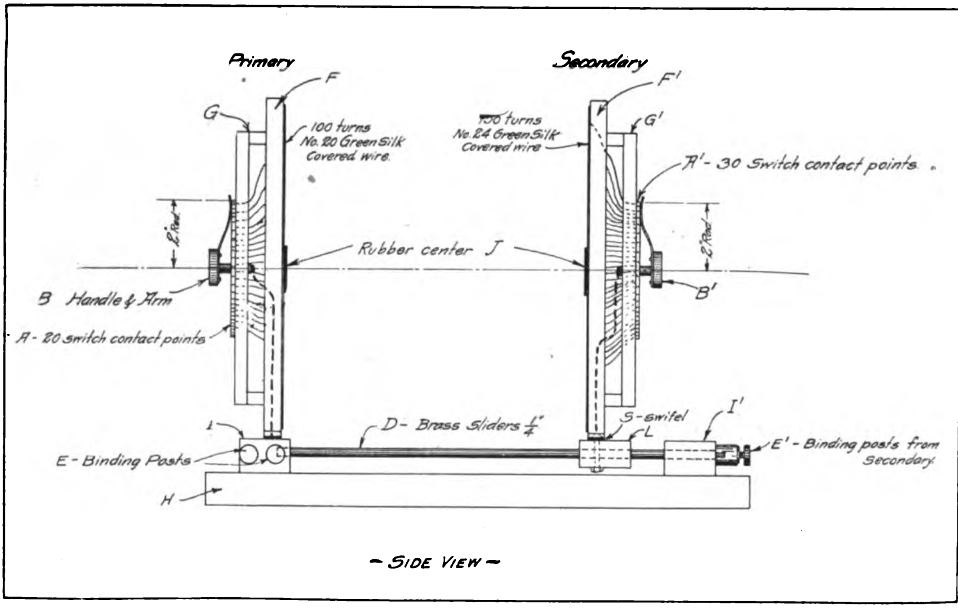
The accompanying diagram of connections for a double slide tuning coil, detector, fixed condenser and head telephones is by far the most efficient I have ever used. and I have tried every hook-up I have ever seen in print. As far as tuning is concerned, it is not any more selective than the ordinary method of connection, but for bringing in that "long distance fellow," it is superior to all. With the circuit as shown, I have copied NAX (2,100 miles) on an aerial 75 feet



Drawing, Third Prize Article

in length and 50 feet in height, using a small Perikon detector and a five dollar set of head telephones.

Specific directions for tuning cannot be given, but in general the following advice is offered:



Drawing, Third Prize Article

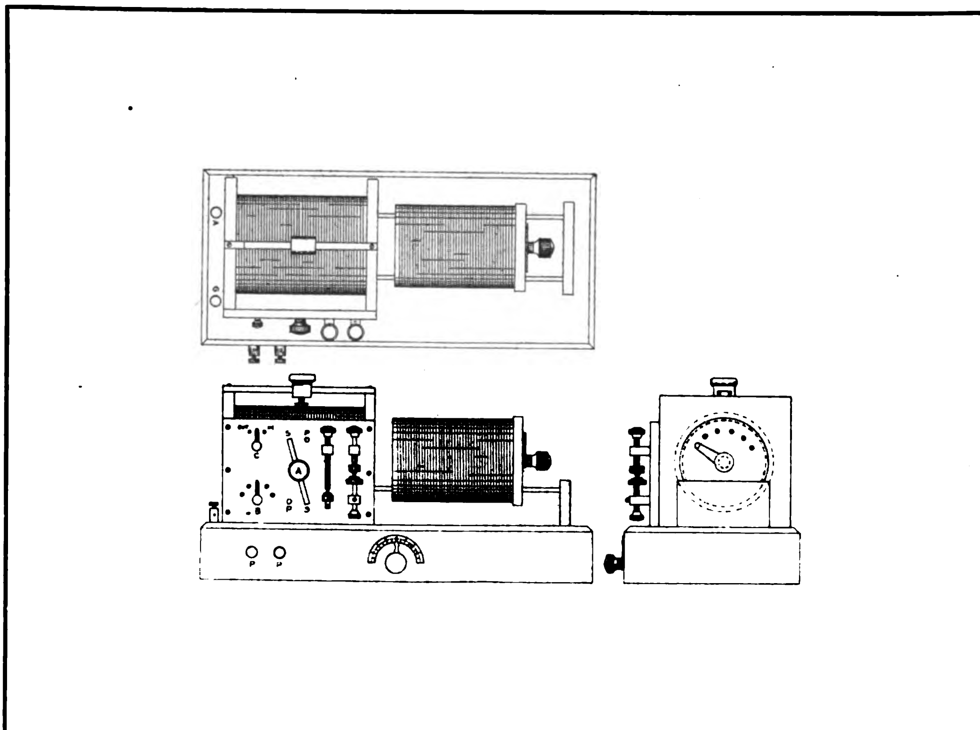


Fig. 1, Fourth Prize Article

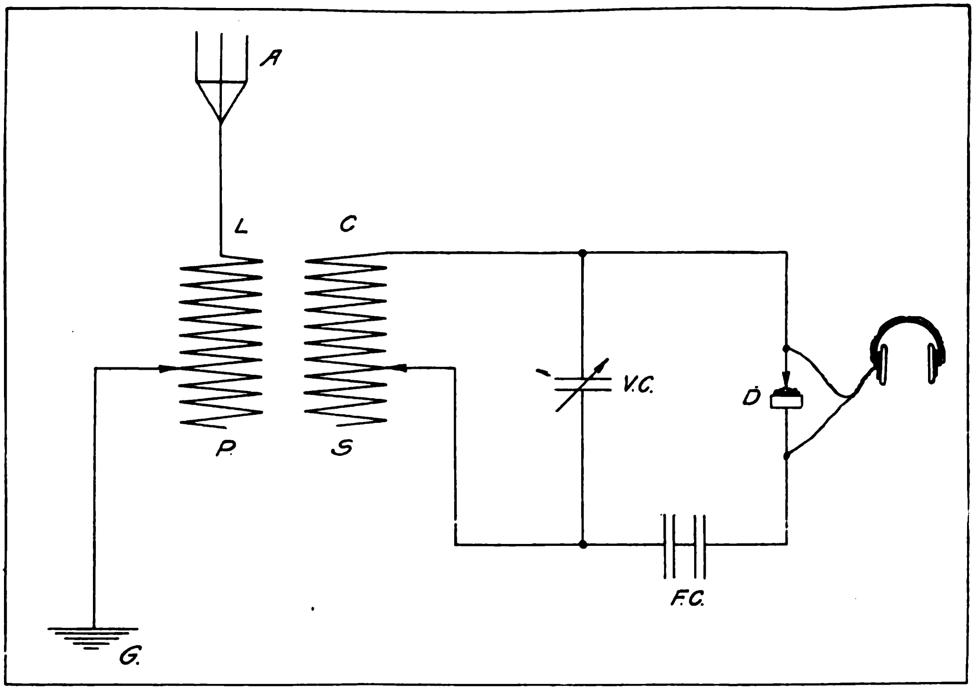


Fig. 2, Fourth Prize Article

and down along the coil until the desired station comes in louder. If this point is not over one-fourth of the way up the coil from the slider, A, the station can probably be brought in louder by moving the slider A, up the coil past the slider, B, usually about three or four times the distance from B to the end of the coil.

It makes practically no difference whether the head telephones are connected across the detector or the fixed condenser; or, for that matter, the set will work very well indeed without any condenser in the circuit; the head telephones and detector being connected in series.

S. C. BEEKLEY, *Pennsylvania.*

NOTE.—We agree with our contributor that for amateur purposes this is the most efficient hook-up that can be employed and it is recommended particularly to those who are just entering the radio amateur field. The method of connection shown is particularly valuable when receiving signals from transmitting stations employing long wave-lengths on a receiving aerial of small dimensions. We prefer that the head telephones be connected across the fixed condenser for the most efficient results.—TECHNICAL EDITOR.

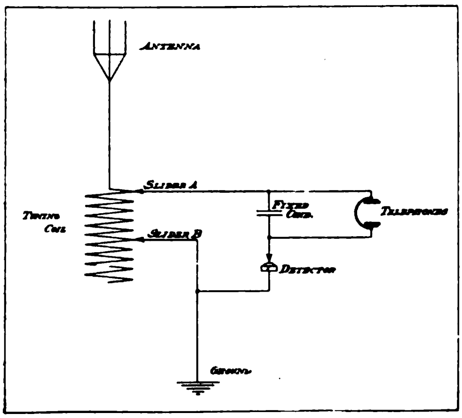
HONORARY MENTION

Comparing the Strength of Signals from Different Stations

It is often convenient to compare the intensity of signals from a station under different conditions, or to compare the strength of signals from different stations. Such measurements are particularly valuable in finding out the best connections for a receiving set or in general testing of mineral detectors. To actually measure the strength of the incoming signals requires elaborate apparatus, but for ordinary purposes a comparative reading is sufficient.

The only instrument needed for this is a potentiometer, preferably one with a sliding contact. Clapp Eastham's type is perhaps the best. Make a closely graduated scale to lay parallel with the slider-rod and solder a wire to the slider passing over the scale. If a rotary or other type of potentiometer is used, make some arrangement similar to this.

Figure 1 shows the connections for changing the potentiometer from one position to another. Switch A is sim-



Drawing, Honorary Mention Article, S. C. Beckley

ply two single-point switches arranged side by side so that one of the levers will make contact with both points. It

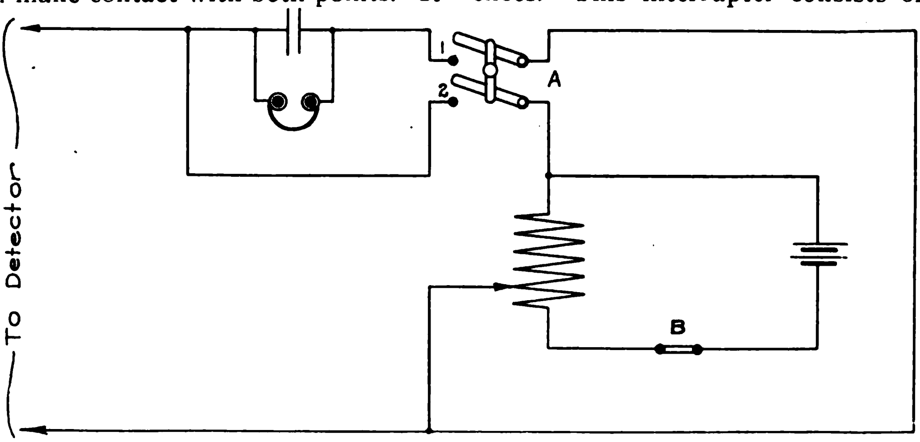


Fig. 1, Honorary Mention Article, Milton B. Sleeper

is easier to operate if the two levers are connected with a strip of hard rubber or fibre. With switch A in position 2, and B open, connection is made for the intensity meter. When switch A is in position I and B is closed, the instrument becomes a potentiometer.

Figure 2 shows the connection for the intensity meter alone. It is well to keep A open when the meter is not in use.

When a signal is received, the slider is moved until the signal is just too faint to hear, and the reading on the scale noted. If the wiring is changed or a new instrument or crystal placed in the circuit, a second reading is taken. By comparing it with the first result, it can be determined if the signals are stronger or weaker. The same meter can also be connected in at other stations to compare the results obtained by different operators.

MILTON B. SLEEPER, *Massachusetts.*

HONORARY MENTION

An Independently Operated Spark Coil Interrupter

The accompanying drawing illustrates a new type of independent vibrator which I have used with some success. The note produced by this device is by no means musical, but at the distant receiving station produces a sound like escaping steam, easily readable through static and other interferences. This interrupter consists of a magnet or solenoid which is supplied with 60-cycle alternating current, the

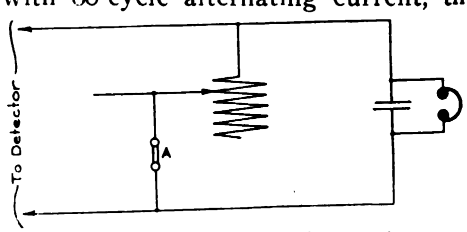
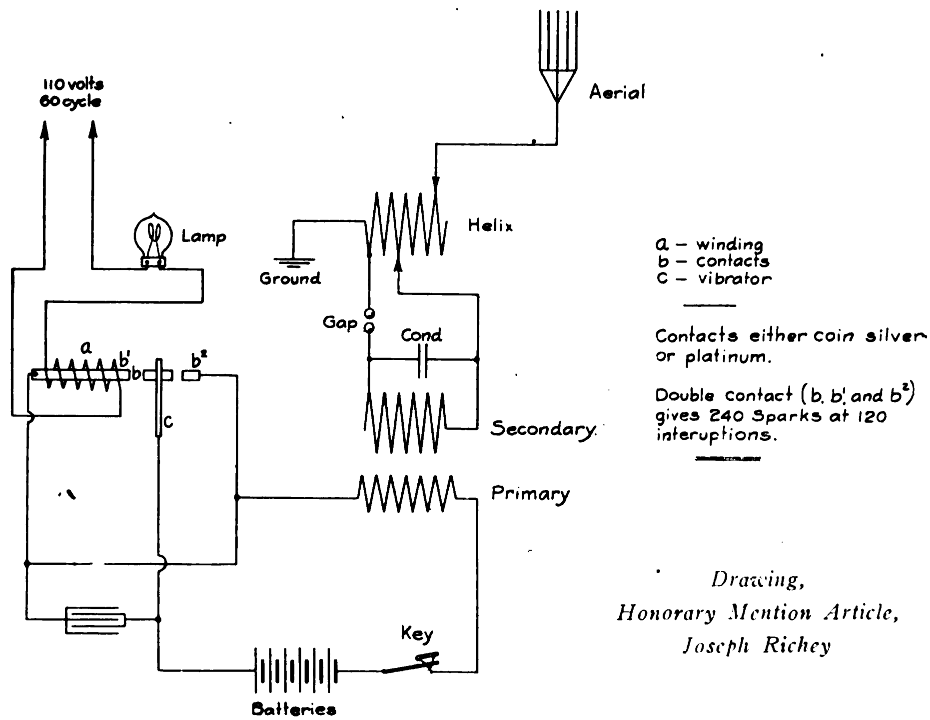


Fig. 2, Honorary Mention Article, Milton B. Sleeper

armature, B, being drawn to the magnet once per alternation.



Drawing,
Honorary Mention Article,
Joseph Richey

The two stationary contacts, B1 and B2, close the circuit from the batteries to the primary of the induction coil as shown. On account of the fact that we have two stationary electrodes 240 sparks are produced in a second of time from the 60-cycle source of supply.

A pony relay has been used with some success in place of the magnet as shown. A condenser which is shunted across the contacts, is constructed as follows: Five sheets of tinfoil thirty-six inches in length are separated by thin paraffin paper, two sheets being connected to one side and three sheets to the opposite side. The entire condenser is wrapped in concentric form as desired.

I have used this interrupter in connection with a 1-inch coil and have reached a receiving station six miles distant. I consider this good work, owing to the hills and iron ore deposits in this vicinity; furthermore my station is situated in a valley.

JOSEPH RICHEY, *Pennsylvania.*

LONG DISTANCE COMMUNICATION

The students in the radio class of the East Side Y. M. C. A., 153 East 86th street, New York City, have finally succeeded, after a series of experiments covering several weeks, in establishing wireless communication with various high-power stations in Europe. Messages are received from the Goldschmidt high-power station at Hanover, Germany, and the Telefunken station at Nauen, Germany. The Marconi, Glace Bay, Nova Scotia, and Clifden, Ireland, stations are heard regularly, the messages sent between these two points being used for code practice. The "KHX" station at San Francisco is heard regularly on the evening press schedule with Honolulu. Messages have also been copied from the new government station at the Exposition Grounds in San Diego, Cal.

In view of the unfavorable local conditions and the fact that signals have not been received heretofore at enormous distances, the students are well pleased with the accomplishment. The apparatus employed has been specially designed for the purpose.

Between the Log Lines

Editor's Note:—All commercial wireless operators are required to keep a record of communications sent by wireless to and from vessels and shore stations, setting down also any incidents of the wireless traffic which serve as a guide to the heads of the department. The record is called a "log" and is turned in by the operator on the completion of each voyage. Land stations, too, send in reports regularly. For the most part these documents are made up of an uninteresting mass of data, of value only to traffic officials; but occasionally a note of human interest creeps into an entry. Sometimes the incidents are humorous, and often they are dramatic. The few random extracts printed on this page give some idea of the highly diversified life of the commercial operator of today.

AT 10:30 A. M., on the morning of January 25, Operator Swanson of the Saratoga jotted down the following interesting entry: "KVG (Algonquin) working, says their propeller has been lost and is trying to get a ship to tow them in. I have advised our Commander." And then, nineteen minutes later: "WHA (Hatteras) tells NAN (Beaufort) that a two-masted schooner is ashore off the life saving station near the south end of outer slew. High seas are preventing the life savers from reaching the wreck."

* * *

Reference to this incident is also found in other logs, Operators Makenzie of the City of Atlanta, and Robinson of the Creole among others, noting that they have relayed traffic relating to the mishap. As far north as Boston, Operator W. S. noted that he did not miss anything, and reported "All signals good here."

* * *

The excitement extended also to the El Norte, besides which Operator Lohman later noted that the Antilles was standing by to take the crew off the schooner Mary L. Baxter, "leaking badly 85 miles south of Diamond Shoals." The crew of nine men was eventually taken off by the El Valle.

* * *

The operator in charge of one of the most important stations on the Atlantic coast noted on January 29, at 2:45 P. M. that the boredom of a temporary lull was enlivened by some canned Caruso, transmitted through the air by a wireless telephone. Fifteen minutes later the entertainment had switched to banjo music, and was as "plain as if in this room." Very seriously, his log calls the attention of the traffic officials to the phonographic breach of neutrality—the banjo selection being "It's a Long Way to Tipperary." Five minutes later the phone experimenter must have received some etherwaved intimation that the universally beloved Caruso was to be preferred, for at 3:50 P. M., so the log-keeper announces, everything was so plain he had only to shut his eyes to dream of happy days in the Mediterranean.

* * *

Various logs from both ship and shore stations lead one to believe that by careful tuning the numbered code of warships may be heard at frequent intervals.

* * *

It is also revealed that Jacksonville and Miami are entering into keen competition for message traffic these days. When a ship in that communication zone sends traffic to WJX the active men at WST feel slighted—and this, of course, works both ways.

* * *

Operator Stevens on the Jamestown gives some indication of resourcefulness in his log entry, that at 7 A. M., January 31, he called KOB (Princess Anne) on his ship's steam whistle and told them by its blasts to listen for a message. The Princess Anne was at the Newport News dock and the Jamestown at anchor, so a little ingenuity was necessary to raise the operator not then on duty. The means employed was successful.

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION

If a man has a bent toward certain activities he will follow it, notwithstanding the bait which destiny may hold out to lure him to other paths. This is the conclusion that must be drawn after a perusal of the life story of Henry Chadwick, manager of the operating department in the Broad street office of the Trans-Oceanic Division of the Marconi Wireless Telegraph Company of America, New York City. Chadwick was born in Bury which is near Manchester, England, in 1884, and arrived at the age when he was old enough to attend the Bury Grammar School without giving any indication that he was to find his real future in wireless. The years rolled on and, having completed his education, he entered a business office in Bury. Then he became an employee of a paper mill. At this juncture fate took her eyes off him for a brief period and there flashed into his brain the idea that he would like to enter the field of telegraphy. Wireless at that time was not included in his plans.

As the most feasible way of arriving at the end which he was desirous of reaching, Chadwick began practising upon a wooden telegraph instrument which he had constructed. Thus, with his energies directed toward becoming a telegrapher, Chadwick, after two years spent in the paper mill, entered the British Post Office service. There he remained for two years leaving the service to become an employee of the Commercial Cable Company in Liverpool. He was afterward detailed at the cable station at Waterville, Ireland.

Wireless came directly to his attention in 1905 when he left Europe to enter the office of the cable company in New York City. One of the features attracting his notice on the steamship on which he embarked was the radio equipment, and when the vessel reached American waters he had absorbed no small store of knowledge regarding the value of wireless. While he was in the employ of the cable company he began a course of study with the object of qualifying as a member of its engineering department, but wireless was still in his thoughts. This is shown by the fact that he joined the forces of the Marconi Company in July, 1914.

Upon the opening of the trans-Atlantic station at Belmar, marconigrams will be sent from the office of the Marconi Company at 42 Broad street, by direct automatic multiple wire circuits to the New Jersey station, which connects with those in Towyn and Carnarvon, Wales. When the high power station on Cape Cod is opened wireless communication will be established with Norway, Sweden, Denmark and Russia. This service will be connected with the Marconi office in New York. Thus, it will be observed, Chadwick as manager of the operating department in the Broad street office will not be lacking in responsibility.

Chapter XII

THE radio-goniometer or direction finder is a specially-designed receiving apparatus for determining the direction of a wireless telegraph transmitting station at a given receiving station. The device was primarily designed as an aid to navigation, enabling the officer of a vessel to make observations and establish his position independent of weather conditions, such as fog, etc. It is applicable in many other ways also, and can be employed to advantage by armies and navies; by means of it a hostile wireless station may be definitely located or the direction of the enemies' battleships, while in radio communication, "sensed."

Government inspectors are likewise enabled to "round up" interfering amateur stations, by using the direction finder. The apparatus is even of considerable value for ordinary receiving purposes (short range work), for it allows the receiving operator, when the ether in a given locality is congested, to "screen out" unwanted wireless signals. It is only recently that the latter advantage seems to have been fully realized.

The Marconi direction finder is an adaptation of the apparatus originally evolved by Messrs. Bellini and Tosi; however, the device as produced by these inventors was not adapted to ship work. Improvements were made by the Marconi Company and the equipment is now turned out in a form entirely satisfactory for use by navigators giving, as it does, a high degree of accuracy.

The complete equipment consists of a goniometer with the necessary appliances for control (Figure 8), a tuned wireless telegraph receiver (Figure 9), a tuned buzzer tester (Figure 10), and an angle divider (Figure 11).

THE DIRECTION FINDER AERIALS

A distinguishing feature of the direction finder equipment is the use of two closed circuit looped aerials having the form of an isosceles triangle as shown in Figure 1. These aerials bisect each other at right angles and also hold an angle of 45 degrees with the bow and stern line of the vessel.

It is important that the aerials be placed in a somewhat clear space on the deck and that the two loops have identical dimensions. The wire should be held taut and firmly in place. The energy collected by the aerials, from a passing electro-magnetic wave, is made to flow through a specially designed set of excitation coils, setting up a magnetic field which acts upon a third coil known as the exploring coil. The latter coil carries a pointer which moves over a 360-degree scale and gives the sense of direction of any transmitting station. This portion of the apparatus is known as the goniometer, the windings for which are clearly shown in the photograph (Figure 2). It will be referred to again hereafter.

The sketch (Figure 3), is a plan view of the two triangular aerials, as previously described, showing their relative positions to the bow and stern line of a given vessel (marked B and S).

Before entering into a discussion concerning the details of the circuits, it may be of value to consider the diagram in Figure 4. Let A and B represent two sides of a single loop of the direction finder aerial, and the arrows, the direction of the flux in a passing wireless wave, then the maximum flow of energy will take place in this loop only when it bears

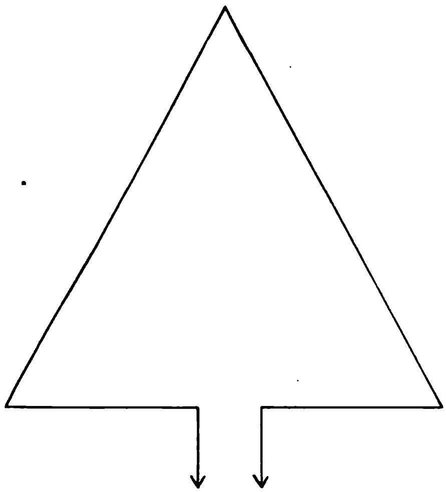


Fig. 1

the position to the plane of the passing wave as shown. Furthermore, a litttle study of the diagram will show that the energy set up by this flux in Side A is in opposition to that set up in Side B; but if the two sides of the loop are separated to a certain degree, the energy in Side B will be set up an instant later than at Side A; hence an electro-motive-force, the resultant of the two forces, will flow around the loop, AB. The magnetic flux of the coil, L, corresponding to this current, will act upon the exploring coil, L-2, where it is again transferred to coil L-3, and associated apparatus and made audible by the detector and head-telephones as indicated.

It is likewise plainly evident that if the loop, AB, is turned so that its plane is at right angles to the plane of the arriving energy both sides of the loop will be acted upon equally and at the same instant. The EMF's of both legs will, therefore, be equal and opposite, resulting in no current flow.

If, however, the loop, AB, is acted upon at any other angle than a right angle EMF will flow, the intensity depending upon the cosine of the angle, which the advancing flux makes with the loop.

The description just given does not take into account the phenomena produced when both loops are employed and the consequent effect on the goniometer coils. This matter will be taken up in a later paragraph. We shall first proceed to a description of the circuit of the direction finder complete.

THE CIRCUITS COMPLETE

Careful inspection should now be made of the diagram of connections shown in Figure 5. The triangular loop aerial, AB, is connected through the variable condenser, K, to the excitation coil L. The loop aerial, CD, is connected through condenser, K-1, and excitation coil, L-1. The condensers, K and K-1, have identical values of capacity and are altered simultaneously in value by a handle mounted on the top of the box (See Figure 8).

The magnetic field produced by the coils, L and L-1, combine and act upon the exploring coil, L-2; the method will

Fig. 2—Goniometer coils and exploring coil

be more clearly understood from the photograph (Figure 2). The energy set up in L-2 by the oscillatory current flowing in the coils, L and L-1, is transferred to the inductance coil of the local detector circuit, L-4, by the coil, L-3.

The coil, L-2, the variable condenser, V, and the coil, L-3, constitute an intermediate circuit similar to that employed in the well-known Marconi valve tuner.

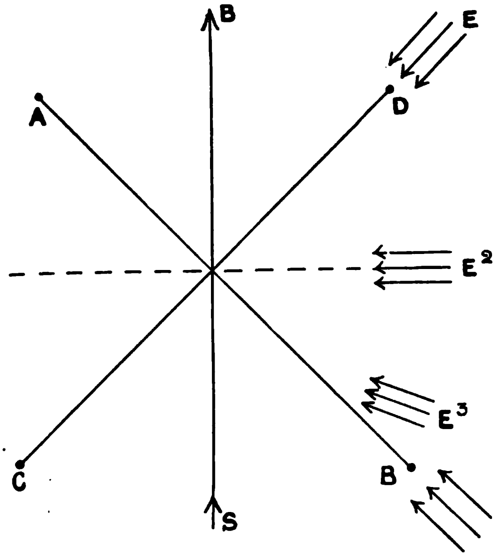


Fig. 3

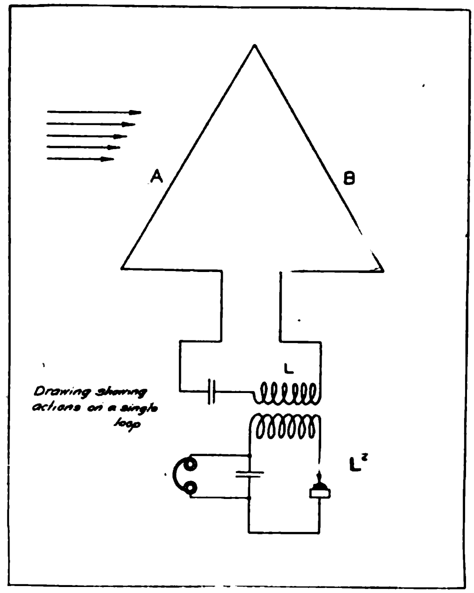


Fig. 4

The value of coupling between the coils, L-3 and L-4, is varied as desired by a knob mounted on the side of the tuned receiver.

The detector circuit consists of the inductance coil, (of fixed value) L-4; the billi-condenser, V-1, in shunt; the fixed condenser, V-2; the head telephones, H; the potentiometer, P, and the battery B. Two detectors are employed for this work, one a crystal of carborundum, the other a crystal of cerusite, either one of which may be connected in the circuit as desired. When the cerusite detector is in use the battery and potentiometer are cut out of the circuit.

THE TUNED BUZZER TESTER

The direction finder outfit also includes a tuned buzzer testing equipment, which may be set to emit waves of either 300 or 600 meters in length. The buzzer box has 4 holes, one in each corner, through which the four leads from the two-looped aerials pass. These holes are marked S. F. (starboard forward), S. A. (starboard aft), P. A. (port aft) and P. F. (port forward). Care should be taken to bring the corresponding leads from the loop aerials, through the proper holes. The leads from both aerials are now in inductive relation to the tuned buzzer circuit; hence the aerials and, in fact, the entire apparatus may be pre-adjusted to a given wave-length, removing all doubt in this respect.

It is sufficient for the time being to say that for practical operation of the apparatus, the aerial circuit, the intermediate circuit and the local detector circuit must be accurately tuned to resonance and the incoming wave. The exploring coil is then turned on its axis until the maximum strength of signals is secured in the head telephones. The pointer on the coil, L-2, will then lie in the direction of the transmitting station.

We may now return to a description of what takes place when the two-looped aerials are acted upon by an arriving electro-magnetic wave. Reference is again made to Figure 3.

HOW ENERGY IS COLLECTED

If the energy from a given transmitting station arrives in the general direction, E, the loop, CD, is set into excitation while the effect on the loop, AB, is nil. To receive the maximum effect of this energy, the exploring coil must, in this case, lie parallel to the goniometer excitation winding connected to the terminals of the loop, CD.

Again, if the energy arrived in the direction, E-1, the effect of the loop, AB, is maximum and on CD nil. Hence the exploring coil must lie parallel to the goniometer winding connected to the loop, AB, to receive this energy, and the pointer will lie along the direction, E-1.

If, however, the energy from a distant station comes in the direction, E-2, both loops are acted upon simultaneously and equally and an oscillatory current will flow through both excitation windings of the goniometer. The magnetic fields set signals will cause the pointer to lie along the direction, E-3.

MAGNET FORCES IN THE GONIOMETER

Careful observation of the sketches in Figures 6 and 7, may assist in showing the manner in which a resultant magnetic field is produced when both aerials are acted upon simultaneously. It should be remembered that in order to set up the

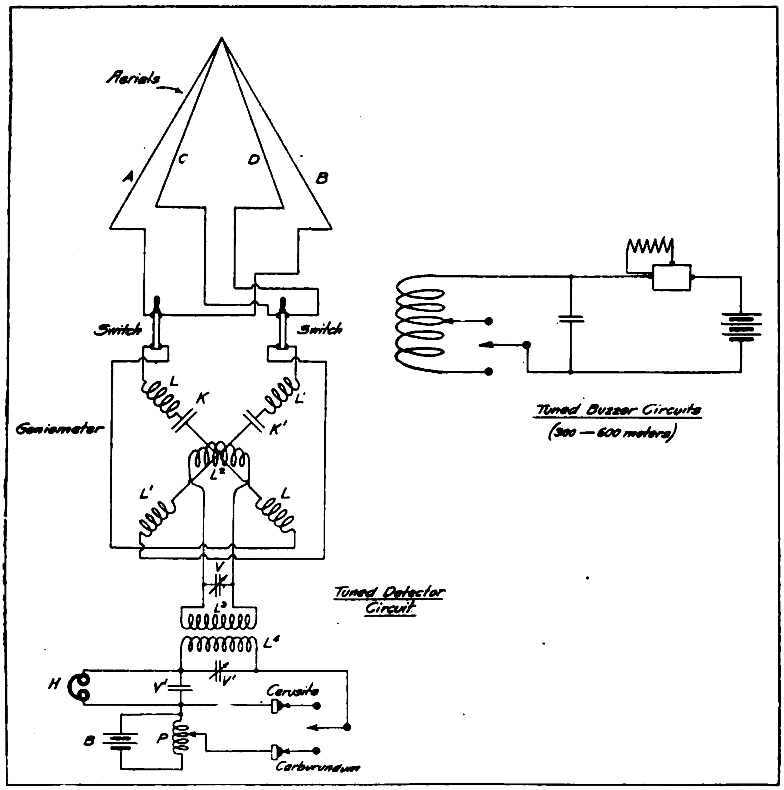


Fig. 5

up by the two coils will combine and produce a resultant field, so that the pointer of the exploring coil, for maximum signals, will be parallel to a line drawn midway between D and B, A, and C (dotted line).

Let, however, the energy arrive in the direction, E-3; in this case the loop, AB, will receive the maximum energy of the advancing wave, while the loop, CD, will be acted upon feebly. The result in the goniometer coils will be the production of a magnetic field, which for maximum maximum value of energy in the exploring coil the windings of the latter are always at right angles to the magnetic lines of force inside the goniometer windings. The diagram in Figure 6 is, in fact, a plan view looking down from the top on a single coil connected to one of the loops as described. The direction of flux with a given current flow, and the corresponding position necessary for the exploring coil in order to receive the maximum value of energy from this flux, is clearly indicated. The position of the

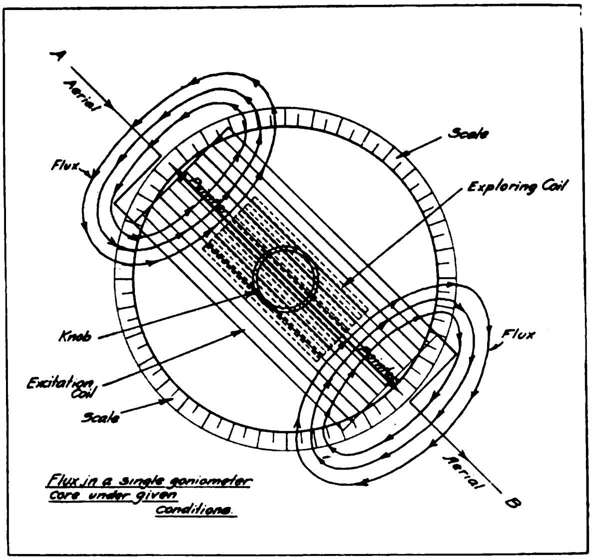


Fig. 6

pointer on the scale and its relation to the coils is also shown.

Figure 7 is a plan view looking down from the top on the two coils of the goniometer and shows by the dotted lines the resultant magnetic field when both aerials are acted upon at one time and with equal intensity. If energy flows in the coil, AB, alone and the current in the windings flows in the direction shown, the corresponding magnetic lines of force will take the general direction shown by the heavy line (the N and S polarity being as indicated). And again, if only the loop CD, were acted upon, then the general direction of flux in the corresponding goniometer coil will be as shown. But when energy flows in both coils at the same time it is evident that the corresponding fluxes are at right angles and a resultant field is produced, which will take the path, F and F-1, and the pointer on the coil will lie in the direction, P and P-1. The exploring coil must, therefore, be in the position shown to receive the maximum effect from this flux.

GENERAL INSTRUCTIONS FOR OPERATION

(1) As a matter of convenience, the box containing the goniometer coils and the variable condenser should be so placed that the zero position of the scale coincides with the bow and stern line of the vessel.

(2) The tuned buzzer circuit is then set into operation at either 300 or 600 meters, depending upon which wavelength it is desired to receive.

(3) The coupling knob on the tuned receiver is turned to 90 degrees.

(4) With the buzzer in operation, the condenser, connected across the intermediate circuit, and the billi-condenser are altered in capacity (simultaneously adjusting the detector) until maximum response is secured in the head telephone.

(5) When the foregoing adjustments have been made, the capacity of the condensers in the antenna circuit is altered by the knob on the top of the goniometer box until a still greater response in the head telephones is obtained. It may then become necessary to slightly readjust the values of capacity in use at the intermediate circuit condenser and the billi-condenser.

(6) When the two loop aerials are in use and the buzzer is in operation the maximum strength of signals from the buzzer should be obtained when the pointer is at zero. The signals should gradually decrease in strength as the pointer is moved toward 90 degrees.

(7) When the two aerials are in use

zero signals should be obtained when the pointer is in the position 90-90 degrees.

(8) When one of the aerial loops is disconnected by means of the switch on top of the goniometer box the maximum signal is received with the pointer at 45-135 degrees in one direction, and the zero signal with the pointer 45-135 degrees in the opposite direction. The reverse condition takes place when the second loop is in use alone.

(9) If when the loops are thus tested singly it becomes necessary, in order to secure the maximum response, to alter the capacity of the intermediate or the billi-condenser, it is a sure indication that the loops are unsymmetrical and therefore out of balance. Identical positions should be observed on both loops. Steps should be taken immediately to correct this error which undoubtedly lies in the aerial. A slight compensation for this unsymmetrical condition may be made at the variable condensers inside the box by means of two small adjusting screws.

(10) The strength of signals in one loop should be identical with that in the other. If not, it indicates a bad connection in one of the aerials.

TO FIND THE DIRECTION OF A STATION

(1) The station whose direction is to be determined, if not already in the act of sending, should be called and requested to send a test letter for two or three minutes, making sure to disconnect the two loop aerials of the direction finder by switches mounted on the top of the goniometer box.

(2) When a reply is received on the ordinary receiving equipment the main ship station is put out of action, even to the disconnecting of the main aerial from the earth, which, if left in the circuit, will seriously affect the accuracy of the goniometer reading.

(3) Next, close the two switches for the loop aerials and swing the direction finder handle until the maximum strength of signals is obtained. This should not be a difficult operation as the apparatus

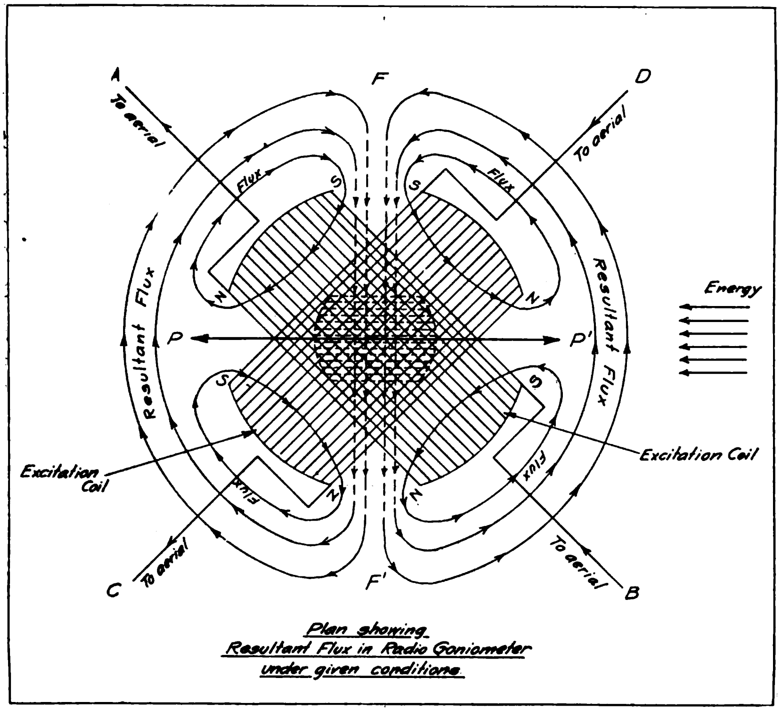


Fig. 7

has previously been adjusted to the maximum degree of sensitiveness and the proper wave-length adjustment by means of the tuned buzzer.

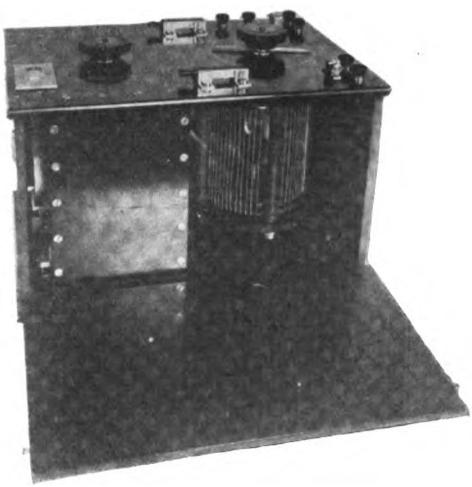


Fig. 8—The goniometer

The pointer will now indicate on the goniometer scale the direction of the transmitting station the signals of which are being received—that is to say, it shows the direction in reference to the bow and stern line of the vessel.

(4) If signals are received and are not sharply defined, having about equal strength over a considerable portion of the scale, the position should be noted where the signals die to zero and a mean of the two readings taken. This reading is facilitated by the angle-divider furnished with the set.

(5) Before transmission is again resumed care should be taken to disconnect the two loop aerials from the goniometer by means of the switches as previously described, and also to put the detector switch at zero.

It should be understood that the direction finder only gives the sense of direction in reference to the bow and stern line of a vessel and not the geographical direction of the wireless station which, of course, must be obtained by the readings of the regular ship's compass. To be more comprehensive: The direction finder gives the angle which the energy from the transmitting station makes with the center line of the vessel.

For instance, if the pointer of the direction finder indicates that the transmitting station has a general direction 20 degrees off the port bow, it does not show whether that station is 20 degrees to the port bow or 20 degrees to the starboard quarter. In the case of land stations there need be no doubt in this respect as it is generally known whether the station is to the port or starboard side of the vessel. There is never much doubt as to whether a ship is approaching or receding from a land station, for by the reverse interpretation the land station would be located at sea—an obvious absurdity.

If, in case of a heavy fog, the signals from another ship indicated that it bore a direction over the bow and stern line of the vessel and the signals from this ship became of gradually increasing intensity, it would, of course, be an indication that the ships were approaching but would not show whether bow-on or in the same direction. A wireless message sent to the ship asking her course, would, of course, remove all doubt and enable the navigator to avoid a collision.

Readings may be taken simultaneously

Fig. 9—The tuned receiver

of two land stations and the position of the vessel located by the well-known method. Readings may be taken from a single station and the ship moved forward in a straight course to a definite distance, and a second observation made. The data obtained in this manner is sufficient to establish the position of the vessel.

Fig. 10—The tuned buzzer tester

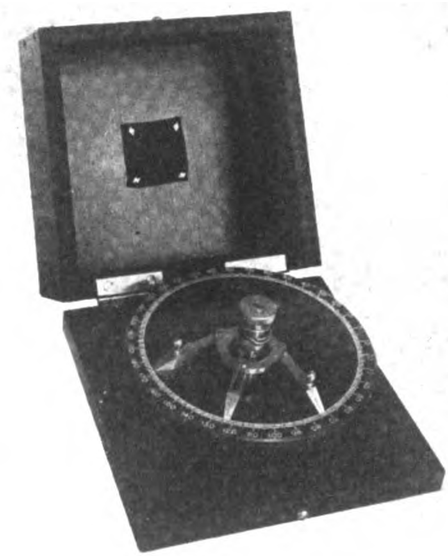


Fig. 11—The angle divider

An interesting application of the direction finder is the assistance it gives in locating a distressed vessel in foggy weather or after darkness. After the distress signals have been received, the position of the distressed vessel transmitted and certain information given to the relief vessel to enable the commander to know what direction he shall take, the distressed vessel is then asked to make the test letter "V," or any other prearranged signal. The direction finder of the relief vessel is then put into operation and a general direction of the signals from the distressed vessel obtained.

The relief vessel is then swung by the helm until the bow and stern line of the vessel coincide with the position of the pointer on the direction finder where maximum signals are obtained. In this manner the relief vessel can be kept on a direct course and the distressed vessel located in the quickest possible manner.

When entering ports like New York where the atmosphere is at times congested with wireless traffic, a direction finder has been employed in a most efficient manner for eliminating unwanted signals. First one loop is thrown in the circuit; if the station desired is not heard the second loop is thrown in and a test made. If the signals are received on this loop, 50 per cent. of the local interference under some conditions may be wholly eliminated or at least weakened to such an extent as to be negligible. Or, if desired, both loops of the direction finder may be employed and the pointer of the goniometer set in the direction of the station from which signals are being received. It is certain that in this direction the maximum strength of signals will be received and those of all other stations not on the same general line will be reduced or wholly excluded.

Under favorable conditions bearings may be taken with the direction finder within two or three degrees of accuracy; the error due to the instrument itself does not exceed one degree. The range of this apparatus with a carborundum detector is from 40 to 50 miles, but with a cerusite detector, it may be extended to 160 or 170 miles which is ample for navigation purposes.

Experiments are now in progress to increase the effective range of the direction finder.

VESSEL CRUSHED IN THE ICE

George Keefe, Marconi operator on the steamer Iowa, showed his devotion to duty when the vessel was crushed in the ice in Lake Michigan, off the mouth of the Chicago River, on January 3, by remaining at his post to send the S O S until five minutes before she sank. He and the others on the hapless craft, including one woman, made their way to safety by walking for a mile and a half over the ice to shore.

The Iowa, steaming from Milwaukee to Chicago, with a crew of seventy and one passenger, was in sight of the harbor at the latter city when she fell into the clutch of the ice floes. Captain Stufflebeam, commander of the Iowa, sent the following marconigram at fifteen minutes to eight o'clock on the morning of the wreck to the Chicago offices of the Goodrich Transit Company, which owned the steamer:

"In open water off the C. H. Harrison crib."

Another wireless message was sent from the Iowa at fifteen minutes to ten o'clock to the effect that she was "making good progress." Then at thirty-five minutes after ten o'clock came this message:

"Send tug at once. Fast in ice. Ice running hard. Starboard forward planking struck loose. Leaking badly."

Rescue craft were dispatched at once, but in the meantime those on the Iowa had made their way to the ice.

Keefe told the following story of the wreck:

"Four miles off the government lighthouse we got wedged in the ice. We fought it from five to nine o'clock. Then the ice began to close in on us and we saw the impending doom of the ship. I sent a message, almost a frantic call, to the Goodrich office, and when she started to sink I sent the S O S."

F. H. Mason, superintendent of the Great Lakes Division of the Marconi Company, has written to Keefe saying that "it has given me a great deal of pleasure to know that you, like all of the other Marconi operators who have been put to the test, came through with flying colors. I wish to congratulate you on your conduct."

THE WAKIVA WRECKED OFF TAMPICO

Wireless telegraphy was employed in an effort to summon aid to the steam yacht Wakiva when she went on the rocks off the Tampico (Mexico) breakwater on the night of January 8. The vessel was abandoned and those on board were rescued by means of a breeches buoy.

The Wakiva, which was owned by Edward L. Doheny, of Los Angeles, Cal., left Tampico at half-past seven o'clock on the night of January 7 for Galveston with Marconi Operator P. Daniels in charge of the wireless. She was only a short distance from Tampico when the wreck occurred. Daniels at once sent out the S O S, which was picked up by the operators on several vessels.

Bound from Tampico for New York was the steamship Brabant, on which was Marconi Operator Guy H. Hawkins. When the Brabant was about fifty miles east of Tampico the operator on the steamship Edward L. Doheny called C Q and asked what vessel had sent out distress signals. He said that some craft had sent out the S O S, but that he did not get the signature. Hawkins then called C Q, asking who had flashed the S O S. Daniels responded to this message by again sending S O S and saying: "The Wakiva is sinking on Tampico Breakwater. Send help." Hawkins replied that the Brabant would arrive at the scene of the accident in about five hours.

The Doheny, the U. S. S. Sacramento and the steamship Energie afterward got into wireless communication with the Wakiva, and the Doheny sent a message to the yacht at ten minutes after nine o'clock to the effect that a boat had been sent to the assistance of those on the wreck. There was a heavy norther blowing, however, and the rough sea which it kicked up prevented the boat from reaching the wreck.

When the Brabant reached the wreck a breeches buoy had been rigged from the foremast of the yacht and anchored to a large concrete rock at the end of the jetty. This enabled all on board to reach shore safely.

THE WASHINGTONIAN SUNK

A rude awakening out of a sound sleep; a cry of "all men to the life-boats! a hurried scramble for place in the craft; then a three miles' pull scantily clad through the chill early morning darkness in a tumbling world of waters to a lightship where wireless communication was established with a passing steamship.

This is an epitomized version of the experience of Albert H. Randow, Marconi wireless operator on the Washingtonian of the American Hawaiian Steamship Company, when she came into collision with the five-masted schooner Elizabeth Palmer off Delaware Breakwater. The Washingtonian sank and the schooner was abandoned with her decks awash, no lives having been lost with the exception of that of a water-tender on the steamship. Neither the Washingtonian nor the Palmer carried passengers.

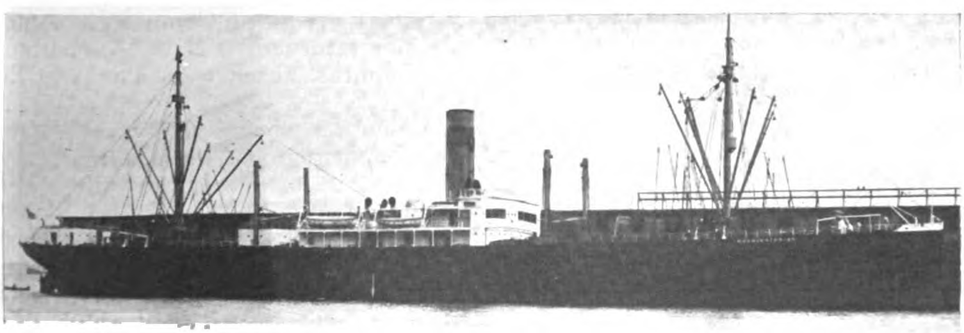
The Washingtonian, a large freighter, was on her way from Honolulu to the Delaware Breakwater. When she arrived in the neighborhood of the Fenwick Island lightship at twenty-five minutes after three o'clock on the morning of January 26, a light mist had overspread the waters. From out of this haze there appeared suddenly the outlines of the hulk of the Palmer. The schooner, with all sails set, struck the freighter just aft of her beam, tearing such a large hole in her side that she sank ten minutes after the collision.

Captain E. D. Brodhead, the commander of the Washingtonian, ordered the life-boats made ready and into them the crew of forty odd men tumbled. Randow was ready to send out the S O S call, but Captain Brodhead had given orders for all to leave the vessel and he therefore did not attempt to do so.

There were thirteen men and one woman—the wife of the steward—on the schooner. They finally left her to her fate and made their way to safety in a motor boat.

Albert H. Randow

Randow experienced considerable discomfort in the ride in the life-boat from the wreck to the lightship due to the fact that the weather was cold and he had left the ship only partly dressed. When the Washingtonian's people arrived at the lightship a wireless message was sent from the station there to the Hamilton of the Old Dominion Line, which was bound northward, telling of the wreck. The Hamilton stopped and took aboard the wreck victims who were conveyed to New York.



The Washingtonian

Vesssels Equipped With Marconi App aratus Since the February Issue

Names	Owners	Call Letters
Georgiana	Walker, Armstrong & Company	KJE
Owera	Congressman Peter Gerry	KZG
San Cristobal	Campania Mexicano de Patroleo Aguila	
Satsuma	Barber & Company	KJI
William O'Brien	East Coast Transportation Company	KPN
Craster Hall	Isthmian Steamship Line	KLK

THE SHARE MARKET

New York, December 24.

The market is sluggish and moderation in trading still prevails. This apathetic condition is due of course to the European war and a general tendency to wait for news of the results of the struggle. It is predicted, however, that the lack of activity in the market will be succeeded by briskness as the cautious spirit which was born with the war gradually gives way to normal confidence. The outlook for Marconis is cheerful and, in the opinion of brokers, they are more than holding their own, considering the state of the market.

Bid and asked prices to-day:

American, 2⅜—2¾; Canadian, 1¼—1½; English, common, 8—10½; English, preferred 7½—10.

The Institute of Rado Engineers

At the meeting of the Institute of Radio Engineers, held February 3, at Fayerweather Hall, Columbia University, New York, John Stone Stone delivered a presidential address and a paper on "The Effect of the Spark on the Oscillations of an Electrical Circuit." The paper described the theory of oscillating circuits having sources of both linear and logarithmic decrements within themselves. A highly novel and interesting application of the principles described was also presented for the first time.

The reading of the paper on "Wooden Lattice Masts," by Cyril F. Elwell, Chief Engineer of the Universal Radio Syndicate (Poulsen System) of England, postponed from the previous meeting of the Institute, followed Mr. Stone's paper and gave in detail the design, construction and guying of lattice masts.

SUES TO GAIN POSSESSION OF THE TUCKERTON STATION

The Compagnie Universelle de Telegraphie et Telephone Sans Fil, a French corporation, has instituted a suit in the New Jersey Court of Chancery to gain possession of the trans-Atlantic wireless station at Tuckerton, N. J., naming as defendants the Hoch-Frequenz-Maschinen Aktiengesellschaft fur Drahtlose Telegraphie, a Prussian corporation; Rudolph Goldschmidt, of Charlottenberg, Prussia, and the United States Service Corporation, a New Jersey company. In the bill of complaint, which was filed on February 15, it is stated that according to the terms of an agreement between the corporations the property and patents of the defendants, including the station at Tuckerton, N. J., were to have been placed in the hands of the complainant upon payment of a certain sum of money. The suit has been instituted for the purpose of compelling the carrying out of the agreement of sale.

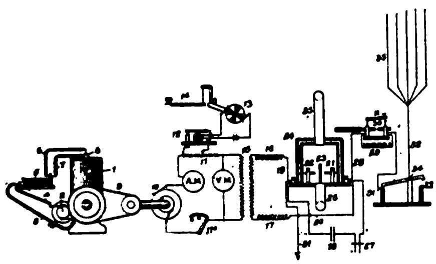
SERVICE ITEMS

Charles H. Taylor, engineer of the Trans-Oceanic Division of the Marconi Wireless Telegraph Company of America, has returned to New York after a two months' absence on a trip to Europe.

Arthur M. Greenwell, manager of the Marconi station at Astoria, Ore., became a benedict on December 5th. Miss Lillian F. Johnson, of Blind Slough, Ore., is his bride. They were married at the Methodist church parsonage, Astoria, Ore., the Rev. W. S. Gordon officiating. Mr. and Mrs. Greenwell will make their home in Astoria.

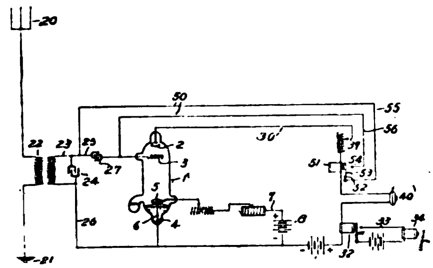
RECENT PATENTS

1,126,966. SENDING MECHANISM FOR ELECTROMAGNETIC WAVES. Reginald A. Fessenden, Washington, D. C., assignor, by mesne assignments, to Samuel M. Kintner, Pittsburgh, Pa., and Halsey M. Barrett, Bloomfield, N. J., receivers. Filed Aug. 26, 1904. Serial No. 222,302. (Cl. 250—17.)



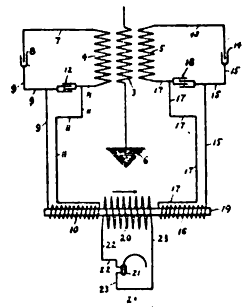
1. Apparatus for wireless telegraphy including a generator and transmitting apparatus, the latter including a typewriter and simultaneously operating code commutator, a resistance in the system, and a short circuit around the resistance, an electromagnetic circuit closer, for closing said circuit, and being controlled by said commutator.

1,127,371. APPARATUS FOR AMPLIFYING OR DETECTING ELECTRICAL VARIATIONS. George W. Pierce, Cambridge, Mass. Filed Mar. 11, 1914. Serial No. 824,034. (Cl. 250—27.)



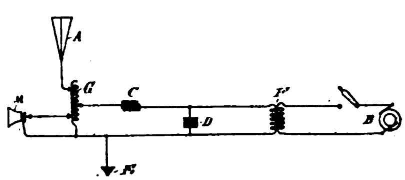
1. An apparatus for amplifying or detecting electrical variations having, in combination, means for maintaining a sensitive conducting gaseous space, a plurality of electrodes in the space, a controlled electric circuit including a source of electrical energy connected between two of the electrodes, a controlling electric circuit including a condenser connected to an electrode other than the controlled circuit electrodes, and means controlled by the current in the controlled circuit for shunting the condenser.

1,127,368. INTERFERENCE-PREVENTER. Thomas Burton Miller, Seattle, Wash., assignor of one-half to Smith Cannery Machines Company, Seattle, Wash., a Corporation of Washington. Filed Jan. 6, 1913. Serial No. 740,385. (Cl. 250—8.)



1. In a receiving apparatus of a wireless telegraph station, the combination with a transformer having a primary helix adapted for connecting one of its terminals to the earth and its other terminal to the antenna of a wireless telegraph station and having two secondary helices, of two separate oscillating circuits each of which oscillating circuits includes one of said secondary helices, two detectors one of which is connected in each of said oscillating circuits in series with said secondary helix therein, a condenser connected in each of said oscillating circuits in series with said detector and said secondary helix therein, two primary helices each of which helices is connected with a different one of said oscillating circuits in parallel with the said condenser therein, a magnetizable core inductively and movably associated with both of said primary helices, a secondary helix movably and inductively associated with said magnetizable core and both of said primary helices and a translating device connected with said secondary helix.

1,125,496. WIRELESS-TELEPHONE TRANSMITTING SYSTEM. Lee de Forest, New York, N. Y., assignor to Radio Telephone & Telegraph Company, a Corporation of Delaware. Filed Sept. 17, 1910. Serial No. 582,449. (Cl. 250—6.)



1. A wireless telephone transmitting system, including a source of alternating current supply having a frequency below the upper audible limit, and a multiple spark gap, and means for modifying the radiated waves from such system by and in accordance with sound waves.

Marconi Men

The Gossip of the Divisions

Eastern Division

E. L. Martin has been assigned to the San Marcos, a one-man ship.

H. Q. Horneij is on the Satilla, bound for Europe.

J. A. Quinlan has been assigned to the newly-equipped oil boat Caloria.

C. L. Fagan and M. E. Fultz are making a trip across as senior and junior, respectively, on the City of Columbus, which is carrying a cargo of cotton to Holland and other countries.

M. H. Hammerly, who was detailed on the Santa Cruz for many months, is now on the Bantu.

W. V. Moore and Alex Bald have been transferred, Moore going to the Philadelphia and Bald to the Calabria.

Earl Thornton has been assigned to the reequipped Vesta.

M. O. Smith, who recently returned from the Pacific coast, is now senior on the Parima. J. E. Doyle of the Southern Division is his junior.

P. K. Trautwein is back on his old ship, the Cherokee, having been transferred with B. N. Lazarus, who is now on the El Dia. The Dia is making a trip across the Atlantic laden with cotton.

H. Orben has been appointed junior of the Kroonland, of which E. N. Pickerill is chief operator. The Kroonland is making an 80-day cruise around the coasts of North and South America, starting from New York and stopping at Havana. From the latter port she will head for the Panama Canal and, after passing through that body of water, will cruise down the coast before proceeding north to San Francisco and the Fair.

M. C. Tierney, who was temporarily assigned to the South Wellfleet Station, has resumed duty at Siasconset. A. R. Gardner has also been assigned to Siasconset, having been transferred from the Virginia Beach Station.

R. Poling and A. G. Berg have resumed duty as first and second operators, respectively, on the Esperanza, which recently went into commission.

Louis Michaels has returned to duty as senior on the Jamestown after two weeks' absence on sick leave.

A. H. Randow, who was the operator on the Washingtonian, which recently sank, has been assigned to the Dakotan.

J. A. Bossen has been assigned to the Nueces, a one-man ship.

G. H. Reachard of the Southern Division has been assigned to the widely-discussed Dacia.

D. J. Surrency and G. I. Martin have been assigned to the Commewijne as senior and junior, respectively, relieving Carl Plossl and V. Carrougher who, after a year's continuous service on that vessel, have been detailed to the Perfection and Hamilton, respectively.

G. P. Hamilton, after more than thirteen months of continuous service as first operator on the Cherokee, has been transferred to the Matura. A. B. Langenberg takes his place as senior on the Cherokee.

R. R. Schleckser has resigned from the service.

T. J. Goss, junior operator of the Stephano, has resigned from the service to enter the Signal Corps of the Canadian Army.

W. C. Thompson is again on duty after a short vacation, having been detailed as senior operator of the El Dia.

C. Heimline has been promoted to first operator and is now on the El Rio. M. A. C. Luedtke is second man.

A. S. Fraser, formerly junior on the Tennyson, has resigned and returned to England to enlist.

H. S. Williams has been assigned to the S. Y. Solgar, which has been placed in commission. The Solgar is controlled by the Canadian Company.

C. D. Riley is crossing the Atlantic on the Antilla.

E. K. Oxner is now on the Craster Hall, a newly-equipped Isthmian liner.

M. Beckerman, who served for almost two years on the Hamilton with his brother Ben, has been promoted and is now senior operator on the Jefferson. P. H. Nisley, of the Marconi School of Instruction, is junior.

William Miller, who was senior operator on the Obidense, which was recently wrecked off the coast of England, has been assigned temporarily to the Kanawha, an English vessel.

O. C. Temple has replaced F. Rosensweig on the Comet.

R. G. Cuthbert has succeeded L. H. Marshall on the Comal as senior operator. Marshall has resigned.

G. F. Hawkins, of the Brabant, who rendered excellent service when the steam yacht Wakiva was wrecked off the Tampico Breakwater, has been transferred to the Guantanamo. N. J. Ribler, formerly of the Guantanamo, is now on the Colorado.

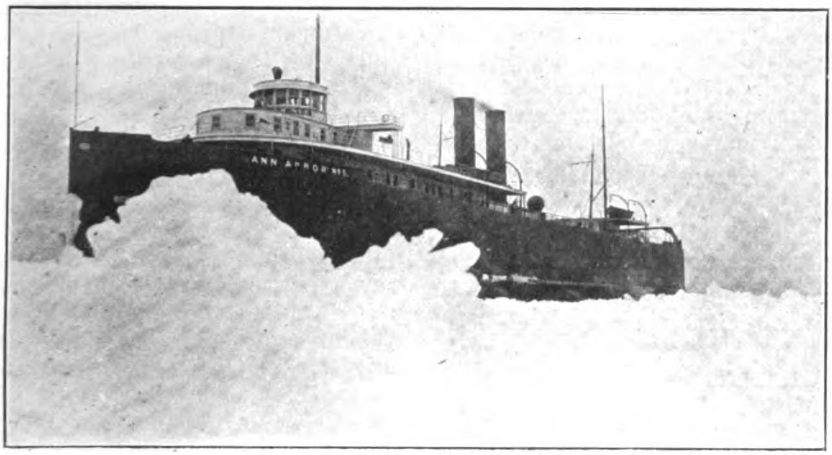
M. Hanover is now on the Brabant.

The inspection, maintenance and repair work in connection with all ship stations has been transferred from the Engineering to the Traffic Department. The Engineering Department will continue to have charge of the coast station equipments.

Great Lakes Division

H. H. Hoffman was recently placed in charge as purser-operator on steamer A. A. No. 3 during the absence of Ross Cutting.

It may be of some interest to Marconi men who have never had a detail on the Great Lakes to be told something of the difficulties of navigation on fresh water during the winter. During February, 1915, the steamers plying on Lake Michigan experienced more difficulties than in any month since 1902. These were due to the heavy snow storms and low temperature which caused the still water to freeze into one compact bed of slush ice. When the steamship George was caught in an ice-jam on February 4, sixteen other vessels were in a similar predicament at various points on the coast of Lake Michigan. The Marconi operators on these ships and the operators at the coast stations rendered valuable service in transmitting information regarding conditions on the ice-locked craft.



The steamship Ann Arbor imprisoned in the ice on Lake Michigan. In the background can be seen the mast and aerial of the steamship Georgia, also in the ice jam

Southern Division

Manager A. R. Gardner of the Virginia Beach station has been transferred to the Siasconset station, having been relieved by A. Y. Forrest, who has until recently been chief equipment tester at the Marconi factory at Aldene, N. J.

Junior Operator Grantlin of the Gloucester has resigned from the Marconi service and enlisted in the naval collier service. Grantlin's vacancy has been filled by Junior Operator Murphy of the Merrimack. Otto Naber has been assigned to the Merrimack as junior operator in place of Murphy. Naber is a former Marconi man, having resigned from the service several months ago.

Operator Walter Neumann has recovered from a severe case of pneumonia, and is now ready to "hit the wet trail" again.

Junior Operator E. McCauley has been transferred from the Ontario to the Somerset, relieving Junior Operator H. O'Day, who in turn relieved McCauley on the Ontario.

Operator F. Birch has been assigned to the Grecian as junior operator, in place of F. A. Lafferty, who was assigned to the Great Northern.

Assistant Operator L. W. Sinclair of the Jacksonville station was married recently. We extend our heartiest congratulations to Mr. and Mrs. Sinclair.

Installer Murray is pushing the amperes in a lively fashion on the reinstallation of the Jefferson, of the Old Dominion Line, at Newport News.

Pacific Coast Division

The Aztec of the Pacific Mail Steamship Company has departed from San Francisco for South America by way of Central America with Operator R. J. Phair, in charge. Phair has been on sick leave since November 24, 1914.

Operators R. H. Brower and E. C. Nelson, first and second, respectively, on the Admiral Farragut of the Pacific-Alaska Steamship Company have completed a year's good service on that vessel.

B. C. Springer and I. W. Hubbard have been assigned to the Admiral Dewey. After a five or six months' run into the hot regions (Panama), the change is very agreeable.

E. S. Clark, formerly of the Oleum, has been transferred to Barge 95, bound for the East Coast.

H. Oxsen, who has been on a vacation since December 7th, 1914, has been assigned to the Balboa. The Balboa is one of the new equipments for the Southern trade. Her cruise is expected to cover a period of about six months.

Operators M. L. Bergin and A. L. Cresse, first and second, respectively, on the Camino, have been highly commended for the operation of their wireless apparatus when the Camino was disabled off the Newfoundland coast. The following extracts from newspapers tell of the accident:

"Halifax, Jan. 17th. Wireless calls for aid from the American steamship Camino, carrying supplies for Belgian refugees, were picked up here to-day. With her rudder torn away, the Camino is helpless in a severe storm, 150 miles southeast of Sable Island in the North Atlantic, and 270 miles from Halifax. Captain Ahlins, in a wireless message, reports that the vessel's deck house has been carried away, but makes no mention of any loss of life. The Canadian Government steamer Lady Laurier and other vessels are speeding to her assistance. The Camino has a crew of 30 and 1 passenger."

"Halifax, Jan. 22nd. A terrific battle against wind and sea is being waged today by the steamers attempting to bring the disabled American steamer Camino into Halifax. A wireless dispatch received here says that the hawser again parted and the Camino fell back in the trough of the sea. The ship is still 300 miles from Halifax."

Other reports regarding the accident are to the effect that the wireless cabin was torn from its lashings. The operators, as the weather permitted, assembled the apparatus in a corner and flashed further signals, keeping in constant touch with other stations.

E. Diamond, formerly of the General Hubbard, has been assigned to the Carlos.

P. M. Proudfoot has joined the Centralia, which is on the passenger and freight run between San Francisco and Eureka.

J. A. Marriott and D. R. Clemons are once more on the liner Congress.

A. C. Forbes and C. Bentley recently arrived here on the China. The newspaper sales on that vessel shattered all previous records.

S. P. Smith, who came from the Atlantic Coast in charge of the plant aboard the Francis Hanify, has been transferred to the California. On February 7 she was reported 1,972 miles south of San Francisco, bound for Galveston.

W. R. Lindsay has been assigned to the Colon. This vessel was wrecked off the coast of lower California on February 5th, during a heavy storm. Lindsay's call for help was answered by two of the United States cruisers in that vicinity. All the passengers and crew were safely taken off.

L. O. Marsteller and N. J. Marthaler have been acting as first and second aboard the City of Topeka since February 1st.

P. C. Millard was assigned to the Col. E. L. Drake.

E. O. Mohl, after a stay of one year and nine months aboard the Hyades has been transferred to the Enterprise.

W. H. Stevenson has been detailed on the Francis Hanify. This vessel is now in the service of the Matson Navigation Company, plying between San Francisco, San Pedro and Honolulu. On her initial trip reports were received nightly until she arrived at Honolulu.

J. A. Falke has been transferred from the "sick squad" to the Governor. Falke has been ill from typhoid fever.

A. F. Pendleton, formerly on this Coast, arrived here recently on the Honolulan from New York.

C. F. Fitzpatrick has been assigned to the Hyades.

D. M. Taylor has relieved L. T. Franklin, as assistant, on the Korea.

W. J. Erich and L. T. Franklin have been assigned as first and second, respectively, to the Lurline.

B. McLean, first, and E. S. Howard, assistant, on the Mongolia, have captured the message toll record for the Pacific Coast, and expect to hold it against all comers.

R. F. Harvey has been assigned as first operator of the Multnomah. R. Baer is assistant.

G. S. Bennett has been transferred to the Matsonia, as assistant. E. T. Jorgensen is senior operator.

F. W. Shaw, temporarily assigned in charge aboard the Manoa, became seriously ill two days before the arrival of that vessel at Honolulu. Shaw, after spending a few days at the local hospital, enjoyed a short vacation at the Kahuku Station, while waiting for the Wilhelmina to take him to San Francisco.

The Manoa left Honolulu on February 2nd with Operators J. A. Miche in charge, and R. E. Hageman as assistant. Hageman is returning to Honolulu as assistant on the Wilhelmina. This is Hageman's second visit to San Francisco as emergency man. During November, 1913, he replaced Operator Gawthorne on the Ventura for the trip to San Francisco and return to Honolulu.

E. Smith, assistant on the Wilhelmina, has been transferred to the same position aboard the Manoa.

J. E. Dickerson, formerly of the Mazatlan, has been assigned to the Navajo, sailing from San Pedro to Bremen.

F. W. Brown, formerly assistant on the Sonoma, has been transferred to the Peru. G. H. Harvey is in charge.

C. E. McNess has been detailed as operator in charge of the President. N. McGovern has been assigned as assistant.

A. Konigstein has been assigned as operator in charge of the General Y. Pesqueira, bound for Central and South America.

C. P. Williams has relieved J. L. Barttro as assistant aboard the Queen.

F. Mousley has joined the Rose City as first operator. T. Lambert is acting as assistant.

C. Trostle, formerly of the Whittier, has been transferred to the Stanley Dollar.

N. D. Talbot and J. Hauselt have left for Panama, as first and second, respectively, of the San Juan.

B. R. Jones and F. Camenisch have been assigned as first and second, respectively, of the Speedwell.

C. A. Peregrine has been transferred to the Santa Clara as assistant.

L. W. Sturdivant has been assigned to the Santa Cruz for the trip from New York to San Francisco, thence to Alaska for the packing season.

J. F. McQuaid, of the Santa Cecilia, and H. W. Sinclair, of the Santa Clara, of the Grace Line, have recently been transferred to the Pacific Coast Division.

San Francisco High Power Station Items

"Slim" Bartlett, who was with us since opening day, has departed for "warmer climes," having been transferred to the staff at Kahuku, Oahu. "Slim" showed a dash of speed when notified at noon that he was to leave at four P. M. Shortly before his departure, Bartlett defeated Pratt of Bolinas in a closely contested game of chess, which was played over the local wire. One move was made daily for a week, the game being finished on Sunday.

H. B. Segur of the Klamath is now holding down the day trick.

A. E. Gerhard is still grabbing the "CLT" business from the air on the night trick, and is well satisfied with the strength of night signals.

Prior to the closing of the duck season several members of the staff tried their luck at shooting. After several cruises about the bay before daylight it was explained that "key pushing" was detrimental to a trigger finger.

We were visited on February 1 and 8 by severe storms during which the wind reached a velocity of eighty miles an hour. This caused some slight delay to operation. Our fuel oil storage tank, which was buried in the ground, floated out of its position during the heavy rain, and, with one end in the air, took on the appearance of an aeroplane gun.

Seattle Staff Changes

Fred Wilhelm temporarily relieved J. A. Marriott on the Congress for one voyage, while Marriott took charge of first trick at the Seattle station.

W. R. Blanchard, A. Brown and G. C. McCarty have resigned.

J. E. Johnson and A. E. Marr have been assigned to the Admiral Watson.

A. Lang and W. Chamberlain are on the Admiral Evans.

Fred Wilhelm and C. F. Trevatt have been detailed to the Minnesota.

R. Ticknor and A. Gail Simpson are now first and second, respectively, on the City of Seattle.

P. C. Millard has been transferred to the Southern District on the Col. E. L. Drake.

W. J. Manahan, formerly a member of the San Francisco Construction Department, has taken up his duties in the Seattle Construction Department. He has just returned from a trip to Bellingham, where he equipped the A. G. Lindsay, which has been renamed the Pavlof. M. A. Obradovic has been assigned to the Pavlof.

ICE-BREAKER FOR RUSSIA

The steel steamer Lintrose, which was built for the Reid Newfoundland Company in 1913, has been purchased by the Russian government for service as an ice-breaker in the White Sea. The vessel will replace the Canadian government ice-breaker Earl Grey, which is said to be frozen in at Archangel.

The Lintrose and her sister ship, the Kyle, have been running between Port aux Basques, at the southwest extremity of Newfoundland and North Sydney, Cape Breton, carrying passengers and freight. The Lintrose has shown that she is able to plough through the ice of Cabot Straits and make nightly trips throughout the winter months. She carries a wireless equipment of 1½ k.w. power which was installed by the Marconi Wireless Telegraph Company of Canada, Limited. Wireless telegraphy will prove of great advantage to the vessel in her capacity of ice-breaker, enabling her to keep in communication with other vessels engaged in similar service and the port of Archangel.

OPERATOR DODD ON THE ILL-FATED PATROL

Among those who were on the British government patrol boat Char when she was recently sunk in collision with the steamship Erewan was John Dodd, wireless operator. Dodd, who was thirty years old, joined the Navy soon after war was declared. For a time he was detailed on the Irresistible, but was later transferred to the Char. The Char was steaming toward the Erewan to search for contraband of war when she ran afoul of the latter's bow and was sunk.

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MARCONI WIRELESS TELEGRAPH COMPANY

OF AMERICA

WOOLWORTH BUILDING

233 BROADWAY, NEW YORK

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Eastern Division

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Southern Division

American Building, Baltimore, Md.

T. M. Stevens..............*Superintendent*

Gulf Division

917 Decatur St., New Orleans, La.

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Great Lakes Division

Schofield Bldg., Cleveland, Ohio

F. H. Mason...............*Superintendent*

Little Ideas Bring Great Results

MARCONI AND THE WIRELESS TELEGRAPH

From the San Francisco Chronicle.

IT was near St. Johns, Newfoundland, in a room in an old barracks building, on December 12, 1901, that Guglielmo Marconi demonstrated to his own satisfaction that a project in which he had been long engaged had been accomplished. On the table in front of him he had placed a mechanical apparatus, and by his side was an ordinary telephone receiver. The window near which he sat had been left partly open, and a wire led from the machine on the table through the window to a gigantic kite that a high wind kept flying fully 400 feet above the room.

When conditions became such that Marconi believed that he would be able to obtain some convincing evidence of success, he placed the receiver to his ear. He sat silently for a long time. He showed no evidence of excitement, though an assistant, who stood near him, was visibly nervous.

Suddenly there came a sharp click of the "tapper" as it struck the "coherer." That meant that something was coming. Marconi listened for a few minutes and then handed the receiver to his assistant. "See if you can hear anything, Mr. Kemp," he said. The other man took the receiver, and in a moment his ear caught the sound of a few little clicks, faint, but distinct and unmistakable, the three dots of the letter S of the Morse Code.

These clicks had been sent from Poldhu, on the Cornish coast of England, and they had traveled through the air across the wide expanse of the Atlantic. This was one of the great moments of history. Marconi was the first man to realize what other men had imagined for many years. Even Edison, the electric wizard, had, for a time, worked on the problem of wireless telegraphy, but Marconi devised the last link that made the wonder possible, and it was this Italian who caught the first click that came across the ocean.

Judge Townsend, in deciding a suit in the United States Court in 1905, declared: "It would seem, therefore, to be a sufficient answer to the attempt to belittle Marconi's great invention that, with the whole scientific world awakened by the disclosures of Hertz in 1887 to the new and undeveloped possibilities of electric waves, nine years elapsed without a single practical or commercially successful result, and Marconi was the first to describe and the first to receive the transmission of definite intelligible signals by means of these Hertzian waves."

As early as 1844 Samuel F. B. Morse had succeeded in telegraphing without wires under the Susquehanna river, and in 1854 James Bowman Lindsay, a Scotchman, had sent a message a distance of two miles through water without wires. Sir William Henry Preece, by using an induced current, had telegraphed several miles without a connecting wire. But the discoveries made in regard to the Hertzian waves placed the subject on a different footing, and the possibility of an actual usable wireless telegraph was now looked at from a new viewpoint.

On January 19, 1903, President Roosevelt sent the first "official" wireless message across the Atlantic to King Edward VII, and in October, 1905, a message was sent from England across the mountains, valleys and cities of Europe to the battle-ship Renown, stationed at the entrance of the Suez canal.

There is apparently no limit to the future possibilities of the wireless. Wireless storm warnings and general weather forecasts for ships at sea, covering conditions 100 miles off shore along the entire Atlantic Coast, were inaugurated by the United States Navy Department on July 15, 1913. Direct wireless communication between America and Asia was established by the completion of stations in Siberia and Alaska, the stations being about 500 miles apart. Today no vessel of any consequence plies the oceans without its system of wireless, and its effectiveness in receiving news of the present European war is well known.

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. P., Omaha, Neb., writes:

Ques.—(1) My aerial is 25 feet in height, 65 feet in length and consists of four wires on a 6-foot spreader with a lead-in 25 feet in length. Please tell me the wave-length and also what it would be if the aerial were 12 feet higher.

Ans.—(1) About 145 meters.

Ques.—(2) Please tell me my receiving range, day and night, with the following instruments: 2-slide tuner, 13 inches in length and 5½ inches in diameter wound with No. 19 enameled wire; navy type inductive tuner as described in the November, 1913, Modern Electrics; Murdock condenser, silicon and galena detectors; 75-ohm receiver and 2,000-ohm receiver.

Ans.—(2) Daylight range 100 miles; night range doubtful; depends upon the station you desire to receive from. You might possibly hear Arlington in the winter time at night. The actual receiving range depends upon the local conditions surrounding your station.

Ques.—(3) What time is it in Omaha when Arlington sends the time at night?

Ans.—(3) One hour earlier at Omaha. When it is 10 P. M. at Arlington, it is 9 P. M. at Omaha, standard time.

* * *

J. A. M., Milford, Utah, writes:

Ques.—(1) Describe the auto-transformer and give the number of the patent covering, used by the DeForest people in their one, two and three-step amplifiers.

Ans.—(1) We have no record showing that patents have been allowed on the one, two or three-step amplifiers.

Ques.—(2) Give the length of the shortest one-wire aerial 50 feet in height that can be successfully loaded to 16,000 meters. What is the shortest wave-length the same aerial would respond to with condenser in series?

Ans.—(2) The wire should be at least 1,000 feet in length. You cannot reduce the wave-length of an antenna to more than one-half its natural wave-length. It simply means cutting the aerial off from the earth connection. To adapt an antenna suitable for the reception of 16,000 meters down to 300 or 600 meter waves is totally out of the question. Better results will be obtained at 16,000 meter wave-lengths if the length of the antenna is increased to 2,000 feet.

Ques.—(3) What are the maximum and minimum wave-lengths of the secondary and primary of the "loose-couplers" referred to in your answer to my inquiries in the December issue? How many turns of wire are needed on each coil and what is the best arrangement of taps?

Ans.—(3) The minimum wave-length to which this tuner will respond depends upon the number of taps you take off the windings. This should be self-evident. For instance, you might take a great number of taps from the windings giving a minimum value of inductance so as to allow wave-length adjustments down to 100 meters. You can arrange the taps to suit yourself, but a tuner responsive to 16,000 meters is not the proper piece of apparatus for receiving shorter wave-lengths. Even though you employ dead-end switches and cut off the unused turns, still you have not wholly eliminated the energy absorption of the unused turns, which should be entirely removed from the used turns for the maximum degree of efficiency. The data we gave you in the December issue was for a tuner to be used on wave-lengths from 7,500 up to 16,000 meters. It was not intended that it should be used on wave-lengths below 7,500 meters.

Ques.—(4) Is a rotary receiving transformer as efficient as a "loose-coupler" and what would be the dimensions, size of wire and number of turns on secondary and primary of a rotary to be equivalent to the "loose-couplers" referred to above?

Ans.—(4) This question is rather ambiguous. It would depend largely upon the design of the rotary receiving transformer. A rotary transformer for waves from 7,000 to 16,000 meters would necessarily have multiple layers, which would make it very inefficient. We advise you to hold to the ordinary designs, making your primary and secondary windings of a single layer on tubes as suggested. We have no data on a rotary tuner covering this range of wave-lengths.

Your fifth question is a repetition. The data for the windings given you in the December issue is quite sufficient for your needs. If you intend to employ this tuner with a valve detector, however, there is no harm in making the secondary winding of No. 36 wire. A design of this description gives a maximum value of voltage which is a desirable thing in connection with this detector. If you make the winding of No. 36 wire for a given wave-length, the coil will be of decreased dimensions as compared with the coil wound with No. 30 or No. 32 wire.

* * *

F. M., Red Bank, N. J.:

Regarding your first query: The audion should work with or without a fixed condenser in series with the grid. If a fixed condenser is employed it should be one of very small capacity, not one of more than 0.0001 Mfds. Please observe that when the fixed condenser is removed from the circuit the wave-length of the secondary circuit of the receiving transformer is changed. For this reason stations which were received on certain adjustments with a fixed condenser in the circuit may disappear when the fixed condenser is cut out. There are certain circuits where best results are secured with a fixed condenser in series with the grid, but with an ordinary amateur tuner they are obtained in the majority of cases without the use of this condenser.

Regarding your second query: Why don't you try the secondary winding of your induction coil without having it measured? As stated many times previously in this department, it is not the resistance but the inductance value of the coil which counts. Because of the particular type of winding employed, however, the inductance value cannot be secured without having a considerable value of resistance. Undoubtedly the secondary winding of an 8-inch spark coil is quite sufficient for use as a one-to-one transformer.

* * *

C. P., Milton, Pa., writes:

Ques.—(1) Where can tantalum wire like that used in audion bulbs be obtained? I want to carry on some experiments with the audion, for which I will need some tantalum wire. I have means at hand for sealing and exhausting bulbs.

Ans.—(1) This wire may be purchased from Eimer & Amend, 205 Third Avenue, New York City.

Ques.—(2) Does the filament have to be tantalum? Why couldn't it be carbon or tungsten? Could it be replaced by a sun glass focused on wing and grid for experimental purposes only?

Ans.—(2) The filament is preferably of tantalum. Some results may be obtained from carbon and tungsten, but they will not be equal to those obtained with the tantalum filament. We can see no connection between a "sun glass" and a filament in vacua giving off electrons.

Ques.—(3) Does it matter what the wing and grid are made of? What is the usual distance from filament to grid and from grid to wing?

Ans.—(3) The wing and grid should both be made of nickel. Some fair results have been obtained when the wing is made of iron. The distance between the wing, grid and filament should be as small as possible, care being taken to keep the filament far enough distant from the grid so as to prevent it from curling up and effecting a short circuit.

* * *

H. B. W., Chanute, Kans., asks:

Ques.—(1) Where can I obtain information explaining in detail how to make an amplifier for boosting weak signals?

Ans.—(1) See the article on "How To Conduct a Radio Club" in the January, 1914, issue of THE WIRELESS AGE.

Ques.—(2) I am using a Murdock oscillation transformer No. 423 (sending helix) in connection with a ½ k.w. transformer, using "loose-coupling" as it is supposed to be used. I have not been able when using this coupling to be heard out of town. Using close coupling (the secondary only) I have been heard in Ohio; yet my friends argue that "loose-coupling" will give the best long distance results. Are they right, and how should I use this helix to get the maximum long distance?

Ans.—(2) We suggest that you study carefully the principles of resonance and coupling and get a clear understanding of these terms. With a given transmitting set, provided both the spark gap and aerial circuits are in resonance, there is some degree of coupling which will give the maximum value of current in the antenna circuit. The proper value is ascertained by experiment. Perhaps when you employed a low value of coupling the current in the antenna circuit dropped to such an amount as to reduce the effective range. But when you tightened the coupling, even though the set emitted two wave-lengths, the energy in one of these waves was of greater intensity than on the single wave-length when employing a loose coupling. Previous issues of THE WIRELESS AGE have contained full instructions for tuning a wireless telegraph set to resonance. Your friends are in the main quite correct in their statements and if you can adjust your set so as to radiate a good amount of energy on a single wave-length it should cover a greater distance than if the energy were split up between two widely separated wave-lengths.

Ques.—(3) Would the shock from the secondary of a ½ k.w. transformer giving a secondary voltage of 13,200 and operating on 110 volts A. C., 60 cycles, kill a man or just give him a severe shock.

Ans.—(3) While it might not be fatal, we advise you not to try the experiment.

Ques.—(4) Suppose an operator is waiting to receive a station sending on a known wave-length, for example, say 600 meters. Has there been any practical instrument developed to utilize the energy of the incoming signals to deflect a needle or to give other visible warning that a certain station is calling?

Ans.—(4) Call bell apparatus has never been developed to a high degree of efficiency and even if it were, the apparatus would be of little practical value, for the bell would ring every time an impulse of static discharged to earth through the antenna circuit. It is possible to "rig up" a polarized relay in the local circuit of an audion or to use the Brown

Amplifying Relays (referred to in previous issues of THE WIRELESS AGE) in a step-up manner to manipulate recording or signalling apparatus. Again you may use a valve amplifier with a loud speaking telephone enabling the signals to be heard across the room. You will find all apparatus of this nature very expensive and generally beyond tht means of the amateur experimenter. It is not well to delve into this phase of wireless telegraphy until you are thoroughly familiar with the fundamentals and have had considerable experience in a practical way.

Ques.—(5) I desire to obtain a complete knowledge of wireless, both from a practical operating standpoint and from a theoretical standpoint. I cannot spare the time to attend a school devoted to wireless. Would you advise me to buy books on the subject or to take a correspondence course.

Ans.—(5) We advise you to purchase books on the subject. We suggest the "Textbook on Wireless Telegraphy" by Rupert Stanley, "The Naval Manual of Wireless Telegraphy for 1913" by Commander Robison. Get into communication with the Book Department of the Marconi Publishing Corporation, 450 Fourth Avenue, New York City, and obtain a list of the books on Wireless Telegraphy which it sells. There are no correspondence courses given in wireless telegraphy and even if there were they would be of little value for a commercial wireless education unless they were written by someone with considerable practical experience. The first-named book in our answer to your query is the most up-to-date publication on the subject that we know of.

* * *

T. O'H., Jr., Chinook, Mont.:

The information in your query relative to the wave-length of certain aerials is not sufficient for calculation. We must have the height of the flat top portion from the earth as well as the length of the rat tails. The first aerial you suggest has a wave-length of about 300 meters; the second, about 325 meters, and the third about 400 meters. These are rough calculations.

* * *

H. F. W., Montpelier, Vt., asks:

Ques.—(1) Is a large (4,500 meter) "loose-coupler" more efficient for receiving long wave-lengths than a small (1,000 meter) coupler with loading coil, and vice versa?

Ans.—(1) An intelligent reply to this query would demand that we know the range of wave-lengths you desire to receive or the stations you expect to hear. Certainly a tuner built for 4,500 meters is more suited to the reception of longer wave-lengths than one having a range of 1,000 meters. This matter has been pretty well discussed in the Queries Answered Department and other articles appearing in THE WIRELESS AGE. It is well to build two tuners at any receiving station, one for the longer range of wave-lengths, say 4,000 to 10,000 meters, and the other for the shorter range of wave-lengths, covering from 300 to 4,000 meters.

Ques.—(2) Has New York (WSL) been transmitting on a 4,800-meter wave for the past week?

Ans.—(2) Yes; this station works nightly on a regular schedule.

Ques.—(3) Please tell me which is the more efficient tuning arrangement with a navy type coupler; should the variable condenser be connected in series or in parallel with the primary winding?

Ans.—(3) Generally the maximum strength of signals is received with the variable condenser of the receiver in series with the antenna rather than in shunt to the primary winding.

Ques.—(4) Are the stations at Belmar and New Brunswick, N. J., in operation now, and if so, on what time schedule, wave-length and spark system?

Ans.—(4) These stations are not quite completed and are therefore not in operation. The corresponding stations in England have been temporarily taken over by the British Admiralty and for this reason commercial work has not begun.

* * *

C. O. S., Frankfort, Mich.:

We have no data on a transformer as you request. We do not know the wave-lengths of the station of the Illinois Watch Company and we cannot advise concerning the mysterious station sending out CQ's.

* * *

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

We have taken note of your sketch and advise that you remove the condenser in shunt to the spark gap. You will secure far better results with a coil of this type by simply connecting the spark gap in series with the antenna circuit. If the spark note is not clear, use smaller electrodes. They should not be more than 3/16 of an inch in diameter at the most. The set should certainly carry four miles unless local conditions prevent. The condenser connected across the spark gap as shown has no value and simply diverts energy which otherwise would radiate into space.

Ques.—(2) How would you fix a mechanical interrupter on the same shaft as a small rotary gap so as to make the interruptions synchronous to the spark frequency at the gap?

Ans.—(2) A description of a mechanical converter appeared on page 667 of the May, 1914, issue of THE WIRELESS AGE.

Ques.—(3) Would the gap referred to increase my range? If not, what would without using a larger coil?

Ans.—(3) We have found this mechanical converter to be rather unsatisfactory, requiring very careful adjustment and constant attention to produce results.

Ques.—(4) A coil rated at one-inch gave, when new, a one-inch spark on 6 dry cells, but now after 6 months of very intermittent usage, will give only a ½-spark on a 6-volt storage battery. Why is this?

Ans.—(4) We are inclined to believe that the capacity of the storage cell is below normal and is not furnishing a sufficient number of amperes to operate the coil. It may be that a portion of the secondary winding of the coil has become short-circuited, but it is more likely that the plates in the storage cell have given out.

* * *

E. L., Independence, Kans., writes:

Ques.—(1) I have an aerial 700 feet in length and 80 feet in height consisting of 6 wires (phosphor bronze 7-22) spaced 14 feet. The earth connection is made to a 6-inch gas main and galvanized sheet iron plate 4 feet by 64 feet for a ground connection; no trees or telephone and electric light wires. With these conditions and a vacuum valve receiving cabinet and 3-step amplifier, what distances or stations should I be able to receive from? Can tune to about 12,000 meters.

Ans.—(1) If there are no local obstructions and the conditions surrounding your station are ideal for receiving you should be able to hear the Marconi high power station at San Francisco, Sayville, L. I., Cape Cod on the Atlantic Coast, and the New Brunswick station as soon as it is in operation.

Ques.—(2) Should a lead-in wire from the aerial referred to come from the center or should a lead be taken from the end?

Ans.—(2) It should be taken off from the end.

Ques.—(3) I am going to put up a small aerial for sending. How near the other aerial should this one be for a pure and sharp wave? Should it be at right angles to the other?

Ans.—(3) To say the least, the small aerial should be placed at some distance from the large aerial. It need not be necessarily at right angles, but if it can be so placed conveniently it should be done.

Ques.—(4) Is it possible to purchase a Pickard telephone head set?

Ans.—(4) Yes; communicate with the Wireless Specialty Apparatus Company, 81 New Street, New York City.

Ques.—(5) With a Clapp-Eastham 1 k.w. "hytone" transmitter what distance should be obtained using a 200 meter wave?

Ans.—(5) Forty miles.

* * *

W. H. S., Ardmore, Pa., writes:

Ques.—(1) It seems to me that the transmitting condenser is a bugbear similar to the detector. The evils caused by leaky condensers are too well known to you to mention. As I understand it, the ordinary glass plate paraffin condenser is notoriously inefficient, and the oil not much better. I am at the present time using a Murdock moulded condenser which seems O. K. The trouble I experience with condensers is that as soon as I regulate the speed of the gap to synchronism they have a habit of puncturing every few days—sometimes with a non-synchronous spark. (Transformer 1/4 k.w.; secondary voltage 13,200.) Of course you sav use two banks in series, but figuring on 0.0017 Mfds. capacity per section, what would it cost for a 200 to 250 meter wave at $2.00 per section?

Ans.—(1) You should use a series parallel connection of the Murdock condensers. You require a capacity value of about 0.01 Mfds. Six sections in parallel will give this capacity. But if you use a series parallel connection you will require 24 of these units, 12 in parallel in each bank and the two banks connected in series. The condenser will therefore cost $48.00. Perhaps you may reduce the strain on this condenser by using the minimum possible length of spark gap. That is to say, have the electrodes of the disc move within 1/50 of an inch of your stationary electrodes.

Ques.—(2) "The Year Book of Wireless Telegraphy and Telephony" shows in some photographs what I believe to be compressed air condensers. I have been wondering what the capacity and price per section are and if they can be purchased by amateurs.

Ans.—(2) We are not aware that condensers of this type are described in "The Year Book of Wireless Telegraphy and Telephony." They are built by the National Electric Signal Company, Bush Terminals, Brooklyn, N. Y.

Ques.—(3) What is the price of the condenser tubes on your new Type E 120-cycle set and what about the brushing mentioned in the second paragraph on page 284 of the January, 1915, issue?

Ans.—(3) Communicate with the Traffic Department of the Marconi Wireless Telegraph Company of America, 233 Broadwav, New York City. Quotations on request. Condensers of all types are subject to brush discharge, the amount depending on the voltage applied.

* * *

L. S., Kingston, N. Y., asks:

Ques.—(1) Is there a wireless station at Mt. Beacon, N. Y.? If so, what are its call letters and what business does it transact?

Ans.—(1) The station formerly located at Mt. Beacon, N. Y., was dismantled several years ago.

Ques.—(2) Is the station at Sayville, L. I., working? If so, what time does it send and on what wave-length?

Ans.—(2) Yes; this station is working on a regular schedule every night at 15 minutes after nine o'clock. Its wave-length is 4,800 meters.

Ques.—(3) At what time during the day besides half past 4 o'clock in the afternoon do the two Wanamaker stations carry on communication?

Ans.—(3) Throughout the day at irregular intervals from half past 8 o'clock in the morning till half past 5 o'clock in the afternoon.

* * *

G. W., Berkelev. Cal., asks:

Ques.—(1) Is it better to have the stationary electrodes of a rotary spark gap opposite each other on different sides of the rotor, as on the Marconi disc discharger, or opposite each other on the same side as on the Halcun rotary? If it makes no difference, why did the Marconi Company adopt the former design?

Ans.—(1) It makes no difference; it is simply a matter of construction.

Ques.—(2) What effect would the use of two grounds of different lengths have on sharp tuning for either sending or receiving? Is such a ground desirable?

Ans.—(2) It will have no effect upon the tuning and will do no harm.

Ques.—(3) Is a vertical sending aerial efficient? Why?

Ans.—(3) The most efficient of all because there is a greater displacement current set up in the immediate space about the antenna and therefore a greater shock given to the surrounding ether.

Ques.—(4) Please tell me the natural period of a vertical aerial consisting of two wires 90 feet in height, the wire used being made up of 7 strands of No. 22 copper wire.

Ans.—(4) Approximately 124 meters.

* * *

G. T. A., Bayfield, Wis., writes:

Ques.—(1) I have a receiving aerial consisting of two wires 160 feet in length and 60 feet in height. Would the results from a 4-wire aerial be enough better to warrant the cost and trouble to put it up?

Ans.—(1) No; no particular advantage.

Ques.—(2) I am using a helix of 11 turns, 10 inches in diameter, and wish to make an oscillation transformer of it by making a secondary in the form of a ring to slide up and down on the outside for the coupling. How many turns should I use, and what size and kind of wire? This design is similar to the one used by the Marconi Company.

Ans.—(2) You may make the secondary winding of No. 4 D. B. R. C. stranded wire. It should have 4 or 5 turns wound closely together. We cannot advise whether your primary winding has the correct dimensions or not. We do not know the range of wave-lengths over which you desire to work or the size of the set with which it is to be used.

Ques.—(3) Should the primary be changed in any way?

Ans.—(3) A proper answer to this query depends upon the range of wave-lengths to be employed.

Ques.—(4) Why has Sayville shut down?

Ans.—(4) The station at Sayville has not closed. It may be heard on its regular schedule at nighttime on a longer wave-length—nearly 4,800 meters.

Ques.—(5) Please give me an explanation of the Arlington weather reports.

Ans.—(5) You may procure from the Weather Bureau, Department of Agriculture, Washington, D. C., a pamphlet fully explaining the time signals. A complete answer to this query also appeared in one of the 1914 issues of THE WIRELESS AGE.

* * *

E. E., Jr., Philadelphia, Pa.:

The following data is applicable for a ½ kw. open core transformer to operate on 60 cycles:

The primary core should be composed of No. 30 soft iron wire, 2¼ inches in diameter, which should then be covered with Empire cloth and wound with two layers of No. 12 D. C. C. wire for a distance of 14 inches. The secondary winding should have 10 pancakes, 7 inches in diameter, each 1¼ inches in thickness, wound with No. 32 single silk-covered wire. Each of these sections should be separated from the adjacent ones by insulating paper, ⅛ inch in thickness. There should be a micanite tube between the secondary and primary windings of a rubber tube of high insulating properties.

The condenser described in the November, 1913, issue of THE WIRELESS AGE should be sufficient for this transformer. The capacity of a suitable condenser should be about 0.01 Mfds. It may be made of 5 plates of glass, 14 inches by 14 inches, covered with foil, 12 inches by 12 inches, the plates to be connected in parallel.

* * *

C. F. O., Boston, Mass., gives us a problem in connection with a transmitting set which he himself admits will be inoperative. Briefly, he proposes to place two secondary windings, one on either side of the primary winding of the closed oscillatory circuit of a transmitter. He then erects an aerial in the loop form having two lead-ins, connecting one of these lead-ins to one of the secondary windings and the second lead-in to the other secondary winding. He informs us further that one of these secondary windings is wound in opposition to the other and therefore the energy from the closed oscillatory circuit of the transmitter will make a complete circuit of the loop antenna per alternation of current. He wishes to know if there is any advantage with this connection or if the circuit is inoperative, and, if so, the reasons therefor.

Ans.—(1) It is at once evident that the secondary windings of the oscillation transformer are short-circuited through the antenna and through the earth and therefore could not be placed in resonance with the primary winding. There could be no advantage in sending an oscillation around this loop, for the magnetic flux on one side of the loop will be in opposition to that on the other, and therefore there would be practically no radiation. The entire arrangement of circuits as proposed is inoperative.

C. F. O. then asks how the balancing aerial of the Marconi High Power Stations enables a given receiving station to work simultaneously with the sending station. He also inquires if there is a difference in the wave-lengths of the two.

Ans.—(2) As he is apparently not familiar with the use of the balancing aerial he should refer to previous issues of the Marconigraph or THE WIRELESS AGE for information on this subject. In the article on "How to Conduct a Radio Club" in the November, 1914, issue of THE WIRELESS AGE he will be able to obtain information regarding what a balancing aerial is intended for. In trans-Atlantic work the transmitting station is located 40 to 50 miles from the receiving station, wire lines connecting the two stations on both sides of the Atlantic. A receiving station on this side constantly receives from a corresponding transmitting station which is situated, let us say, in England. The transmitting station on this side constantly sends to a corresponding receiving station in England. The transmitting station in America does not interfere with the receiving station on this side; first, because the stations are from 30 to 50 miles apart; second, on account of the difference in wave-lengths between the transmitting and receiving station; and third, what energy might leak into the receiving aerial on this side is destroyed by the energy picked up from the transmitting station on the balancing out aerial.

Our correspondent then wishes to know if it would not be possible to send out an ideal continuous wireless wave by a succession of overlapping condenser discharges taking place so rapidly that there would be no breaks practically between the successive discharges. He wishes to know if this would not be the solution of the "long-sought for" ideal continuous generator.

Ans.—(3) This method was first employed by Guglielmo Marconi himself and it has been patented and successfully employed in trans-Atlantic service. The results obtained are practically the some as those procured with the well-known high-frequency alternator and many problems encountered in the high-frequency alternator are by this method wholly eliminated.

C. F. O. also sends us a freakish hook-up of a transmitting set, asking us if it has any bearing on the previous question. We can see no value whatsoever in this arrangement of the transmitting circuits and the problem presented has not sufficient value to be discussed.

Another query is along the following lines: He wishes to know if atmospheric conditions change the tone of wireless signals and then he cites one instance when the signals of a certain naval station seemed to change their tone. We advise that the rising and falling note which he heard from this particular station was undoubtedly due to poor regulation of the spark gap, which, by the way, was of the quenched type. Continuous discharges of atmospheric electricity at the receiving station will often change slightly the note of the transmitting station. It perhaps may be accounted for by interaction between the frequencies of the transmitting station and the impulses set up by the station. Generally speaking, however, this is not true, atmospheric electricity having but little effect upon the note of the signals.

* * *

R. N. L., Woodlawn, N. Y.:

Generally speaking, the operation of a 10-inch Marconi coil in connection with 60-cycle alternating current will be found unsatisfactory. It is rather hard to advise as to the impedance to use, but we suggest that you make several trials. You do not require more than 3 plates for the condenser of the size you suggest. Any number of hook-ups for the valve and crystal detectors have appeared in preceding issues of THE WIRELESS AGE and we suggest that you note them.

* * *

G. E. W., San Francisco, Cal., asks:

Ques.—(1) I should like to know the locations, names and wave-lengths of the stations which have the following call letters: NFC, NFH, NFI, NEK, CKK, NFU and NFL. What do RR, MF and RRB mean?

Ans.—(1) NFC, U. S. S. Eagle; NEK, U. S. S. Delaware; NFU, U. S. S. Ranger. The remaining "N" calls have not been assigned. The signal which you seem to think is CKK is probably KKC, which is the steamship Chalmette of the Southern Pacific Line. The signal RR is the international acknowledgment of receipt and is equivalent to O. K. You must have made an error in reading the signals MF and RRB; they are not standard signals.

Ques.—(2) What wave-lengths do the government stations use for sending out the time signals, and what stations send these signals?

Ans.—(2) Arlington, 2,500 meters; Key West, 1,000 meters; New Orleans, 1,000 meters; North Head, 2,000 meters; Eureka, 1,400 meters; San Diego, 2,000 meters; Mare Island, 2,500 meters.

* * *

W. Q. R., Baltimore, Md., asks:

Ques.—(1) Would the connection of the ground wire to the radiator of the steam-heating system make a good wireless ground?

Ans.—(1) It is not the best method, particularly for transmitting, because if there is a considerable length of piping between your apparatus and the actual earth connection, severe inductive effects are apt to be experienced in the house wiring. It is best, if possible, to run a stout copper wire from the apparatus to the water piping system where it enters the building from the street. In this manner high resistance joints such as may be expected at the pipe connections are eliminated. If the length of pipe from the apparatus to the earth is not over 10 feet and the current is not required to pass through many joints, direct connection to the steam pipes may be sufficient for both transmitting and receiving. We believe, however, that the underwriters in the majority of cities demand that the wireless system be connected to the earth with as short a length of wire as possible, and furthermore that circuits through pipe joints be avoided.

Ques.—(2) The length of the ground wire from the aerial to the connection at the radiator is 6 feet. In winter weather would the heat from the radiator effect or injure the instruments in any manner?

Ans.—(2) If the instruments are placed directly over the radiator it may warp the wood or hard rubber portions of your apparatus, and it is therefore advisable to place the apparatus at one side of the radiator so that it is directly out of the path of the heat waves.

Ques.—(3) Can an oscillation transformer be used with a 1-inch spark-coil?

Ans.—(3) Generally speaking, it is found unsatisfactory, owing to the very small condenser capacity which may be used with a coil. Better results are generally obtained by connecting the earth to the aerial leads directly to the spark gap. The 3-inch spark coil is the minimum size that may be employed with the oscillation transformer for satisfactory results. We are aware that amateurs often use 1-inch spark coils in this manner, but we have invariably found that the antenna circuit and spark gap circuit were hopelessly out of resonance.

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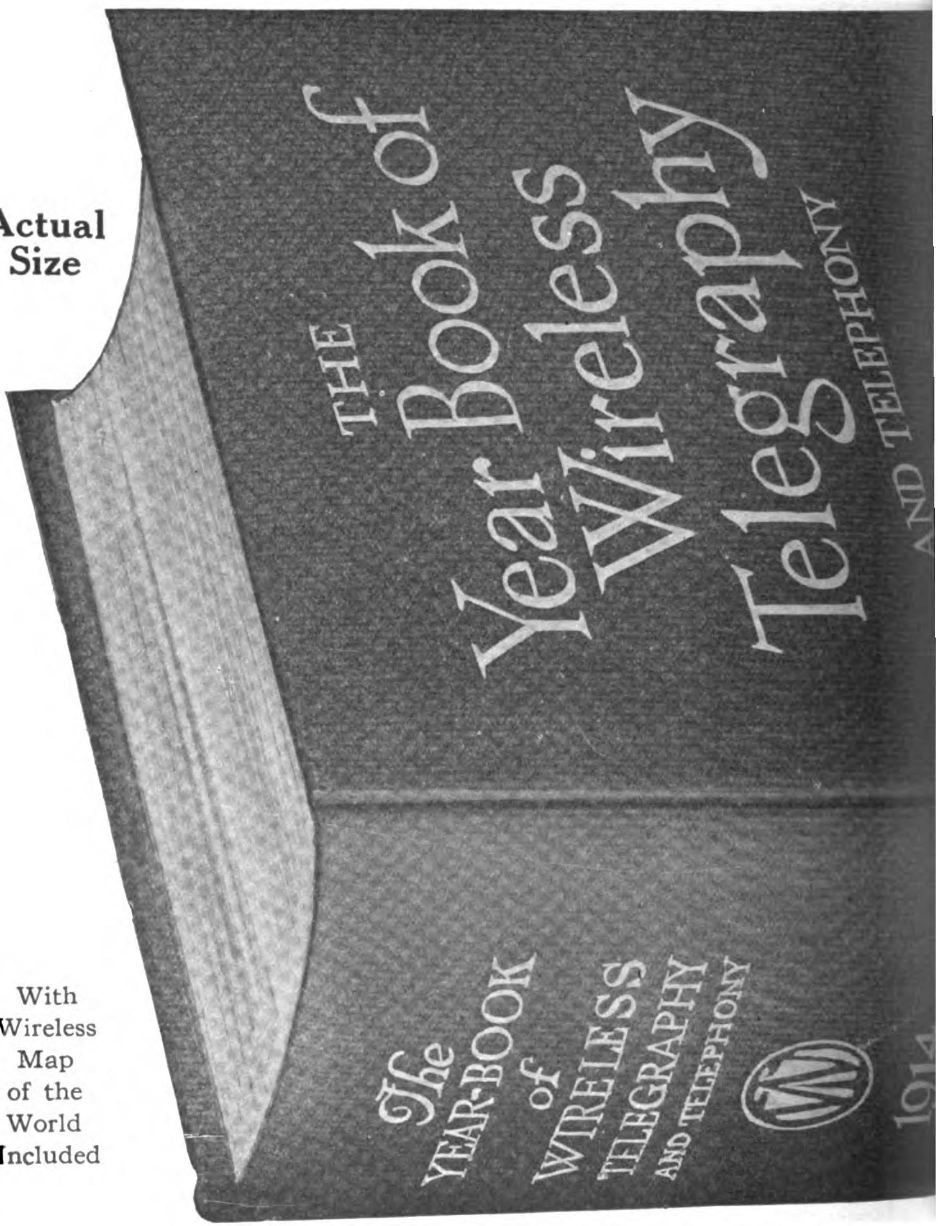

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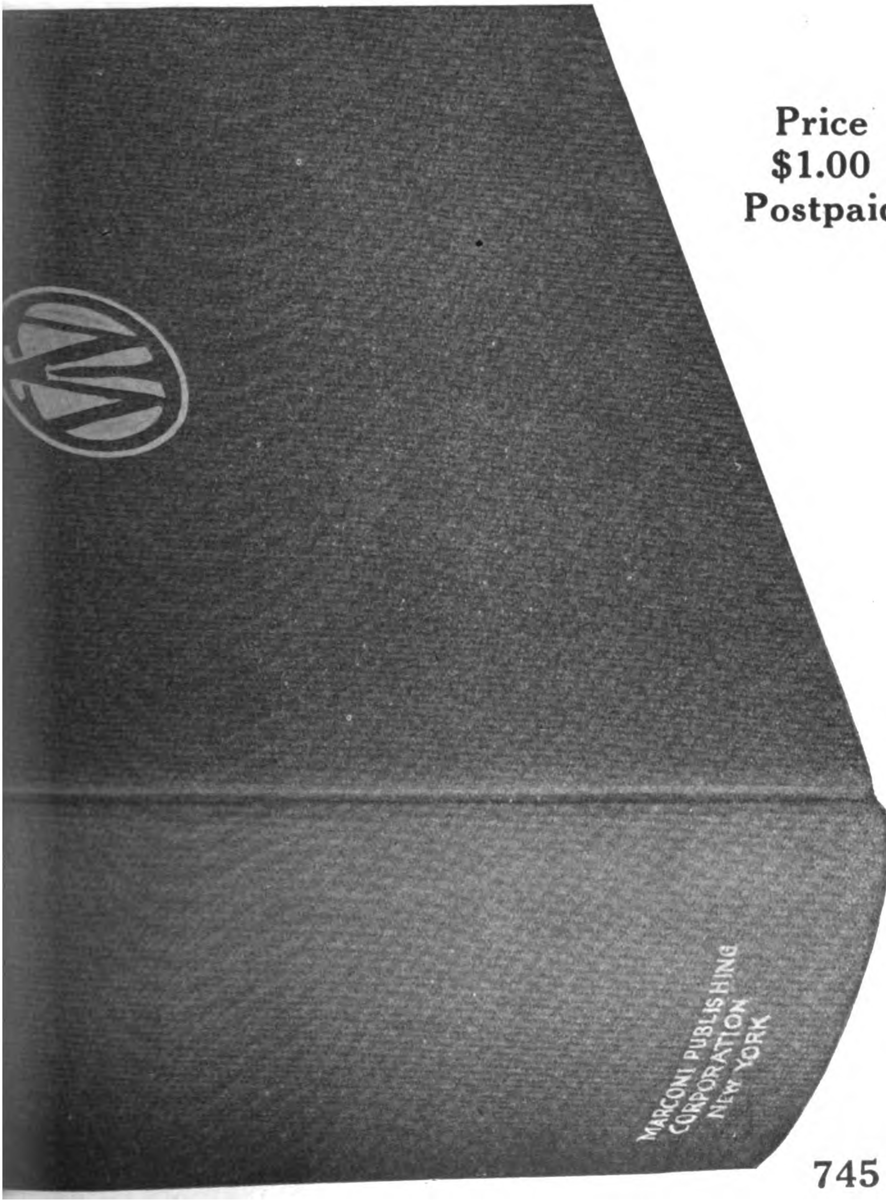

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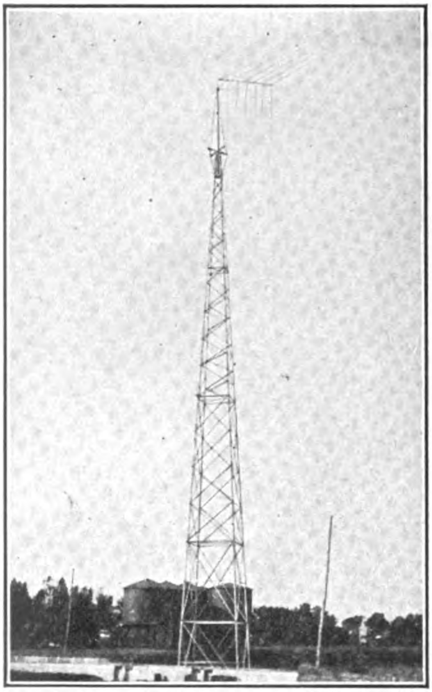

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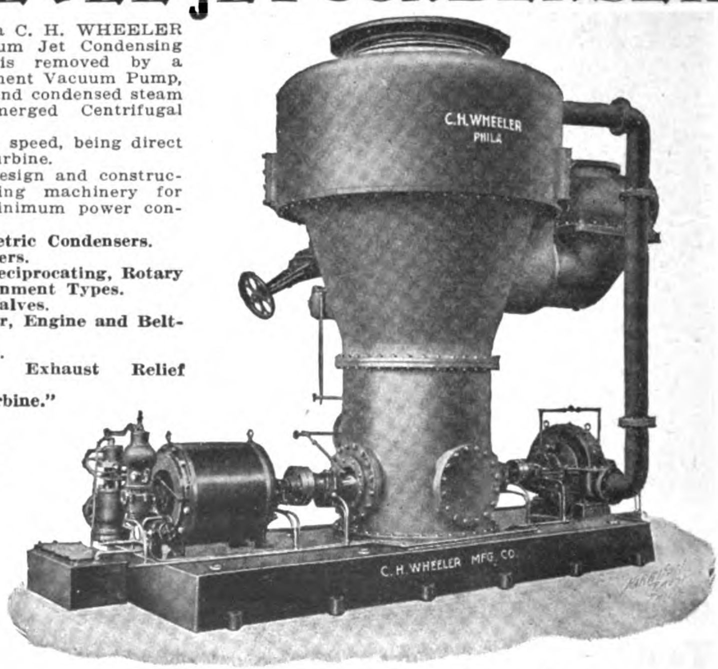

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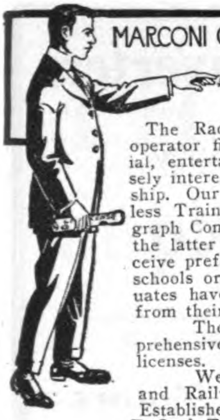

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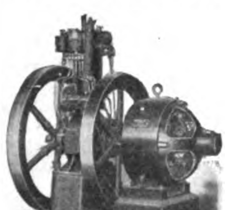

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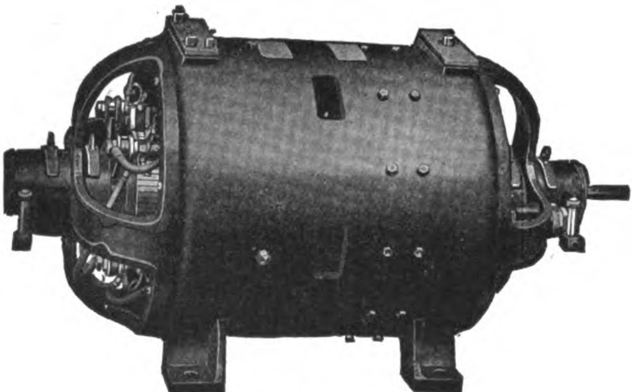

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This type 'phone is provided with an enclosed protective spark gap.

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

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

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

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

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

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