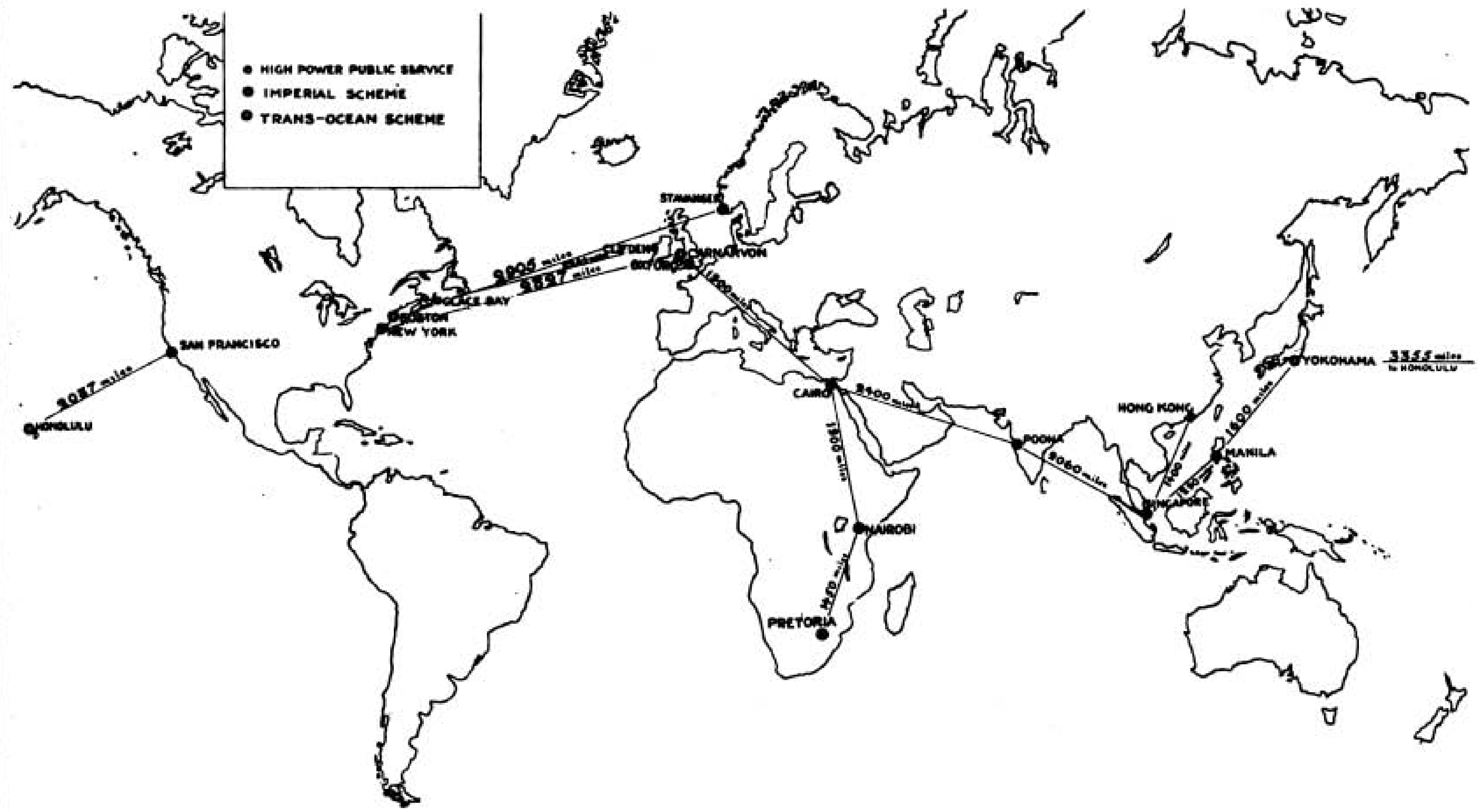
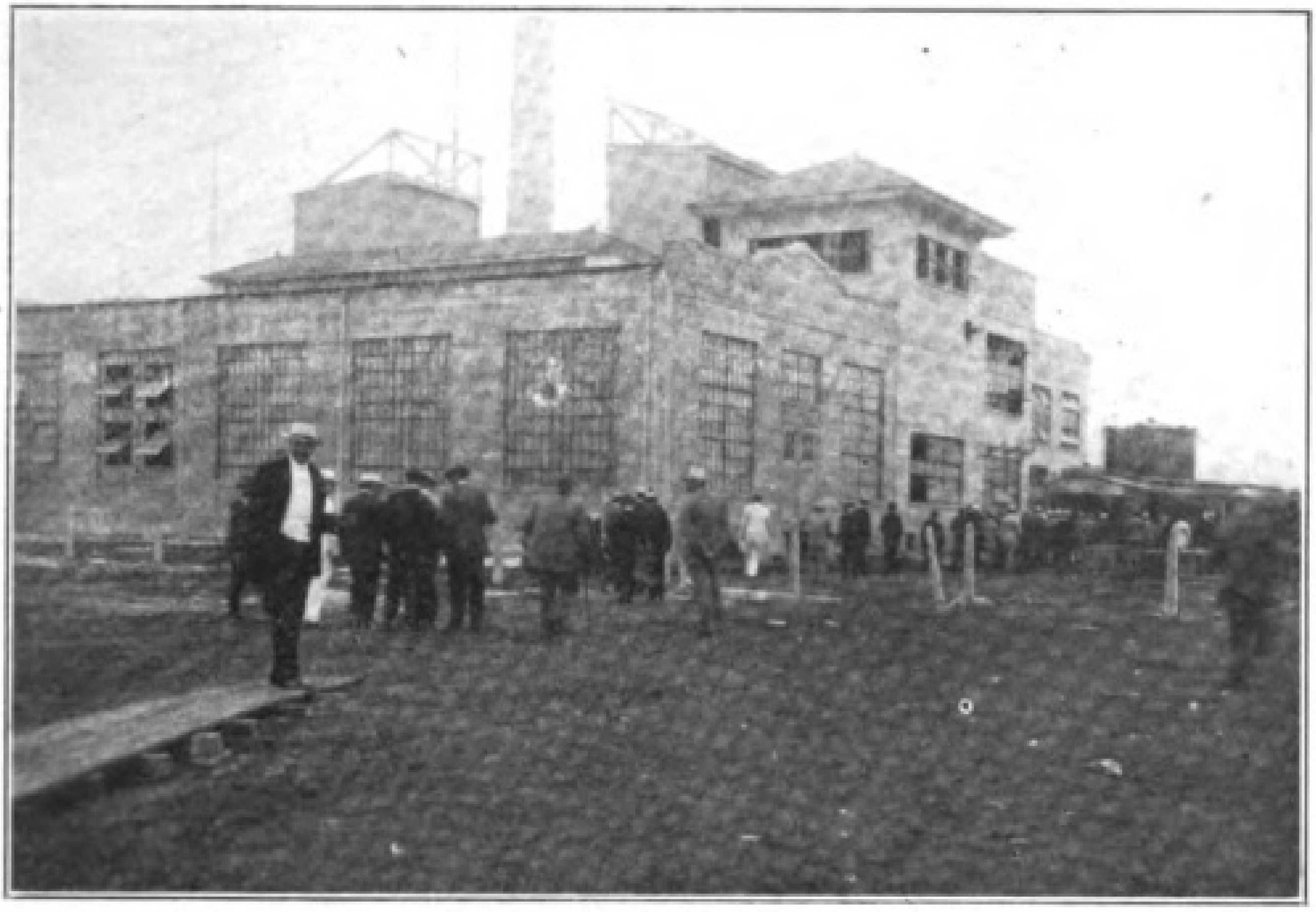
THE WIRELESS AGE

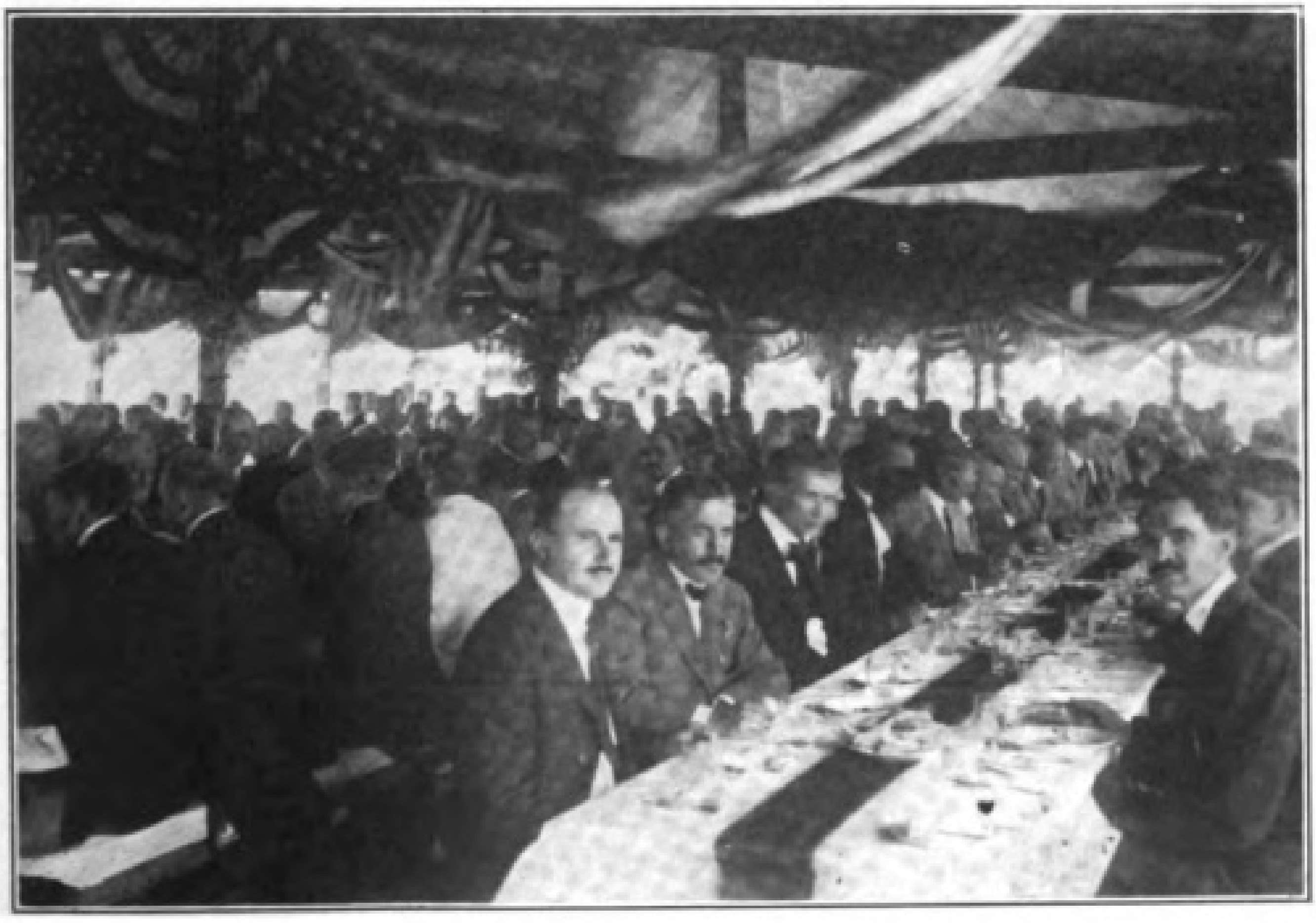
FEBRUARY, 1915



Just as the year 1901 was drawing to a close, Marconi received the first wireless signals sent across the Atlantic. This map graphically illustrates the progress made in long distance communication during the thirteen years which have since passed. Only trans-oceanic stations in the Marconi globe-girdling chain are shown, with the distances spanned continuously during 24-hour working days indicated in services now open and projected. It remains but to await the cessation of hostilities in the Great War for the Marconi world circuit to be completed and all the stations open for commercial business.



The photograph above and the one below were taken on September 24 last, during the ceremonies attending the opening of the Hawaii-California Marconi trans-oceanic wireless service. Several hundred representative business men, the governor and the mayor attended the luncheon in far-off Honolulu. President Wilson and the country's highest state officials sending messages



From a photograph taken of Guglielmo Marconi a few days after the first wireless message had been received from across the ocean

In striking contrast to the photographs on the second page preceding, is this article which appeared in McClure's magazine for February, 1902. It reports the transmission of the now famous "S" signals across the Atlantic →

Marconi's Achievement

Telegraphing Across the Ocean Without Wires

By Ray Stannard Baker

[Immediately upon the announcement of Mr. Marconi's success in signaling across the Atlantic Ocean, Mr. Baker went to St. John's, Newfoundland, where he visited the inventor and the scene of his experiments, afterwards accompanying him to Nova Scotia, and obtaining from him a complete and accurate account of his extraordinary achievements. McClure's Magazine printed, in March, 1897, the first article ever published about the young inventor, and, believing in him from the first, has followed his work step by step. In June, 1899, appeared a description of his successful signaling across the English Channel. The present paper is the authoritative story, obtained from the inventor himself, of his crowning triumph.—The Editor, 1902.]

IT is not at all surprising that Mr. Marconi kept his own counsel regarding his plans in coming to Newfoundland. So much hung on his success; and his project, in its bare outlines, was of a nature to balk human credulity. Think for a moment of sitting here on the edge of North America and listening to communications sent *through space* across 2,000 miles of ocean from the edge of Europe! A cable, marvelous as it is, maintains a tangible and material connection between speaker and hearer: one can grasp its meaning. But here is nothing but space, a pole with a pendent wire on one side of a broad, curving ocean, an uncertain kite struggling in the air on the other—and thought passing between. And the apparatus for sending and receiving these trans oceanic messages costs not a thousandth part of the expense of a cable. It is true that Marconi had already convinced the world of his ability to transmit messages for short distances without wires; yet his earlier successes seemed in no wise to prepare the public for his greater achievement. Earlier in the year he had communicated about 250 miles between stations on the British coast, but who imagined that he would suddenly attempt nearly eight times that distance? Even famous scientists and inventors refused at first to believe that signals had been actually transmitted from England to America. The project was too daring for public announcement. No one knew better what its success might mean to *t h a n k s a m w e l l*

Facsimile of message received from an incoming steamer by wireless telegraphy at the station on Nantucket—a despatch to the N. Y. Herald

the world than the inventor: the entire reconstruction of the present methods of transoceanic communication, the possible rejection as waste of millions of dollars' worth of the costly and cumbersome cable apparatus now in use, new possibilities opened in commerce and politics, war made more difficult, nations brought into closer and more sympathetic relationships—in short, the very shrinkage of the earth. Supposing the inventor had heralded his plans—and failed!

Very quietly, therefore, on December 6, 1901, Mr. Marconi landed at St. John's, with his two assistants, Mr. Kemp and Mr. Paget. It was understood that he would attempt communication with the transatlantic steamships as they passed back and forth 300 miles away. He set up his instruments in a low room of the old barracks on Signal Hill, which stands sentinel at the harbor mouth half a mile from the city of St. John's. So simple and easily arranged is the apparatus, that in three days' time the inventor was prepared to begin his experiments. On Wednesday, the 10th, as a preliminary test of the wind velocity, he sent up one of his kites, a huge hexagonal affair of bamboo and silk nine feet high, built on the Baden-Powell model *: the wind promptly snapped the wire and blew the kite out to sea. He then filled a 14-foot hydrogen balloon, and sent it upward through a thick fog bank. Hardly had it reached the limit of its tetherings, however, when the aerial wire on which he had depended for receiving his messages fell to the earth, the balloon broke away, and was never seen again. On Thursday, the 12th, a day destined to be important in the annals of invention, Marconi tried another kite, and though the weather was so blustery that it required the combined strength of the inventor and his assistants to manage the tetherings, they succeeded in holding the kite at an elevation of about 400 feet. Marconi was now prepared for the crucial test. Before leaving England he had given detailed instructions to his assistants for the transmission of a certain signal, the Morse telegraphic S, represented by three dots (. . .), at a fixed time each day, beginning as soon as they received word that everything at St. John's was in readiness. This signal was to be clicked out on the transmitting instruments near Poldhu, Cornwall, the southwestern tip of England, and radiated from a number of aerial wires pendent from masts 210 feet high. If the inventor could receive on his kite-wire in Newfoundland some of the electrical waves thus produced, he knew that he held the solution of the problem of transoceanic wireless telegraphy. He had cabled his assistants to begin sending the signals at three o'clock in the afternoon, English time, continuing until six o'clock; that is, from about 11.30 to 2.30 o'clock in St. John's.

At noon on Thursday (December 12, 1901) Marconi sat waiting, a telephone receiver at his ear, in a room of the old barracks on Signal Hill. To him it must have been a moment of painful stress and expectation. Arranged on the table before him, all its parts within easy reach of his hand, was the delicate receiving instrument, the supreme product of years of the inventor's life, now to be submitted to a decisive test. A wire ran out through the window, thence to a pole, thence upward to the kite which could be seen swaying high overhead. It was a bluff, raw day; at the base of the cliff 300 feet below thundered a cold sea; oceanward through the mist rose dimly the rude outlines of Cape Spear, the easternmost reach of the North American Continent. Beyond that rolled the unbroken ocean, nearly 2,000 miles to the coast of the British Isles. Across the harbor the city of St. John's lay on its hillside wrapped in fog: no one had taken enough interest in the experiments to come up here through the snow to Signal Hill. Even the ubiquitous re-

* For a full description of Baden-Powell's achievements with kites see McClure's Magazine for April, 1899.

porter was absent. In Cabot Tower, near at hand, the old signalman stood looking out to sea, watching for ships, and little dreaming of the mysterious messages coming that way from England. Standing on that bleak hill and gazing out over the waste of water to the eastward, one finds it difficult indeed to realize that this wonder could have become a reality. The faith of the inventor in his creation, in the kite-wire, and in the instruments which had grown under his hand was unshaken.

"I believed from the first," he told me, "that I would be successful in getting signals across the Atlantic."

Only two persons were present that Thursday noon in the room where the instruments were set up—Mr. Marconi and Mr. Kemp. Everything had been done that could be done. The receiving apparatus was of unusual sensitiveness, so that it would catch even the faintest evidence of the signals. A telephone receiver, which is no part of the ordinary instrument, had been supplied, so that the slightest clicking of the dots might be conveyed to the inventor's ear. For nearly half an hour not a sound broke the silence of the room. Then quite suddenly Mr. Kemp heard the sharp click of the tapper as it struck against the coherer; this, of course, was not the signal, yet it was an indication that something was coming. The inventor's face showed no evidence of excitement. Presently he said:

"See if you can hear anything, Mr. Kemp."

Mr. Kemp took the receiver, and a moment later, faintly and yet distinctly and unmistakably, came the three little clicks—the dots of the letter S, tapped out an instant before in England. At ten minutes past one, more signals came, and both Mr. Marconi and Mr. Kemp assured themselves again and again that there could be no mistake. During this time the kite gyrated so wildly in the air that the receiving wire was not maintained at the same height, as it should have been; but again, at twenty minutes after two, other repetitions of the signal were received.

Thus the problem was solved. One of the great wonders of science had been wrought. But the inventor went down the hill toward the city, now bright with lights, feeling depressed and disheartened—the rebound from the stress of the preceding days. On the following afternoon, Friday, he succeeded in getting other repetitions of the signal from England, but on Saturday, though he made an effort, he was unable to hear anything. The signals were, of course, sent continuously, but the inventor was unable to obtain continuous results, ow-

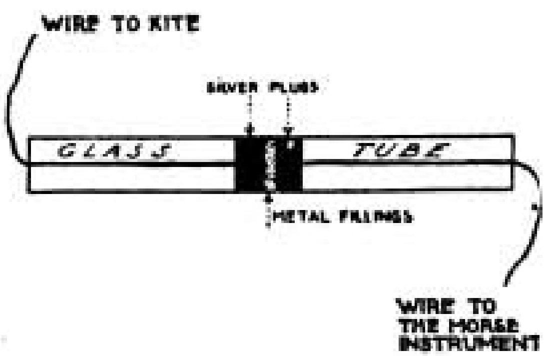
Preparing to fly the kite which supported the receiving wire. Marconi on the extreme left ing, as he explains, to the fluctuations of the height of the kite as it was blown about by the wind, and to the extreme delicacy of his instruments, which required constant adjustment during the experiments.

Even now that he had been successful, the inventor hesitated to make his achievement public, lest it seem too extraordinary for belief. Finally, after withholding the great news for two days, certainly an evidence of self-restraint, he gave out a statement to the press, and on Sunday morning the world knew and doubted; on Monday it knew more and believed. Many, like Mr. Edison, awaited the inventor's signed announcement before they would credit the news. Sir Cavendish Boyle, the governor of Newfoundland, reported at once to King Edward; and the cable company which has exclusive rights in Newfoundland, alarmed at an achievement which threatened the very existence of its business, demanded that he desist from further experiments within its territory, truly an evidence of the belief of practical men in the future commercial importance of the invention. It is not a little significant of the increased willingness of the world, born of expanding knowledge, to accept a new scientific wonder, that Mr Marconi's announcement should have been so eagerly and so generally believed, and that the popular imagination should have been so fired with its possibilities. One cannot but recall the struggle against doubt, prejudice, and disbelief in which the promoters of the first transatlantic cable were forced to engage. Even after the first cable was laid (in 1858) and messages had actually been transmitted, there were many who denied that it had ever been successfully operated, and would hardly be convinced even by the affidavits of those concerned in the work. But in the years since then, Edison, Bell, Röntgen, and many other famous inventors and scientists have taught the world to be chary of its disbelief. Outside of this general disposition to friendliness, however, Marconi on his own part had well earned the credit of the careful and conservative scientist; his previous successes made it the more easy to credit his new achievement. For, as an Englishman (Mr. Flood Page), in defending Mr. Marconi's announcement, has pointed out, the inventor has never made any statement in public until he has been absolutely certain of the fact; he has never had to withdraw any statement that he has made as to his progress in the past. And these facts unquestionably carried great weight in convincing Mr. Edison, Mr. Graham Bell, and others of equal note of the literal truth of his report. It was astonishing how overwhelmingly credit came from every quarter of the world, from high and low alike, from inventors, scientists, statesmen, royalty. Before Marconi left St. John's he was already in receipt of a large mail—the inevitable letters of those who would offer congratulations, give advice, or ask favors. He received offers to lecture, to write articles, to visit this, that, and the other place—and all within a week after the news of his success. The people of the "ancient colony" of Newfoundland, famed for their hospitality, crowned him with every honor in their power. I accompanied Mr. Marconi across the island on his way to Nova Scotia, and it seemed as if every fisher and farmer in that wild country had heard of him, for when the train stopped they came crowding to look in at the window. From the comments I heard, they wondered most at the inventor's youthful appearance. Though he is only twenty-seven years old, his experience as an inventor covers many years, for he began experimenting in wireless telegraphy before he was twenty. At twenty-one he came to London from his Italian home, and convinced the British Post-Office Department that he had an important idea; at twenty-three he was famous the world over.

The inventor is somewhat above medium height, and though of a highly strung temperament, he is deliberate in his movements. Unlike the inventor of tradition, he dresses with scrupulous neatness, and, in spite of being a prodigious worker, he finds time to enjoy a limited amount of club and social life. The portrait published with this article, taken at St. John's a few days after the experiments, gives a very good idea of the inventor's face, though it cannot convey the peculiar luster of his eyes when he is interested or excited—and perhaps it makes him look older than he really is. One of the first and strongest impressions that the man conveys is that of intense nervous activity and mental absorption; he has a way of pouncing upon a knotty question, as if he could not wait to solve it. He talks little, is straightforward and unassuming, submitting good-naturedly, although with evident unwillingness, to being lionized. In his public addresses he has been clear and sensible; he has never written for any publication; nor has he engaged in scientific disputes, and even when violently attacked he has let his work prove his point. And he has accepted his success with calmness, almost unconcern; he certainly expected it. The only elation I saw him express was over the attack of the cable monopoly in Newfoundland, which he regarded as the greatest tribute that could have been paid his achievement. During all his life, opposition has been his keenest spur to greater effort.

Though he was born and educated in Italy, his mother was of British birth, and he speaks English as perfectly as he does Italian. Indeed, his blue eyes, light hair, and fair complexion give him decidedly the appearance of an Englishman, so that a stranger meeting him for the first time would never suspect his Italian parentage. His parents are still living, spending part of their time on their estate in Italy and part of the time in London. One of the first messages conveying the news of his success at St. John's went to them. He embarked in experimental research because he loved it, and no amount of honor or money tempts him from the pursuit of the great things in electricity which he sees before him. Besides being an inventor, he is also a shrewd business man, with a clear appreciation of the value of his inventions and of their possibilities when generally introduced. What is more, he knows how to go about the task of introducing them.

No sooner had Marconi announced his success than critics began to raise objections. Might not the signals which he received have been sent from some passing ship fitted with wireless-telegraphy apparatus? Or, might they not have been the result of electrical disturbances in the atmosphere? Or, granting his ability to communicate across seas, how could he preserve the secrecy of his messages? If they were transmitted into space, why was it not possible for any one with a receiving instrument to take them? And was not his system of transmission too slow to make it useful, or was it not rendered uncertain by storms? And so on indefinitely. An acquaintance with some of the principles which Marconi considers fundamental, and on which his work has been based, will help to clear away these objections and give some conception of the real meaning and importance of the



Coherer, exact size

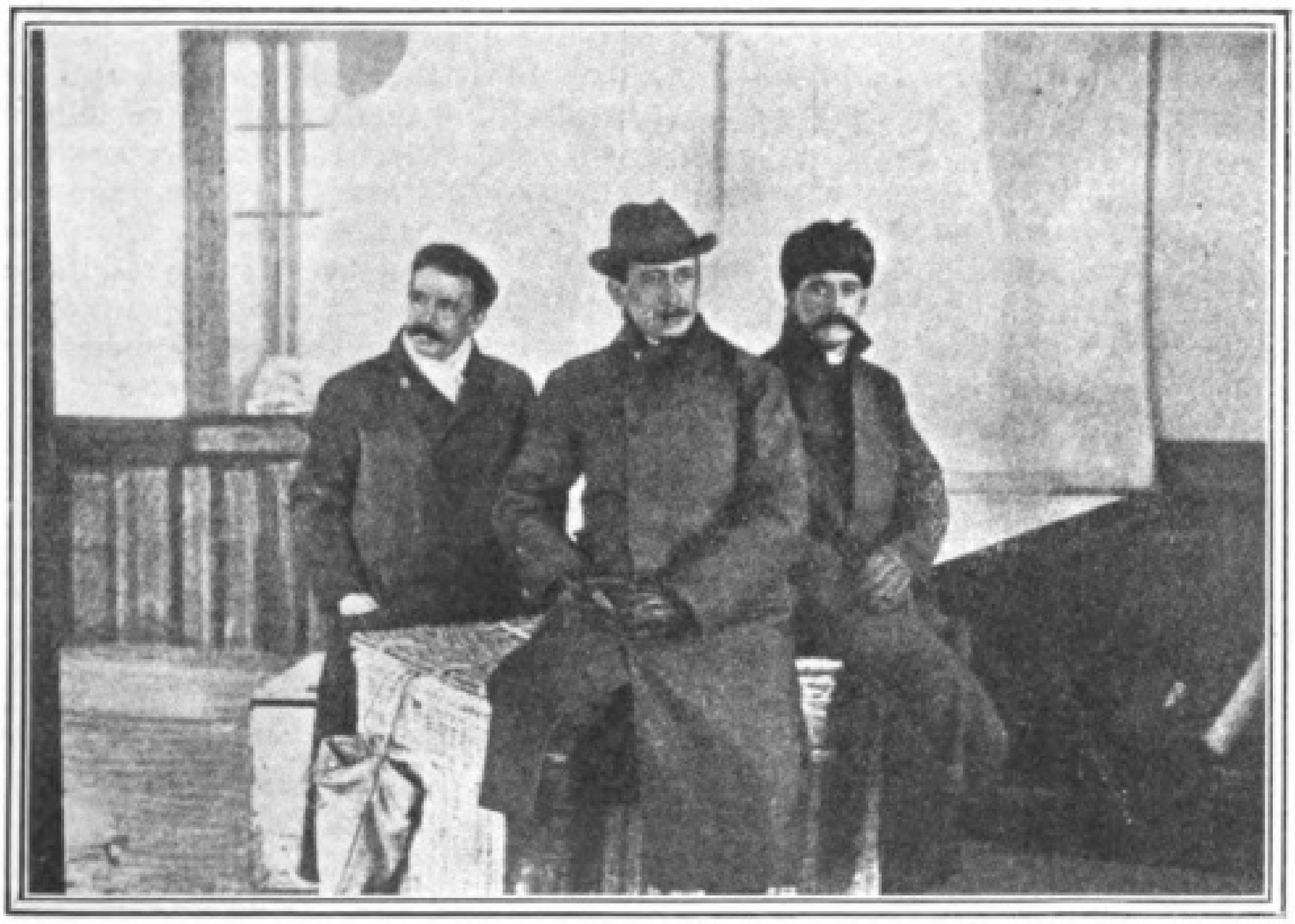
work at St. John's and of the plans for the future development of the inventor's system.

In the first place, Mr. Marconi makes no claim to being the first to experiment along the lines which led to wireless telegraphy, or the first to signal for short distances without wires. He is prompt with his acknowledgment to other workers in his field, and to his assistants. Professor S. F. B. Morse, the inventor of telegraphy; Dr. Oliver Lodge and Sir William Preece of England; Edison, Tesla, and Professors Trowbridge and Dolbear of America, and others had experimented along these lines, but it remained for Marconi to perfect a system and put it into practical working order. He took the coherer of Branly and Calzecchi, the oscillator of Righi, he used the discoveries of Henry and Hertz, but his creation, like that of the poet who gathers the words of men in a perfect lyric, was none the less brilliant and original.

In its bare outlines, Marconi's system of telegraphy consists in setting in motion, by means of his transmitter, certain electric waves which, passing through the ether, are received on a distant wire suspended from a kite or mast, and registered on his receiving apparatus. The ether is a mysterious, unseen, colorless, odorless, inconceivably rarefied something which is supposed to fill all space. It has been compared to a jelly in which the stars and planets are set like cherries. About all we know of it is that it has waves—that the jelly may be made to vibrate in various ways. Etheric vibrations of certain kinds give light; other kinds give heat; others electricity. Experiments have shown that if the ether vibrates at the inconceivable swiftness of 400 billions of waves a second we see the color red, if twice as fast, we see violet, if more slowly—perhaps 230 millions to the second, and less—we have the Hertz waves used by Marconi in his wireless-telegraphy experiments. Ether waves should not be confounded with air waves. Sound is a result of the vibration of the air; if we had ether and no air, we should still see light, feel heat, and have electrical phenomena, but no sounds would ever come to our ears. Air is sluggish beside ether, and sound waves are very slow compared with ether waves. During a storm the ether brings the flash of the lightning before the air brings the sound of thunder, as every one knows.

Electricity is, indeed, only another name for certain vibrations in the ether. We say that electricity "flows" in a wire, but nothing really passes except an etheric wave, for the atoms composing the wire, as well as the air and the earth, and even the hardest substances, are all afloat in ether. Vibrations, therefore, started at one end of the wire travel to the other. Throw a stone into a quiet pond. Instantly waves are formed which spread out in every direction; the water does not move, except up and down, yet the wave passes onward indefinitely. Electric waves cannot be seen, but electricians have learned how to incite them, to a certain extent how to control them, and have devised cunning instruments which register their presence.

Electrical waves have long been harnessed by the use of wires for sending communications; in other words, we have had wire telegraphy. But the ether exists outside of the wire as well as within; therefore, having the ether everywhere, it must be possible to produce waves in it which will pass anywhere, as well through mountains as over seas, and if these waves can be controlled, they will evidently convey messages as easily and as certainly as the ether within wires. So argued Mr. Marconi. The difficulty lay in making an instrument which would produce a peculiar kind of wave, and in receiving and registering this wave in a second apparatus located at a distance from the first. It was, therefore, a practical mechanical problem which Marconi had to meet. Beginning with crude tin boxes set up on poles on the grounds of his father's estate in Italy, he finally devised an apparatus from which a current generated by a battery and passing in brilliant sparks between two brass balls was radiated from a wire suspended on a tall pole. By shutting off and turning on this peculiar current by means of a device similar to the familiar telegrapher's key, the waves could be so divided as to represent dashes and dots, and spell out letters in the Morse alphabet. This was the transmitter. It was, indeed, simple enough to start these waves traveling through space, to jar the etheric jelly, so to speak; but it was far more difficult to devise an apparatus to receive and register them. For this purpose Marconi adopted a device invented by an Italian, Calzecchi, and improved by a Frenchman, M. Branly, called the coherer, the very crux of the system, without which there could be no wireless telegraphy. This coherer, which he greatly improved, is merely a little tube of glass as big around as a lead pencil, and perhaps two inches long. It is plugged at each end with silver, the plugs nearly meeting within the tube. The narrow space between them is filled with finely powdered fragments of nickel and silver, which possess the strange property of being alternately very good and very bad conductors of electrical waves. The waves which come from the transmitter, perhaps 2,000 miles away, are received on a suspended kite-wire, exactly similar to the wire used in the transmitter, but they are so weak that they could not of themselves operate an ordinary telegraph instrument. They do, however, possess strength enough to draw the little particles of silver and nickel in the coherer together in a continuous metal path. In other words, they make these particles particles again together, and another dot or dash is printed. All these processes are continued rapidly, until a complete message is ticked out on the tape. Thus Mr. Kemp knew when he heard the tapper strike the coherer that a signal was coming, though he could not hear the click of the receiver itself. And this is in bare outline Mr. Marconi's invention—this is the combination of devices which has made wireless telegraphy possible, the invention on which he has tak-



Mr. Marconi and his assistants: Mr. Kemp on the left, Mr. Paget on the right. They are sitting on a balloon basket with one of the Baden-Powell kites in the background

"cohere," and the moment they cohere, they become a good conductor for electricity, and a current from a battery near at hand rushes through, operates the Morse instrument, and causes it to print a dot or a dash; then a little tapper, actuated by the same current, strikes against the coherer, the particles of metal are jarred apart or "decohered," becoming instantly a poor conductor, and thus stopping the strong current from the home battery. Another wave comes through space, down the suspended kite-wire, into the coherer, there drawing the en out 132 patents in every civilized country of the world. Of course his instruments contain much of intricate detail, of marvelously ingenious adaptation to the needs of the work, but these are interesting chiefly to expert technicians.

In his actual transoceanic experiments of last December, Mr. Marconi's transmitting station in England was fitted with twenty masts 210 feet high, each with its suspended wire, though not all of them were used. A current of electricity sufficient to operate some 300 incandescent lamps was used, the resulting spark being so brilliant that one could not have looked at it with the unshaded eye. The wave which was thus generated had a length of about a fifth of a mile, and the rate of vibration was about 800,000 to the second. Following the analogy of the stone cast in the pond with the ripples circling outward, these waves spread from the suspended wires in England in every direction, not only westward toward the cliff where Marconi was flying his kite, but eastward, northward, and southward, so that if some of Mr. Marconi's assistants had been flying kites, say on the shores of Africa, or South America, or in St. Petersburg, they might possibly, with a corresponding receiver, have heard the identical signals at the same instant. In his early experiments Marconi believed that great distances could not be obtained without very high masts and long, suspended wires, the greater the distance the taller the mast, on the theory that the waves were hindered by the curvature of the earth; but his later theory, substantiated by his Newfoundland experiments, is that the waves somehow follow around the earth, conforming to its curve, and the next station he establishes in America will not be set high on a cliff, as at St. John's, but down close to the water on level land. His Newfoundland experiments have also convinced him that one of the secrets of successful long-distance transmission is the use of a more powerful current in his transmitter, and this he will test in his next trials between the continents.

And now we come to the most important part of Mr. Marconi's work, the part least known even to science, and the field of almost illimitable future development. This is the system of "tuning," as the inventor calls it, the construction of a certain receiver so that it will respond only to the message sent by a certain transmitter. When Marconi's discoveries were first announced in 1896, there existed no method of tuning, though the inventor had its necessity clearly in mind. Accordingly the public inquired, "How are you going to keep your messages secret? Supposing a warship wishes to communicate with another of the fleet, what is to prevent the enemy from reading your message? How are private business despatches to be secured against publicity?" Here, indeed, was a problem. Without secrecy no system of wireless telegraphy could ever reach great commercial importance, or compete with the present cable communication. The inventor first tried using a parabolic copper reflector, by means of which he could radiate the electric waves exactly as light, which, it will be borne in mind, is only another kind of etheric wave, is reflected by a mirror. This reflector could be faced in any desired direction, and only a receiver located in that direction would respond to the message. But there were grave objections to the reflector; an enemy might still creep in between the sending and receiving stations, and, moreover, it was found that the curvature of the earth interfered with the transmission of reflected messages, thereby limiting their usefulness to short distances.

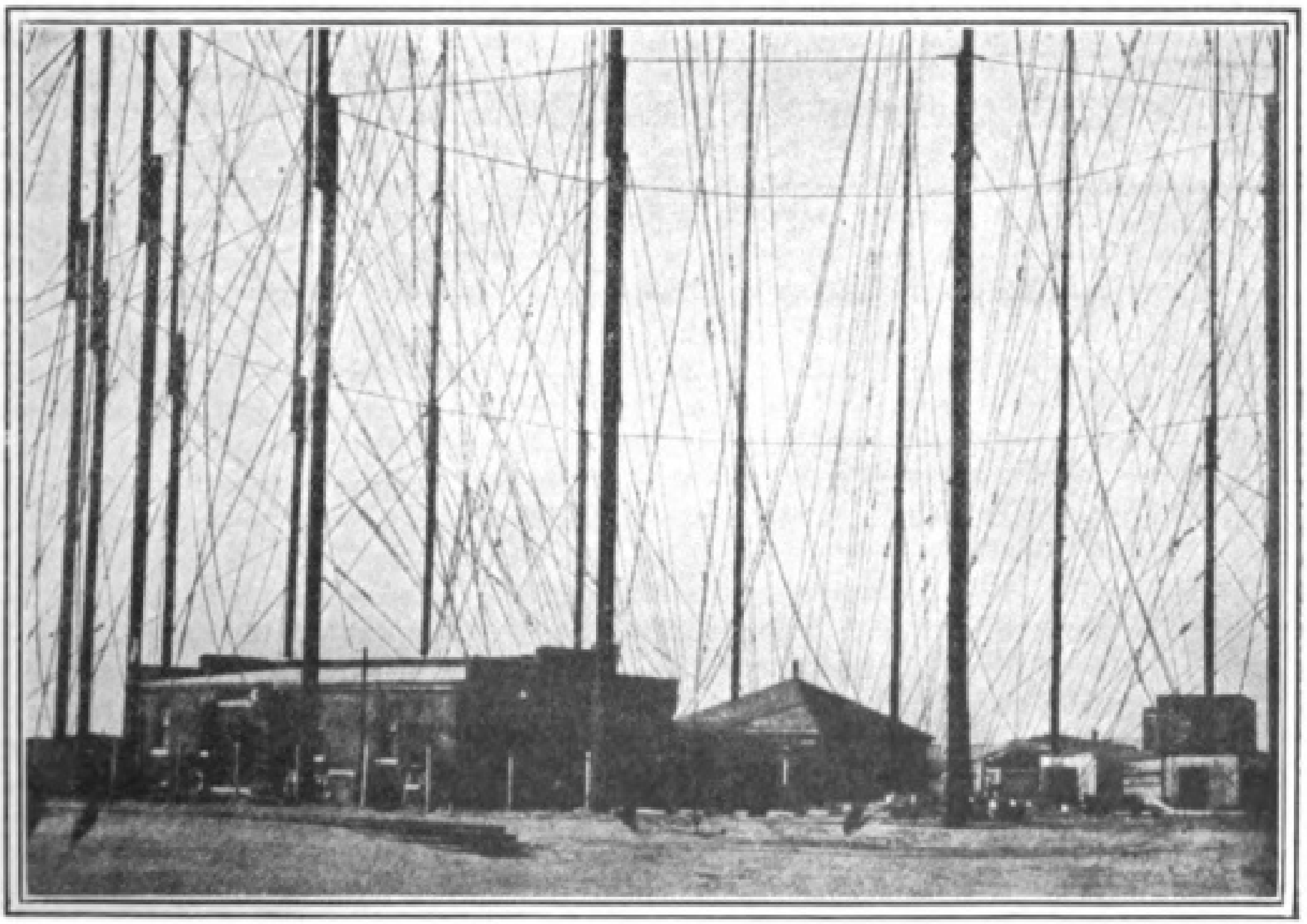
In passing, however, it may be interesting to note one extraordinary use for this reflecting system which the inventor now has in mind. This is in connection with lighthouse work. Ships are to be provided with reflecting instruments which in dense fog or storms can be used exactly as a searchlight is now employed on a dark night to discover the location of the lighthouses or lightships. For instance, the lighthouse, say, on some rocky point on the New England coast would continually radiate a warning from its suspended wire. These waves pass as readily through fog and darkness and storm as in daylight. A ship out at sea, hidden in fog, has lost its bearings; the sound of the warning horn, if warning there is, seems to come first from one direction then from another, as sounds do in a fog, luring the ship to destruction. If now the mariner is provided with a wireless reflector, this instrument can be slowly turned until it receives the lighthouse warning, the captain thus learning his exact location; if in distress, he can even communicate with the lighthouse. Think also what an advantage such an equipment would be to vessels entering a dangerous harbor in thick weather. This is one of the developments of the near future.

The reflector system being impracticable for long-distance work, Mr. Marconi experimented with tuning. He so constructed a receiver that it responds only to a certain transmitter. That is, if the transmitter is radiating 800,000 vibrations a second, the corresponding receiver will take only 800,000 vibrations. In exactly the same way a familiar tuning fork will respond only to another tuning fork having exactly the same "tune," or number of vibrations per second. And Mr. Marconi has now succeeded in bringing this tuning system to some degree of perfection, though very much work yet remains to be done. For instance, in one of his English experiments, at Poole in England, he had two receivers connected with the same wire, and tuned to different transmitters located at St. Catherine's Point. Two messages were sent, one in English and one in French. Both were received at the same time on the same wire at Poole, but one receiver rolled off its message in English, the other in French, without the least interference. And so when critics suggested that the inventor may have been deceived at St. John's by messages transmitted from ocean liners, he was able to respond promptly:

"Impossible. My instrument was tuned to receive only from my station in Cornwall."

Indeed, the only wireless telegraph apparatus that could possibly have been within hundreds of miles of Newfoundland would be one of the Marconi-fitted steamers, and the "call" of a steamer is not the letter "S," but "U."

The importance of the new system of tuning can hardly be overestimated. By it all the ships of a fleet can be provided with instruments tuned alike, so that they may communicate freely with one another, and have no fear that the enemy will read the messages. The spy of the future must be an electrical expert who can slip in somehow and steal the secret of the enemy's tunes. Great telegraph companies will each have its own tuned instruments, to receive only its own messages, and there may be special tunes for each of the important governments of the world. Or perhaps (for the system can be operated very cheaply), the time



The station on Cape Cod

will even come when the great banking and business houses, or even families and friends, will each have its own wireless system, with its own secret tune. Having variations of millions of different vibrations, there will be no lack of tunes. For instance, the British navy may be tuned to receive only messages of 700,000 vibrations to the second, the German navy 1,500,000, the United States Government, 1,000,000, and so on indefinitely.

Tuning also makes multiplex wireless telegraphy a possibility; that is, many messages may be sent or received on the same suspended wire. Supposing, for instance, the operator was sending a hurry press despatch to a newspaper. He has two transmitters, tuned differently, connected with his wire. He cuts the despatch in two, sends the first half on one transmitter, and the second on the other, thereby reducing by half the time of transmission.

A sort of impression prevails that wireless telegraphy is still largely in the uncertain experimental stage; but, as a matter of fact, it has long since passed from the laboratory to a wide commercial use. Its development since Mr. Marconi's first paper was read, in 1896, and especially since the first message was sent from England to France across the Channel in March, 1899, has been astonishingly rapid. Most of the ships of the great navies of Europe and all the important ocean liners are now fitted with the "wireless" instruments. The system has been recently adopted by the Lloyds of England, the greatest of shipping exchanges. It is being used on many lightships, and the New York Herald receives daily reports from vessels at sea, communicated from a ship station off Nantucket. Were there space to be spared, many incidents might be told showing in what curious and wonderful ways the use of the "wireless" instruments has saved life and property, to say nothing of facilitating business. Though it is not generally known, messages are now received in England at the rate of twelve cents a word for transmission to vessels that have already sailed from port. The inventor informed me that his company was now actually doing a profitable business on a commercial basis, though all profits are expended as fast as earned in new experiments.

Mr. Marconi, indeed, since his experiments in Newfoundland have been successful, assured me that the time when messages would be regularly flashing between Europe and America was much nearer than most people realized.

"It will be a matter of months rather than of years," he said.

And, indeed, the simplicity and ease of installation of his apparatus would certainly argue a speedy accomplishment of that end. He informed me that he would be able to build and equip stations on both sides of the Atlantic for less than $150,000, the subsequent charge for maintenance being very small. A cable across the Atlantic costs between $3,000,000 and $4,000,000, and it is a constant source of expenditure for repairs. The inventor will be able to transmit with single instruments about twenty words a minute, and at a cost ridiculously small compared with the present cable tolls. He said in a speech delivered at a dinner given him by the governor at St. John's that messages which now go by cable at twenty-five cents a word might be sent profitably at a cent a word or less, which is even much cheaper than the very cheapest present rates in America for messages by land wires. It is estimated that about $400,000,000 is invested in cable systems in various parts of the world. If Marconi succeeds as he hopes to succeed, much of the vast network of wires at the bottom of the world's oceans, represented by this investment, will lose its usefulness. It is now the inventor's purpose to push the work of installation between the continents as rapidly as possible, and no one need be surprised if the year 1902 sees his system in practical commercial operation. Along with this transatlantic work he intends to extend his system of transmission between ships at sea and the ports on land, with a view to enabling the shore stations to maintain constant communication with vessels all the way across the Atlantic. If he succeeds in doing this, there will at last be no escape for the weary from the daily news of the world, so long one of the advantages of an ocean voyage. For every morning each ship, though in mid-ocean, will get its bulletin of news, the ship's printing-press will strike it off, and it will be served hot with the coffee. Yet think what such a system will mean to ships in distress, and how often it will relieve the anxiety of friends awaiting the delayed voyager.

Mr. Marconi's faith in his invention is boundless. He told me that one of the projects which he hoped soon to attempt was to communicate between England and New Zealand. If the electric waves follow the curvature of the earth, as the Newfoundland experiments indicate, he sees no reason why he should not send signals 6,000 or 10,000 miles as easily as 2,000.

Then there is the whole question of the use of wireless telegraphy on land, a subject hardly studied, though messages have already been sent upward of sixty miles overland. The new system will certainly prove an important adjunct on land in war-time, for it will enable generals to signal, as they have done in South Africa, over comparatively long distances in fog and storm, and over stretches where it might be impossible for the telegraph corps to string wires or for couriers to pass on account of the presence of the enemy.

Two months later this article appeared in McClure's →

Messages to Mid-ocean

Marconi's own Story of his Latest Triumph

Recorded by Henry Herbert McClure

EVER since Marconi announced that he had received telegraph signals from Cornwall, England, at St. John's, Newfoundland, there has been a growing doubt in many minds as to whether he had really accomplished the feat. Marconi has settled all those doubts now. On board the Philadelphia, during the week of February 22d, a receiver took and printed on a tape messages from Cornwall, 1,551 miles away. Notice this statement. No telephone instrument was used; there was no human agency to "think" or "imagine," and perhaps err. At a prearranged hour a transmitter at Cornwall shot a message through the air; Marconi and the ship's officers and others on board the Philadelphia heard the tick, and, looking at the tape, saw the dots and dashes which you or I or anybody still can see. When a machine does a thing, we humans believe; so long as a man stands between, we doubt.

Fully two miles of telegraph tape, covered with thousands of signals and messages, bear witness to this latest triumph. By way of voucher, the captain and chief officer of the Philadelphia signed and certified the messages and signals which they saw printed by the instruments, and the documents in the case thus presented include messages received up to 1,551.5 miles, and signals received up to 2,099 miles. All this happened on a ship which received on S.S. Philadelphia Lat 45.15 N. Long 38.15 — a distance of 1551.5 (one thousand five hundred and

was steaming away from England at twenty knots an hour, and under conditions which permit no question as to the significance of the experiments.

"Can you read?" inquired Marconi of the writer of this article the day he arrived fresh from his triumph and full of enthusiasm. "Will they say now I was mistaken in Newfoundland?" and he pointed to a piece of tape, the full length of which was covered with the blue marks of a telegraphic inker. It bore the inscription, "Received on SS. Philadelphia, Lat. 42.1 N., Long. 47.23 W., distance 2,099 (two thousand and ninety-nine) statute miles from Poldhu. Capt. A. R. Mills."

"Before I sailed from England," said Mr. Marconi, "I gave instructions to the operators at my Poldhu station to the effect that they should send signals at stated intervals during the week of my voyage. They were to operate two hours out of every twelve, or one hour out of every six, sending messages and signals in periods of ten minutes, alternating with intervals of five minute rests."

Marconi's party occupied four staterooms on the upper deck. On a small table in one of these the instruments rested. It was the same installation as is used on all the transatlantic steamers equipped with his apparatus, except that this one was fitted with special coherer attachments which attuned it to the Poldhu station. Outside of the cabin there was little to be seen. One wire passed through a porthole of the operating-room and was fastened to the side of the ship, thus establishing a "ground"; and in place of one aerial wire extending to the top of the ship's mast, four were used in parallel, in order that a better effect might be secured. The end of these four wires was 150 feet above the water-line, a fact worthy of note in comparison with the height of the kites and balloon at St. John's—over 400 feet.

At Poldhu, the sending station, there was used practically the same apparatus as for the Newfoundland experiments. Engines and dynamos generating from six to forty horse-power of energy created a voltage of 20,000, and this high tension was transformed up to 250,000. When the operator pressed the telegraphic key, a spark a foot long and as thick as a man's wrist, the most powerful electric flash yet devised, sprang across the gap; the very ground near by quivered and crackled with the energy. No human being could stand near the huge coil which produced this tremendous flash of lightning. Of so great a power must be the transatlantic stations, in order that 3,000 miles away a few slender wires may pick up an infinitesimally small part of the energy radiated, and the receiving instruments record the message that speeds like light across the space. With every tick of the inker on the tape there are hundreds of thousands of waves in the ether to produce it; with every flash of the transmitting instruments, hundreds of thousands of ether waves have circled the globe in all directions. Yet, thanks to this young man of twenty-seven years, the proper message is received by the proper station; and, to the world, what was hardly a probability three months ago is now an undisputed fact.

The Philadelphia left Cherbourg at midnight, February 22d. Several messages were sent and received until the 150 mile limit was passed. About 6 P. M. on the 23d, when the liner was 250 miles out, there came the message:

"Stiff southwest breeze; fairly heavy swell."

And on the next morning, at the appointed time:

"All in order. V. E. (Do you understand?)"

Chief Officer Marsden happened to be in the operating-room when this message was ticked out. The ship was then 500 miles away from Poldhu, and he could scarcely credit his senses. He had actually seen it, and, full of excitement, he rushed about the ship, telling his fellow-officers of the feat.

W from Poldhu (Cornwall) over
fifty one and a half statute miles G Marsden Chief Officer

"Ho, ho!" they laughed. "Do you think we are going to believe that?"

"Wait until the set time to-morrow, then, and see for yourselves," replied Marsden.

The next day the skeptics crowded about the operating-room. Watch in hand, Marconi sat looking at his instruments. Then he opened a brake on the coil of tape, and the white strip began to unroll. Suddenly Marconi burst out, "There it comes," and simultaneously began the "tap, tap, tap," of the inker, and another message had waved itself through the ether, and had been recorded on a piece of narrow paper nearly 1,000 miles away from its source.

The days following were full of suppressed excitement. Shortly after midnight on the 24th, amidst scores of signals, came the message:

"Fine here."

The distance was then 1,032.3 miles. Another about the same time read:

"Thanks for telegram. Hope all are still well. Good luck."

The supreme test for messages came when the ship was 1,551.5 miles from Poldhu. At that time, just before the break of day on the 25th, came the message:

"All in order. Do you understand?"

"Let me show you just how accurately these instruments operate," said Marconi to Captain Mills. (The ship was then in mid-ocean.) "I will release the brake on the coil of tape just a few seconds before the appointed time, and we shall see when the signals begin, and whether they come as they should."

Mr. Marconi and the captain held their watches. Ten seconds before the expected working period a snap of the brake set the coil in motion. The two waited with breathless expectancy. The captain had been one of the skeptics at the start. Now he was all confidence and enthusiasm. Almost exactly on the second for which they were waiting there was a slight buzz near the coherer. Marconi lifted his hand. "Tap, tap, tap," sounded the inker as it clicked against the tape. The young man smiled. "Is that proof enough, Captain?" For exactly ten minutes the signals continued in unbroken order.

"Now," said Marconi, "let us see whether these instruments will get anything during the five minutes' rest period of the Poldhu operators. You know some of the scientists say my receivers may be affected by atmospheric electricity. It is possible, too, that some of the other ocean liners equipped with my system may be operating within range of this ship. If they are, we shall not know it, for these instruments are tuned to receive messages from the Cornwall station only. But some people say I cannot tune my messages."

Again the two waited beside the instruments. Nothing appeared on the tape, although it was allowed to unroll during the time. Then again, as suddenly and as strangely as before, began the "tap, tap, tap" of the inker. The Poldhu operators had returned to their labors, and Marconi, half way across the ocean, was getting the click every time they pressed the key and sent that enormous flash of energy across the sparking gap of the transmitter.

The signals continued to come during the working periods of the next day. Shortly before the end of the appointed hour in the evening, the last set of signals arrived. The ship was 2,099 miles from Poldhu. The record established at Newfoundland had been broken, and the proof of Marconi's achievement was indisputable.

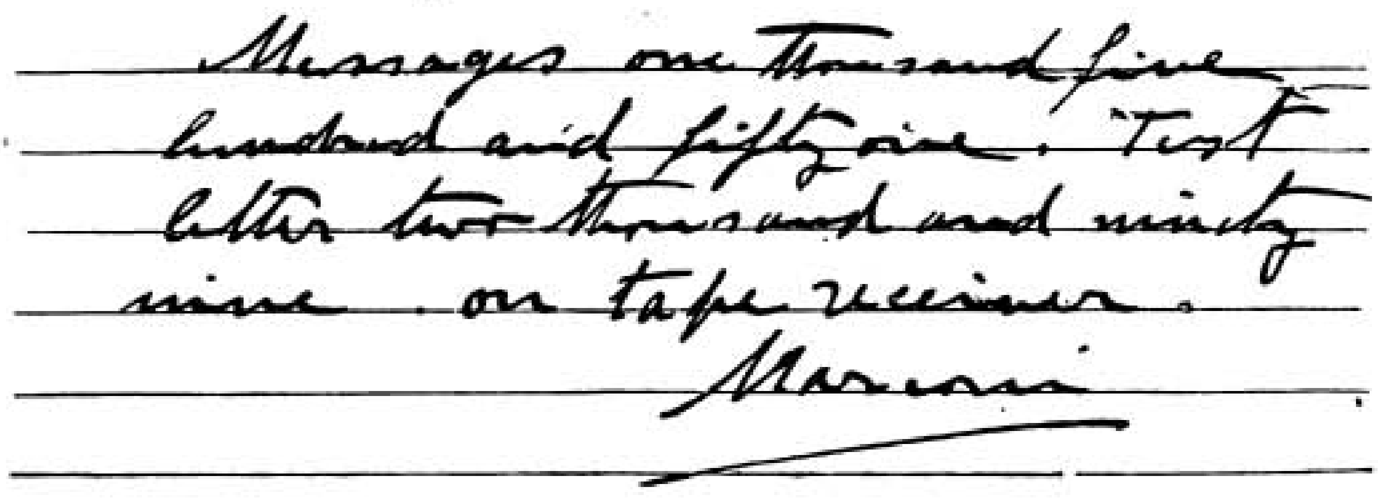
No one could doubt that the signals had been received, and the fact that the steamship Umbria, which was equipped with a Marconi installation, and only a few hours behind the Philadelphia, did not receive a single signal from Poldhu proves conclusively Marconi's assertion that he can so regulate his instruments that only the proper stations shall receive certain messages.

"I knew the signals would come up to 2,100 miles, because I had fitted the instruments to work to that distance," he replied to a question. "If they had not come, I should have known that my operators at Poldhu were not doing their duty.

"Why, I can sit down now and figure out just how much power, and what equipment would be required to send messages from Cornwall to the Cape of Good Hope or to Australia. I cannot understand why the scientists do not see this thing as I do. It is perfectly simple, and depends merely on the height of wire used and the amount of power at the transmitting ends. Supposing you wanted to light a circuit of 1,000 electric lamps. You would use enough dynamos and produce enough current for that effect. If you did not have that much power, you could not operate 1,000 lamps. It is the same with my system. We found several years ago that, if we doubled the height of our aerial wire, we quadrupled the effect. We used one-fortieth of a horse-power then. Now I use several horse-power, and, by producing a powerful voltage, I naturally get an effect in proportion to that power. It is not possible to keep on extending the height of our aerial conductors, so we simply use more power when we wish to do long distance work.

"Give me a week at Nantucket and I will guarantee to receive signals from England. As soon as we can get up stations in this country similar to our station at Poldhu we shall be able to transmit and receive any and all kinds of messages across the Atlantic."

It is the first prophecy that Marconi has made since he began his work in wireless telegraphy seven years ago. He has not failed before. Few believe that he will fail now.


Messages one thousand five hundred and fifty nine. Test letter two thousand and ninety nine on tape receiver. Marconi

Autographic reproduction of the cablegram Mr. Marconi sent to London when he arrived in New York

ENFORCING NEUTRALITY IN TRAFFIC

The Marconi Wireless Telegraph Company of America has issued a special order to its operators relating to the enforcement of the President's executive order and the instructions issued by the Navy Department. The text follows:

1. Radio messages containing information relating to the location or movements of armed forces of any belligerent nation, or relating to material or personnel of any belligerent nation, will be considered as unneutral in character and will not be handled by radio stations under the jurisdiction of the United States, except in the case of cipher messages to or from United States officials.

2. No cipher or code messages are permitted to be transmitted to radio ship stations of belligerent nations by any radio shore station situated in the United States or its possessions or in territory under the jurisdiction of the United States. Similar messages received by such radio stations from ships of belligerent nations will not be forwarded or delivered to addressees.

3. No communication of any character will be permitted between any shore station under the jurisdiction of the United States and warships of belligerent nations, except calls of distress, messages which relate to the weather, dangers of navigation or similar hydrographic messages relating to safety at sea.

4. No cipher or code radio message will be permitted to be sent from or received at any radio station in the United States via any foreign radio station of a belligerent nation, except from or at certain stations directly authorized by the Government to handle such messages. Press items in plain language relating to the war, with the authority cited in each item, will be permitted between such stations, provided no reference is made to movements or location of war or other vessels of belligerents.

5. No radiogram will be permitted to be transmitted from any shore radio station situated in the United States or under its jurisdiction to any ship of a belligerent nation or any shore radio station that in any manner indicates the position or probable movements of ships of any belligerent nation.

6. Code or cipher messages are permitted between shore radio stations entirely under the jurisdiction of the United States and between United States shore stations and United State's or neutral merchant vessels, provided they are not destined to a belligerent subject and contain no information of any unneutral character, such as the location or movements of ships of any belligerent nations. In such messages no code or cipher addresses will be allowed and all messages must be signed with the sender's name. Radio operating companies handling such messages must assure the Government censor as to the neutral character of such messages. Such messages both transmitted and received must be submitted to the censor at such time as he may designate, which will be such that will not delay their transmission.

7. In general censoring officials will assure themselves beyond doubt that no message of any unneutral character is allowed to be handled.

8. In order to insure that censors may, in all cases, be informed thoroughly and correctly as to the contents of radio messages coming under their censorship, they will demand, when necessary, that such messages be presented for their ruling in a language that is understandable to them.

9. At such radio stations where the censor is not actually present at the station when messages are received by the radio station for forwarding either by radio or other means, messages may pass provided they are unmistakably of a neutral character, without being first referred to the censor, but the operating company will be held responsible for the compliance by their operators with these instructions.

Approved:

Josephus Daniels,
Secretary of the Navy.

January 1, 1915.

IN THE SERVICE

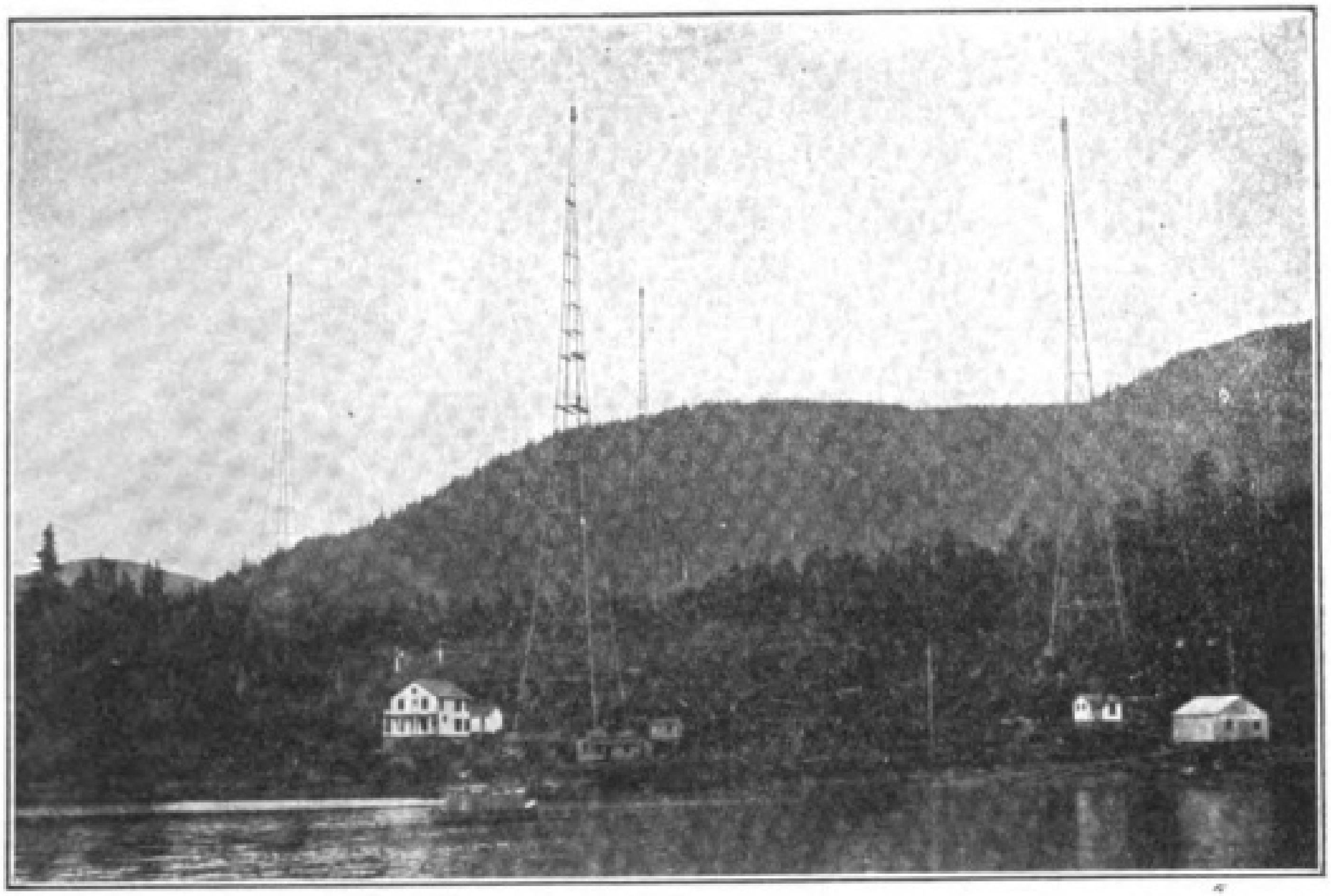
SHORE-TO-SHIP DIVISION

The uncertainties in the life of a wireless man are well illustrated in a chapter from the career of Ernest T. Edwards, superintendent of the Eastern Division of the Marconi Wireless Telegraph Company of America. When Edwards was an operator in the service of the English Marconi Company he was detailed on one occasion to the Fuerst Bismarck which was scheduled to start on a pleasure cruise. Russia and Japan were then engaged in a dispute which terminated in war. As a result the Bismarck was purchased by the Russian government for use as a transport, thus ending the operator's anticipations of a voyage filled with pleasing possibilities; then the vessel, with Edwards in the wireless cabin, was ordered to steam to Liebau, Russia, to take on troops. But no arrangement had been made for the control of the wireless when the transfer of the ownership of the Fuerst Bismarck took place and a satisfactory adjustment of the matter had not been brought about on the arrival of the liner at Liebau; so Edwards removed the set and left the vessel, circumstances having again interfered with the plans which had been mapped out for him.

He was born in Birmingham, England, where, in the government telegraph office, he obtained his first experience in telegraphy. After several years spent in the government service he left it to enter the employ of a stock exchange firm. While he was engaged in business he became ambitious to enter the Marconi service and in 1902 he joined the forces of the English company. The most important station of the Marconi Company then was the Lizard at Cornwall, being the first wireless communication point with which ships bound for England were able to get into communication.

It was to this station that Edwards was assigned. Associated with him were some half dozen other men, constituting the operating staff. The majority of the men were engaged in studying the wireless apparatus as well as the methods of transmitting and receiving. Edwards was at the Lizard for four months when he received a detail as operator in charge on the Minnehaha of the Atlantic Transport Line. Several months afterward he was transferred to the Campania in the same capacity where he remained for a year.

His experience on the Fuerst Bismarck, to which reference has been made, occurred soon afterward. Then he represented the Belgian Company at Hamburg, Germany. But he was anxious to return to England, so he obtained a detail at the Isle of Wight station. He left there to go to Belfast to equip the steamship New York of the American Line, on which he came to this country. He made several voyages on the New York and then was detailed at the Siaconsett station. He was afterward appointed to take charge at Sea Gate, leaving that post to take the superintendency of the Eastern Division with headquarters in New York City.



The Marconi station at Ketchikan which has been completed recently. It will be used as the relay station for the dissemination of all Alaskan messages

Public Ownership of Railroads, Waterways and Water Power

Wireless Threatens Government Monopoly

By Kenneth C. Kerr

From The Railway and Marine News

GOVERNMENT ownership enthusiasts might well study the present development in the Alaska telegraph situation. The United States Government, through its Signal Corps, has for years had control of all communication by telegraphic cable between Seattle and various Alaska ports. This is designated as a cable to be used by the various departments of the Government, but as it has been utilized to a far greater extent as a commercial telegraph line, it would have been described as a monopoly if it had been owned and operated by a private individual or corporation. In the preceding article a careful comparison of rates as between the regular telegraph companies and this Government owned and operated line was given in detail and the direct charge was made that the Alaska cable in every way was the most inefficient and the service given of the poorest possible kind.

At the present time the Marconi Wireless has entered into the Alaska situation and presents the unique spectacle of wireless preparing to eliminate a submarine cable by giving better service at much lower rates. Just completed at Ketchikan, which is the first important point in Southeastern Alaska, is a Marconi wireless station which is one of the most powerful and complete in the Pacific Northwest. It is a 25 kilowatt plant and is to be used as the great relay station for the dissemination of all Alaska messages. To the north, 250 miles, at Juneau, a 10-kilowatt station has been erected, while at Astoria is another 25-kilowatt station which will be the central plant for the North Pacific Coast.

In addition to these three stations the company's Northwest headquarters have been moved to the twenty-first floor of the new forty-two story L. C. Smith Building in Seattle, and by special arrangements with the owners of this building and of the Alaska Building, two blocks up Second Avenue, the antennae have been stretched from the top of each building, making this practically one of the highest wireless towers in the United States. While the plant in the Smith Building is but a 5-kilowatt, yet the great height of the two buildings has increased the efficiency of the Seattle office 200 per cent., and, while Friday Harbor, in the San Juan Island, was formerly used as a relay station, this has been eliminated, although Friday Harbor will continue as a commercial station. Seattle is now in direct communication will all ships plying in Alaska waters and has successfully reported the movements of Nome boats as well as important wreck details. The antennae at Ketchikan and at Astoria are stretched from four 300-foot self-supporting steel towers, while Juneau has but two towers. All of the plants include the necessary mechanical and administrative residences and buildings for appliances and repairs.

The most important feature of this new and important departure is the promised cut in rates under those charged by the Government cable. Under the new system while the Government cable charges 19 cents a word, minimum of 10 words, to Ketchikan, the Marconi Wireless reduces this to 12 cents a word, minimum of 10 words. From Seattle to Juneau the United States rate is 16 cents per word, minimum of 10 words, while the Marconi Wireless rates will be 10 cents, minimum of 10 words. More important than all is the fact that the United States cable operates but six hours per day and six days per week. This, in the past, has been the greatest cause of annoyance to industrial operators and ship owners in Alaska, as wrecks and other casualties are more likely to happen at night than at any other time; yet the United States Government cable has never been available at night. The Marconi Wireless will operate throughout the entire year, Sundays and holidays, day and night. It is already furnishing news bulletins to all of the ships plying in Alaska waters, and the newspaper men throughout Alaska daily visit the ships while in port to find out the latest news from all over the world.

This suggests the inconsistency of the Government cable in making rates. While it charges a most unheard of rate for commercial messages, it charges but one cent a word for newspaper telegrams, and this in the past has enabled various people operating in Alaska to save considerable and beat the Government on its own rate; that is to say, it was often unnecessary to cable orders to the Northland at anywhere from 16 cents to 38 cents a word, when the news of such order was included in the daily dispatches sent to the newspapers. There was nothing deliberate about such moves but as many clever newspaper men in Seattle were supplying all the papers in Alaska with current happenings, it was oftentimes quite unnecessary for operators to go to the great expense of signing an official order covering the same information. Thereby the Government by its excessive rates for commercial messages lost much business and discouraged the building up of commercial telegrams. It never put in any reduced rates or night-letters, but under the new system of the Wireless, a regular night-letter service will be established and the whole of Southeastern Alaska is at once placed in direct communication with Seattle and, therefore, throughout the world, at a lower rate.

The Marconi Wireless will not stop at the busy ports of the southeast section but will move to Prince William Sound. The moment it is determined where the terminus of the railroad is to be, near that point four 300-foot towers will be set up and a 25-kilowatt station will be established. Later on, a relay station will be established at some point along the Alaska peninsula and this station will undoubtedly become next to the immense plant at Honolulu the most important station in the Pacific. As business justifies, various other stations will be established throughout Alaska and in each case the rates charged by the United States Government cable will be reduced from 30 to 50 per cent.

The above is merely a resume of current events in the development of Alaska's telegraph system. Generally speaking, such an announcement would be regarded as but another important step in the industrial development of a great, resourceful region. Importance is given to the subject at this time simply because it presents such an interesting phase of Government ownership. Here is a case where the Government had absolute control, and, quoting former Governor Stubbs of Kansas, that Government ownership would mean economy in operation, better service and lower rates, to the public, the reverse is shown to be the case.

When Governor Stubbs wrote his theoretical paper he overlooked the fact that in this country we have a Government owned and operated submarine cable, steam railroad, steamship line and any number of municipal public utilities which can be taken as examples of what might be accomplished under public ownership. In every case, the writer has taken the actual reports of the companies named and, without quoting any other authority, operation under Government ownership is shown to be inefficient and expensive.

In the present instance the Government had a chance to greatly aid in the development of Alaska by giving good service and all the week-day and night service at reasonable rates. In place of this it has refused to operate its cable office on Sundays, holidays and at night and it has not given good service. In its mechanical maintenance it has been extravagant, the telegraphic tolls it has charged have been without exception far greater than those charged on any telegraph or cable system in the world and, at the present time wireless is enabled to go into the field and, in some cases, cut the rates right in half and get the business, in the face of the fact that wireless telegraphy has to date been considered by the public the most expensive telegraph service of all.

PRAISE FOR MARCONI MEN

General Superintendent Kimball of the United States Life Saving Service has forwarded, through the Marconi Wireless Telegraph Company of America, an expression of appreciation of the splendid services performed by the Marconi men at the Bolinas Station during the wreck of the steamship Hanalei on November 23rd. In the communication Messrs. Baxter, Hanson, Peterson, Bartlett, McNess and Sanford are mentioned specifically for co-operative work with the life saving crews.

Edward J. Nally, vice-president and general manager of the Marconi Company, sent at the same time a personal letter expressing his gratification at the assistance rendered. He requested that the sentiments be conveyed "to all the staff at Bolinas who worked so hard and endured so many hardships that succor should be given to the passengers and crew of the Hanalei. While the information that has come to me gives only the names of Mr. Baxter and a few of the operators, I take it that others at Bolinas whose names were not mentioned were also indefatigable in their work of rescue, and to them as well I wish to be made known our appreciation and thanks."

A newspaper dispatch from Akron, Ohio, says that a dirigible airship is being constructed in that city for the United States government. It will be completely equipped with wireless telegraph apparatus, machine guns, armored cages and sensitive air instruments.

In Recognition *of* Experience Knowledge & Skill

Something about the operators who have been given Extra First Grade Commercial Licenses :: ::

Elmo N. Pickerill

THE Secretary of Commerce of the United States has issued ten commercial extra first grade wireless operators' licenses as a mark of recognition for experience, knowledge and skill in radio work. The licenses were awarded after a special examination which was made up of many questions selected from three previous tests. One of the requirements called for was the ability to send thirty words a minute in Continental and twenty-five in Morse. It was also stipulated that those to whom the licenses were awarded should have spent a certain length of time as wireless operators on ships.

The Marconi service is well represented in the list of license holders. Six of the men who passed the examination are in the employ of the Marconi Company, while two received their training under its direction.

Elmo N. Pickerill, of the Marconi service, enjoys the distinction of holding extra first grade license No. 1. He has spent approximately half of his working life in operating a key, having entered the employment of the Frisco Railroad as a land line operator when he was sixteen years old. He took up wireless in April, 1905, when he was assigned to the Colorado stations. He came to the East in January, 1908, and was detailed as a wireless operator on an oil tank ship bound for Germany, this being his first sea trip. He was at one time in charge of the wireless station on the roof of the Waldorf-Astoria in New York City and also served as operator on several ocean steamships. Among them were the Prinz August Wilhelm, the Saratoga, and the Vasari. His service with the Marconi Company includes a period of employment in its general offices in New York City and as instructor in the Marconi School of Instruction.

E. M. Cadwell

He is now detailed as senior operator on the steamship Kroonland, which recently returned from a Mediterranean cruise in the course of which he met with a number of interesting experiences. These he described in THE WIRELESS AGE for January, 1915. Pickerill has the reputation of being an expert operator, being able to send and receive at a high rate of speed both in the Continental and Morse codes.

License No. 2 was issued to Harry Sadenwatter, assistant instructor in wireless at the East Side Y. M. C. A., New York City. Sadenwatter, who is twenty-four years old, was in the Marconi service for two years. He has passed an examination for government radio inspector.

Joseph A. Worrall

R. R. Carlisle, instructor at the Marconi School in San Francisco, and holder of an extra first grade license, No. 3, was born in Lettonia, Ohio, January 25, 1885. He began his working career as a messenger in the office of a land line and afterwards became interested in wireless. In April, 1911, he became operator on the oil tank steamship Santa Maria. He was later transferred to the Pacific Mail steamship Korea. He was appointed to his present position in 1913.

D. I. Moir, another Marconi man, is the possessor of extra first grade license No. 4. He was born in New York, October 10, 1882, and entered the wireless field in 1904. He installed and operated a 25-k.w. station in Santo Domingo where he gained considerable wireless experience. Afterwards he was placed in charge of the 25 k.w. equipment at Fauntleroy, Seattle. He has been in the employ of the Marconi Company since 1912, being at present assigned as engineer in charge of construction at the semi-high-power station at Astoria, Ore.

The holder of license No. 6 is E. M. Cadwell, who was in the service of the Marconi Company from July, 1912, to December, 1913. He was second operator on the steamship Momus from July until September of the same year; first operator on the steamship Denver from September until February; first operator on the steamship Ancon from February until April; first operator on the steamship Colon from April until June; first operator on the steamship Esperanza from June until July; first operator on the steamship Saratoga from July until December.

License No. 7 was issued to Samuel E. Miller, who is attached to the Pacific Coast Division of the Marconi Company. Born August 2, 1882, in Evansville, Ind., he obtained his early education at the grammar and high schools there, afterward attending the University of Iowa. After leaving the university he was employed in both the operating and traffic departments of several railroad and steamship companies. He entered the Marconi service in July, 1913, and is now detailed as operator in charge on the steamship City of Topeka.

Joseph A. Worrall, who holds license No. 9, has been interested in wireless telegraphy since he was sixteen years old when he equipped a station at his home. This was in 1910. His interest in the art grew as time went on and two years later he became a commercial operator. Worrall, who is attached to the Eastern Division of the Marconi Company, has been detailed on many vessels since he has been in the service, the first being the pilot boat New Jersey. Among the other craft on which he has served are the San Marcos, the San Juan, the Saratoga, the St. Paul and the Medina.

Edwin K. Oxner, who is also attached to the Eastern Division of the Marconi Company, holds license No. 10. He is twenty-one years old and has been in the Marconi service for the last two years, having been detailed at various times on the steamships Rayo, Vesta and Currier. The technical side of wireless has a strong attraction for him and he is ambitious to become a radio engineer. He believes that there are a considerable number of operators who could obtain first grade licenses if they were willing to take the examination.

Edwin K. Oxner

H. B. Hertz was awarded licence No. 5 and License No. 8 was issued to C. A. Scott.

A rifle cartridge rolled out of the hole on to the concrete

MICE AND MEN

By Angus Lynne

BEING AN ADVENTURE OF JEREMIAH BRANDT LATE UNITED STATES SECRET SERVICE

BEING a Government pussyfoot—which no one but a Service man could call me and get away with it—but being still of aforesaid vocation, nevertheless, I have to keep fairly well informed, as you may have suspected. A lot of my general information is gained through reading. You would be surprised to know the number and character of books and periodicals I wade through every month. Very often they give me ideas of real value, more often they stir up memories. It is for the last reason that I am setting this down.

When I read in the November issue about the opening of the Marconi service from 'Frisco to the Hawaiian Islands, it certainly brought a flood of memories back to me. What a difference a few years can make!

Merely thinking of that gigantic plant at Kahuku makes Jeremiah Brandt, your more or less humble servant, fairly gasp. It is fifteen years and six months since I have been in that general neighborhood, but the going was good even then. I wonder how some things that happened at the time would work out now, with that whale of a station instead of the dinky little—but I'll tell the story and you can judge for yourself.

If you are old enough and have been jogging in or round about shipping or diplomatic circles part of your life, you remember that the sinking of the Japanese cruiser Ashate in Honolulu Harbor by one of the Inter-island steamers, in July, 1899, was considered by all reasonable men to be a pure accident. While making the rather awkward turn into the channel, with her helm hard a-starboard, the little steamship Lehue had, by the breaking of a link in her rudder chain, continued a half circle at full speed, and rammed the cruiser on the starboard bow, causing her to sink quietly in the mud half an hour later.

There was no trouble of any kind. The crew reached the shore in safety. The vessel, in the course of six months, was successfully raised and refitted, and the Inter-Island & Steam Packet Company footed the bill without a murmur. No complications ensued.

Whether some astute minds at Tokio thought otherwise or not, you may judge for yourself.

Our war in the Philippines had settled down into desultory guerilla fighting and the public had turned to something more thrilling in its morning cent's-worth, when I was sent West by my chief on a rather unsatisfactory errand.

I had nothing definite to go on. I was simply told that "other Powers" had their eyes on our one-year-old territory, Hawaii, and I was told to go down there and "keep my eyes open." Not very satisfactory instructions, were they? But we have had to act on less sometimes, and not to look for help and recognition if we failed, either.

Of course, after the Manila and Apia affairs, I naturally thought of Germany as the Power in question, and laid my plans accordingly.

June, 1899, therefore, found me located at the Hawaiian Hotel, Honolulu, in the character of a speculator in shares—the sugar boom being then at its height—and enjoying the delightful climate and scenery.

My suspicions led me to cultivate the society of the young Americans in the employ of the large German trading houses, and a month passed without my hearing a single thing to help me in my task.

Yet how small are the causes which lead to great events.

I was chatting one day with the clerk in charge of one of the big warehouses of a German firm down near the docks. Around us huge casks of oil, bags and boxes of all kinds were piled. The strong foreign odor of spices filled the air.

My companion broke a short silence.

"Doggone those little devils!" he said angrily. "They give me more bother than enough."

"What's eating you, old man?" I asked, surprised.

"It's not me they're eating," he replied. "It's the rice. Look what they've done." He pointed to a double row of heavy, strong looking bags.

"Rats?" I asked.

"No, mice. I've got three lazy beasts of cats that sleep in the sun all day. I've tried poison, but I can't put that down where there is human food. I'll get a Chink to stitch it up," and he left the warehouse.

Casually, hardly troubling to think of the matter, I strolled to the rows of rice bags. Sure enough, a hole had been gnawed through the heavy double packing of one of the bags and a quantity of rice had run out on the floor.

Stooping, I put my finger in the hole. It went right in two or three inches or more. The little robbers! A rush of fresh rice followed the withdrawal of my finger and to my intense surprise a rifle cartridge rolled out of the hole on to the concrete.

To slip it into my pocket was a second's work. I turned back to the door as the clerk and a Chinese coolie hurried up.

"They've made their mark," I said lightly, looking at some grains of rice in my hand. "And it looks like good stuff, too."

"Good stuff!" answered the clerk, still rather huffy. "It's the best Japanese rice for the Kahuku Plantation. They get a shipment every week. Their coolies won't eat anything else. But then the proposition is going to be a gold mine. Have you any shares?"

Then followed the usual Sugar Stock talk while we watched the coolie stitch up the rent in the sack of rice.

That afternoon in my room I examined my find. It was a small-bore, Japanese Government rifle cartridge, fully loaded and with a nickle-steel bullet.

"Somethin' doin'," I said to myself.

* * * * * *

Lakui, the northernmost island of the Hawaiian group, had not been much exploited at the time of which I write. On the southern and eastern sides, though, where the rainfall was fairly regular, some old established plantations were reaping the harvest of high sugar prices and booming stocks, and on the higher lands a cattle ranch or two struggled for existence. But on the northern side, huge, almost barren tracts of disintegrated lava soil burned under the tropical sun and, except near the beach, refused to show any vegetation.

There, the Kahuku Sugar Company had staked its claim, expecting fine results from the virgin soil by pumping brackish water from wells near the sea to the barren flats above. For a week I tried my hardest to find out who were behind this company, but beyond discovering that the majority of the shares were in the names of German firms in Europe, I was unsuccessful.

Now at that time the islands were unconnected with the mainland by cable. All news from the outer world came a week late. Between the islands themselves wireless—then in a more or less experimental stage—had been installed and urgent messages could be sent; but the service was none too reliable. Strangely enough, the telephone service was, and had been for twenty years, in good working order on all the islands.

Two days later I was at Kahuku. The manager was a German and seemed a good fellow. Anyhow, he made me welcome in his roomy bungalow and set before me the best he had. The view from the veranda was magnificent. Looking a little west of north the huge crescent of Kahuku Bay stretched before us, the water flaming and sparkling in the rays of the setting sun. We smoked peacefully, resting well fed.

"What are those fellows doing?" I said lazily, pointing at a group of Japanese on the turf near the beach. "I thought your men knocked off at six."

The manager laughed. "Only a little harmless relaxation," he answered. "They are going to celebrate some national festival very soon, and they asked permission to erect a flagstaff to fly the German, American and Japanese flags. That short, stout fellow is in charge. They have clubbed together and bought the flagstaff and flags. I believe they have even got a set of signal flags to decorate with."

I smoked for a while.

"Can you see the Japan-bound mail steamers from here?" I asked.

"See them!" he replied. "I should think we could. They come right past Kahuku Point both ways and the Tayo Kishen boats come in quite close."

"They are the Japanese mail boats, aren't they?" I asked again.

"Yes," he answered, "and fully subsidized by government. A copy from us, Mr. Brandt." And he gave me a dig on the superiority of the German administration.

I pondered again for a while.

"How many coolies have you here?"

"I have nearly six thousand. My directors have impressed me with the necessity of getting at least a thousand acres of land cleared and planted for the first year's crop. Then there is the railroad under construction, the pumping stations and the foundations for the mills. It all takes a lot of men."

He evidently was talking for the benefit of one he considered as prospective buyer.

"Are they all Japs?" I asked casually, knocking the ash off one of my host's excellent cigars.

"All but about two hundred Chinese rough carpenters and masons. Then there are the Portuguese overseers, 'Lunas,' we call them."

"You must have a lot of trouble with such a rough lot," I said interrogatively. "The Japs must be always fighting?"

"On the contrary," answered my host, "they are a remarkably steady crowd. Quite above the average. There is rarely any trouble, and they work together like trained men."

That night I lay sleepless for a long time. Five thousand trained men; a signal staff; Japanese steamers passing close; rifle cartridges sent wholesale in rice from Japan. What did it all mean? My kind, thick-headed German friend evidently knew and suspected nothing.

We rode together over the new works the next day. I was uneasy, excited and full of suspicion. On a hill overlooking the foundations of the great sugar mill to-be, we stood together, the manager rather tediously explaining some details. A noise of voices cheering came from the beach. We turned and saw, rounding the northern point, a handsome white cruiser. The Japs about us were very excited; a gang on the beach, shoveling sand for concrete, had stopped working and they were all gesticulating wildly.

"What is she?" I said. "One of ours, I think."

"One of ours, more like," said the German. Then he called: "Sujimoto!"

A short, powerful Jap came running.

"What ship that?" said the manager, pointing. The gesture explained the question.

A firm set of teeth appeared. A breath was drawn through them. The man bowed.

"Ashate! Nippon! Ashate! Bang! Bang!" he said.

There was another cheer from the bystanders.

"Oh, he means the new Japanese cruiser Ashate," said the manager, who seemed well posted on matters nautical. I found out later that he had served three years in the Imperial German Navy. "She has six eight-inch quick-firers, and is just about the last word."

"For Honolulu?" I said, trying to speak calmly.

"Yes," he answered. "And she has beaten the Hong Kong Maru that's due to-morrow."

"The day of the fête?" I murmured.

"The day of the fête."

Then, all at once, I knew.

* * * * * *

Yes, His Excellency was in. I wrote "Very urgent" on my official card and sent it in. Presently I was ushered into the sanctum of the President in his stately home on Nuuanu Street and given a chair.*

The handsome old man stroked his silver beard, my card in his left hand.

"Well, Mr. Brandt," he said, after a long pause. "What can I do for you?"

"Mr. President," I said, "What I have to tell you may amount to nothing or may be of very great importance. Before I go further, let me ask a few questions relative to the naval and military defenses of Honolulu——"

He stopped me imperiously with one large, shapely hand.

"One minute, sir."

He spoke into a desk telephone. There was a minute's silence, then a young, dark man came quickly in.

"My secretary, Mr. Brandt." The white hand waved again.

"Mr. Brandt would like to know the naval and military forces at the disposal of the city."

The young man looked quickly at me.

"The U. S. S. Iroquois, three small guns and thirty-five men; two batteries of U. S. artillery, one hundred and nine men, and eleven field guns; four companies U. S. 17th Infantry, two hundred and twenty men, one Maxim gun."

His voice came short, sharp and monotonous.

"Thank you," I said.

"Now," I continued, "is any U. S. warship expected in port?"

The secretary paused; the President stroked his silver beard.

"No," came the answer. "The Philadelphia left for 'Frisco three days ago. The Boston is not due from Manila until next month."

"Thank you," I said again, curtly. I didn't like the secretary's manner. "That will do."

He looked rather taken back. The President nodded, and he left the room.

"Mr. President," I went on, determined to make a showing, "I have exclusive information that upwards of five thousand Japanese, trained soldiers supplied with ammunition, and, naturally, rifles for it, are within four hours' sail of this city. Also that a Japanese cruiser, having guns of calibre large enough to destroy the place in an hour, is in the harbor. The soldiers can be picked up by the next Japanese mail steamer and landed here at night without a soul being the wiser. Do you think the situation is serious?"

He stroked his silver beard, his eyes on the carpet.

"You are certain of what you say?" he asked slowly.

"I am," I replied.

He looked at his watch. It was 3:30 o'clock. Then he took up his desk telephone.

"Cabinet meeting at 4," said this autocrat, and, turning to me, he smiled. "Will you smoke, Mr. Brandt?" he said.

It was a stormy meeting. A third of the ministers—I noticed they were nearly all natives—laughed at my story. Three of the white Ministers were for protective measures at once. The entrance to the harbor should be stopped, mined. The field guns trained on the Ashate from the wharf. The commander and officers invited ashore and forcibly detained. There was no end to the suggestions.

At last the white hand was raised. The contending voices died away.

"What does Mr. Brandt suggest?"

* The Provincial Government which displaced the Queen was carried on for some time after the annexation of the Island by the U. S.

asked the President, calmly. I took the floor.

"With the Ashate out of action the scheme, if any, falls through. Never—under the new Labor Act and with the cable installed—will the chance occur again. It is for us to strike."

"What then?" asked the President.

I turned to the Minister of the Interior. "Mr. Swain, can you trust your captains?" He was president and part owner of the Inter-Island fleet.

He appeared surprised. "Some, implicitly. Why?"

"Captain Morris, of the Lehue?" I went on.

"Yes."

"Then send for him at once," I said, and the telephone rang almost before I had finished speaking.

It was smart work. The Lehue with the "doctored" link in her rudder chain, left the wharf at 5. At 5:10 the link, assisted by a good blow from the chief engineer—it was in a dark alley way—gave, and at 5:12 the Lehue hit the Ashate on the starboard bow with all the force five hundred tons at ten knots—work it out for yourself—behind an iron wedge, can give.

At six o'clock the three hundred chattering Jappies were ashore in various states of toilet, their officers being cared for at the club and hotel.

I told the President on the steps of his stately home. He stroked his beard.

"You forgot the wireless telegraph," he said quietly.

I struck my fist in my palm. "So I did," I cried. "Then the Hong Kong Maru will have no extra passengers aboard to-morrow."

"And the artillery need not have their 'Route-march' to-night," went on the President.

"The government will have enough expense without that," I answered, smiling.

"Repairs to two ships and no lives, against how many ships and how many lives?" said he. "I call it cheap!" and he held out the long, shapely hand.

A special Commission recently witnessed a test of the Hammond wireless-controlled torpedo boat.

REVISION IN FUEL REGULATION FOR AUXILIARIES

On October 22 Congress enacted an amendment to the statute governing the fuel to be used in any auxiliary engine for wireless purposes. According to the latest edition of the government regulations ship stations' auxiliaries must operate on a fuel which fulfills the requirements of Steamboat-Inspection Service, namely, "none of the inflammable articles specified in section 4472, Revised Statutes, or oil that will not stand a fire test of 300° F., shall be used as stores on any pleasure steamer or steamer carrying passengers except that vessels not carrying passengers for hire may transport gasoline or any of the products of petroleum for use as a source of motive power for motor boats or launches of such vessels."

The new amendment adds the following provision:

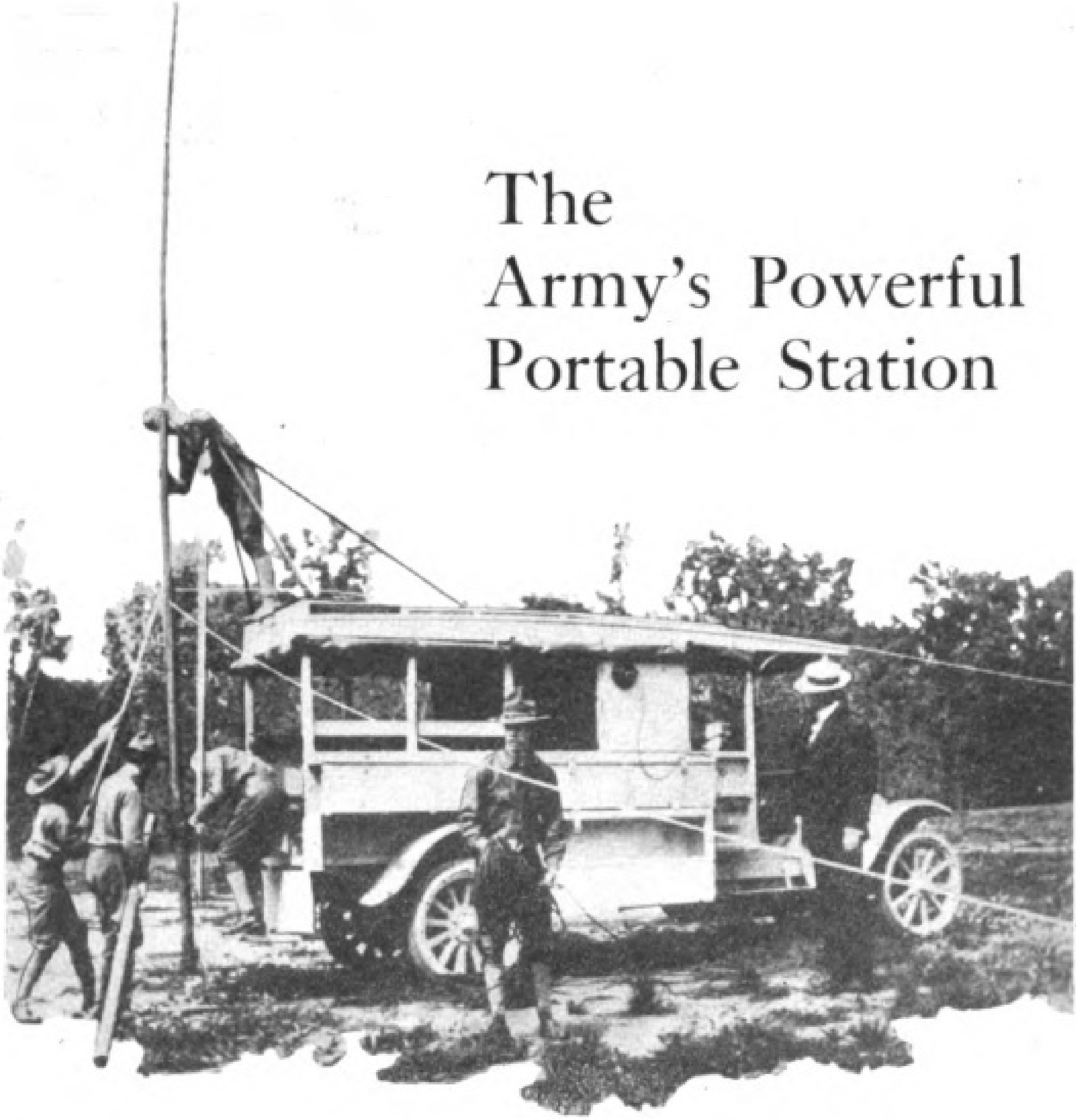
"Provided, however, that nothing in the foregoing or following sections of this Act shall prohibit the transportation and use by vessels carrying passengers or freight for hire of gasoline or any of the products of petroleum for the operation of engines to supply an auxiliary lighting and wireless system independent of the vessel's main power plant."

It is added also that the transportation and use of this fuel shall be under the approved regulations of the board of supervising inspectors.

THE DIFFICULTIES OF "JAMMING"

Commander F. G. Loring, of the British Navy is quoted in an interview in a newspaper as saying that attempts to interrupt wireless communication by "Jamming" are seldom successful. He declares that it is very difficult if not impossible to "jam" a well-organized wireless service. If the enemy attempts interference he must put his own wireless communication completely out of action for the time being with no certainty of seriously inconveniencing the communication of his opponent. Commander Loring believes also that the chance of having the signals of a fleet interrupted by an enemy is very slight.

The Army's Powerful Portable Station



A PORTABLE wireless outfit which will send messages up to 800 miles under favorable conditions, and receive almost any distance, was completed about five months ago in the Signal Corps Laboratory at Washington, D. C. This set is mounted on a White automobile chassis and the instruments are all of Signal Corps manufacture.

During a recent test the station was erected and placed in communication with Arlington in ten and one-half minutes. The photograph above shows the station being set up, the leading insulator being seen very plainly.

An interior view of the tractor and Seargent Malloney in command are the subjects of the other illustration. The switchboard on the left and parallel to the side controls the primary current; it is mounted on springs to absorb shocks and carries the voltmeter, ammeter, frequency meter, wattmeter, field rheostat and primary relay and the necessary switches.

The current is supplied at 110 volts, 500 cycles, from a 2 k.w. Diehl generator run by the 30 h.p. engine which drives the truck. This is stepped up to 22,000 volts by a 2 k.w. open core transformer and discharged through the quenched gap mounted on the switchboard between the two seats.

The moulded mica condenser and edgewise-wound helices and loading coils are all mounted behind the switchboard and controlled by the handles shown.

The primary of the oscillation transformer is varied by the handle mounted above the gap. Taps are taken off at a number of determined places and by revolving the handle the different turns are cut in.

The secondary is controlled in a like manner by the handle in the upper right hand corner. The coupling is varied by the lower left hand handle which operates a rack and pinion.

The antenna loading inductance is varied by the other handle, which turns a little wheel, causing it to roll over the edgewise-wound strip, allowing fine variation.

The hot wire meter is shown in the centre of the board.

The normal radiation of the set is 16½ amperes and constant communication is effected with the Brooklyn Navy Yard from Tobyhanna, Pa. The call letters of the tractor are W.S.

The single pole, double throw switch mounted to the left of the hot wire ammeter is the change-over from sending to receiving.

The receiving set on the right hand bench is all mounted in a cabinet. It consists of a doughnut tuner, two variable condensers, a fixed condenser, two very simple detectors which work to perfection, a pair of 5,000-ohm phones and the necessary switches.

Galena, cerusite and silicite (a new substance) are used with each detector.

The antenna is usually supported by an 85-foot mast: sufficient sections, however, are carried to raise this to 110 feet for long distance work. The mast is in sections and can be raised and lowered very quickly.

The aerial is of the umbrella type and requires six men to raise it. The ground is of the counterpoise type, consisting of insulated wires radiating out in all directions from a central socket into which each wire plugs.

While at Bethlehem, Pa., on the march from Fort Meyer, Va., to Tobyhanna, Pa., the operator found that he could increase the radiation from 10¼ amperes to 16½ amperes by plugging the extreme end of each wire in the ground; but by burying the socket

Interior view of the tractor taken during a march from Fort Meyer, Va., to Tobyhanna, Pa.

from which all the wires radiated, the antenna current was considerably decreased.

The operation of the equipment is as follows:

After receiving his call the operator pushes a button and a private starts up the motor which drives the generator; he then throws the change-over switch and after securing the proper voltage and frequency he starts sending. With the completion of his message he pushes a button and the motor is stopped while he listens for the answer.

Considering all the adjustments to be made, he is able to change from sending to receiving and vice versa very quickly. While the generator is running the car is violently shaken and it is surprising to see how the detector remains in adjustment throughout the vibrating and with the gap only about 18 inches away. The detectors are shunted with a 5 M F condenser when sending. Doubtless many people who read this have heard the shrill signals W. S., but did not know which station it was. It is not listed in the government call lists.

OPERATORS' INSTRUCTION

CHAPTER XI

IN order to provide a receiving equipment more suitable for the reception of long wave-lengths, changes have recently been made in the design of the original type 103 tuner, which is now known as type 107. This has been found advisable because certain high power stations both in this country and abroad, employ wave-lengths somewhat in excess of those for which the type 103 tuner was originally designed. In the circuit diagram (Figure 1) a complete sketch of the fundamental circuits of this tuner is shown. The coupling balls which were originally used on the intermediate circuit have now been shifted so as to become the primary winding of the receiving tuner. These balls are connected in series with each other and with the antenna circuit. The inductance being of fixed value, variations of wave-lengths are made at the short wave condenser, V, and the aerial tuning inductance, A.

The variable condenser which was formerly employed in shunt to the intermediate circuit is now placed in shunt with the secondary winding of the receiving tuner and is also shunted by the Billi condenser. The double-pole, double-throw switch formerly used for placing the tuner from the "stand-by" to the "tuning" side is now employed as a change-over switch for connecting an additional inductance coil in series with the secondary winding, as shown in the accompanying circuit diagram.

Without the use of the "loading" coil in the secondary circuit, a range of wave-lengths of from 250 to 2,460 meters is secured. With the "loading" coil in series a range of wave-lengths of from 1,240 to 4,000 meters is attained. Of course the wave-lengths to be secured in the antenna circuit will depend upon the size of the aerial itself, but with an aerial having a natural wave-length of 300 meters, the minimum wave-length obtained is 280 meters and the maximum 2,040 meters. On an aerial having a wave-length of 600 meters the minimum wave-length is 380 meters and the maximum, 3,700 meters. The type 107 tuner is therefore, suitable for the reception of wave-lengths from the Naval Station at Radio, Va. (for the time signals) the Eiffel Tower in Paris, and the Marconi station at Poldhu, Cornwall, England.

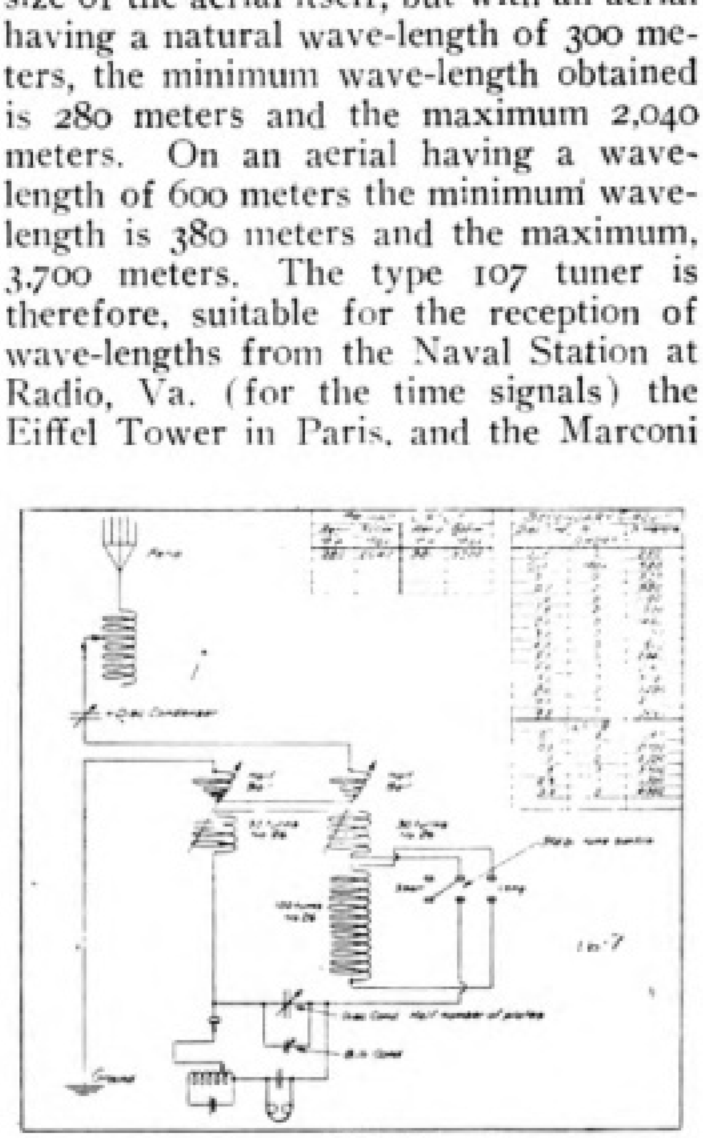


Fig. 1

No distinct stand-by side has been provided for in this tuner, but if the coupling knob is set at 90° the value of coupling between the primary and secondary windings is sufficient to give a "broad adjustment."

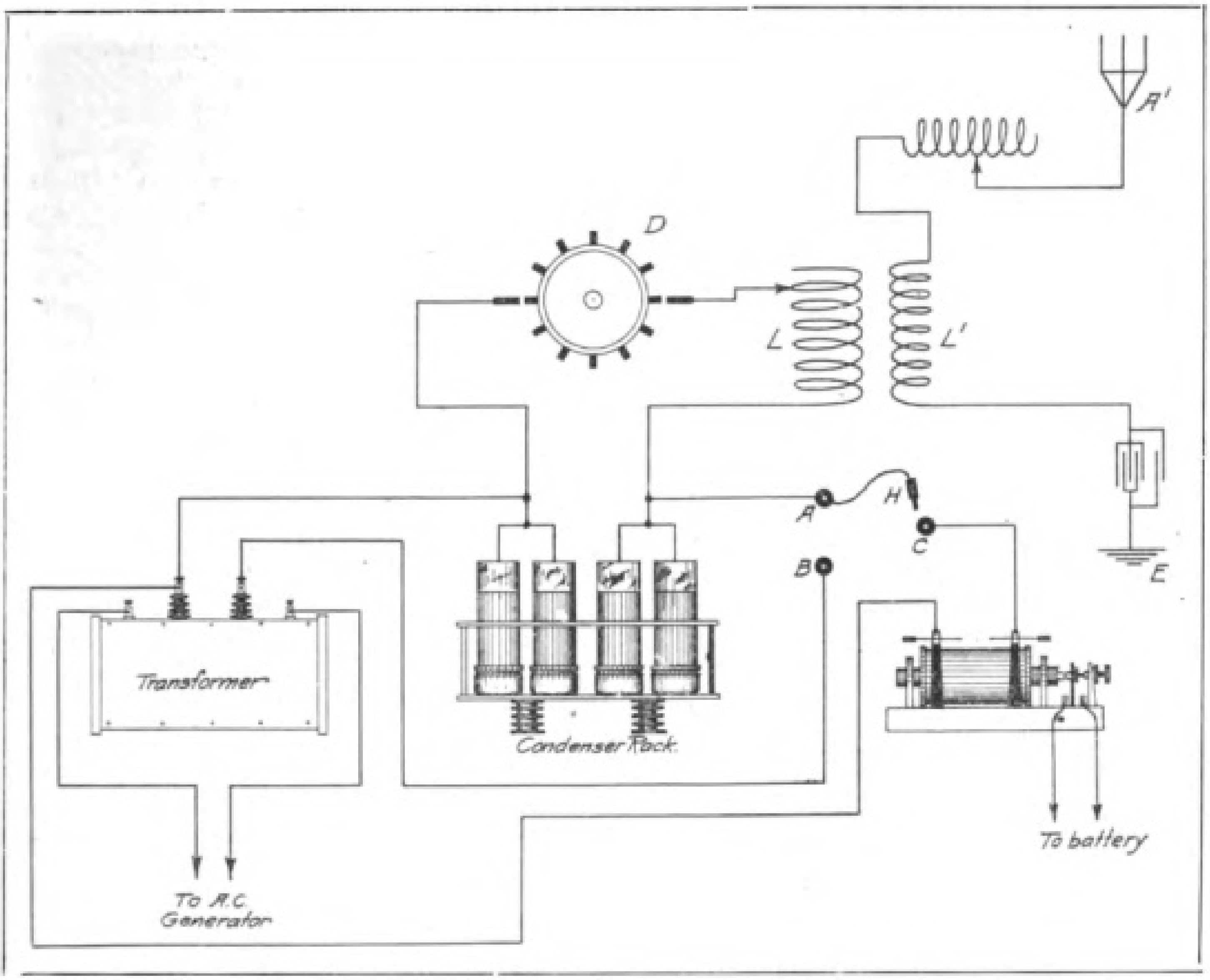


Fig. 2

For the benefit of operators in the Marconi service a complete table of wave-lengths is given in the drawing (Figure 1). For practical working the method of adjustment is as follows:

If it is desired to receive signals from the Arlington station, a wave-length of 2,500 meters is obtained by throwing the double-throw, double-pole switch to the right, the disc condenser set to 1.0 and the Billi condenser to its maximum value. The same wave-length may be arrived at by disconnection of the loading coil in series with the secondary winding, and placing the disc condenser at 9.8. Better signals, however, will be received with the loading coil in series and the condenser at 1.0, as stated before. When the secondary circuit has thus been set to a distinct wave-length, the values of the short wave condenser V, and the aerial tuning inductance, A, should be altered until maximum response is received in the head telephones, indicating resonance.

THE AUXILIARY SET

It has been customary heretofore to connect the secondary windings of the induction coil of the auxiliary set to a spark gap, which was in turn directly connected in series with the antenna circuit of the transmitter. Under these conditions the antenna is subjected to the low frequency high potential current of the induction coil as well as a high frequency oscillatory current, due to a discharge of the antenna's capacity across the spark gap. On certain installations serious leakage at the antenna insulators has been experienced and it has, therefore, been decided to employ this coil in a less troublesome and more efficient manner.

In Figure 2 a standard condenser rack is shown to which is connected a rotary disc discharger, D, and the primary winding of the oscillation transformer, L. L^1 is the secondary winding of the oscillation transformer which is connected in series with the antenna, A^1. To the left of the drawing we have a power transformer as indicated; to the right an induction coil operated by direct current from storage cells. A plug connector, H, is attached to the high potential insulator, A.

One terminal of the secondary winding of the power tranformer is connected to the high potential insulator, B, and one terminal of the secondary winding of the induction coil to the high potential insulator, C. B. and C are fitted with sockets to take the plug connector, H. It will be observed that in case of accident to the power set the same condenser, spark gap and oscillation transformer are energized by the induction coil, the connections for which are shifted at A, B.'C.

When the auxiliary coil is employed in this manner the disc discharger, D, is stopped and the movable electrodes set in such relation to the stationary electrodes as to give a very short spark gap. The vibrator of the coil is then adjusted and the length of the gap at D regulated until the spark note is clear and regular. The coupling between L and L^1 is increased until maximum radiation as shown by the aerial hot wire ammeter is secured. It is at once evident that the problem of antenna leakage is solved and the auxiliary set is in operative condition under all weather conditions.

No changes of the constants of the closed or open oscillatory circuits are required, for the set has been previously adjusted to wave-lengths of 300 and 600 meters and conditions are not altered when the closed circuit is energized by the auxiliary coil.

NEW SCHEDULE FOR PRESS

The Marconi Company has announced that effective January 25, its coast stations will transmit press items on the following schedule:

The notice also calls the attention of operators to the necessity of arranging their traffic so there will be no unnecessary interference during the periods specified.

Stations	Week Days A. M.	Week Days P. M.	Sundays A. M.	Sundays P. M.	Average Time Required
Cape May, N. J.	9:15	9:00	9:15	9:00	35 minutes
Va. Beach, Va.	7:45	5:45	7:45	5:45	20-45 "
Cape Hatteras, N. C.	8:30	6:30	8:30		30 "
Savannah, Ga.	7:00	5:00	7:00		40 "
Jacksonville, Fla.		Midnight		Midnight	40 "
Miami Beach, Fla.	11:00		11:00		40 "

PERSONAL ITEMS

G. W. Nicholls has been appointed District Superintendent, Eastern Division, Marconi Wireless Telegraph Company of America, with headquarters in Boston. A. Mowat, who was slated for the position, is out of the service.

David Sarnoff, who recently returned from an inspection trip to Philadelphia, has been promoted to the position of Assistant Traffic Manager of the American Marconi Company. His duties will also embrace those of Contract Manager as before. On January 6, Mr. Sarnoff was elected Secretary of the Institute of Radio Engineers.

W. D. Terrell, Radio Inspector for the port of New York, issued invitations to students and interested operators to attend an address on storage battery equipment, delivered during the second week in January.

George S. De Sousa, Traffic Manager of the Marconi Company, sailed from New York, January 27, on the San Jacinto, bound for Galveston. The trip was preceded by one to Baltimore and Washington. He will be absent from New York for about two weeks.

A Letter to Loren Lovejoy

DEPARTMENT OF COMMERCE,

Washington,

December 14, 1914.

My Dear Mr. Lovejoy:—

I have noted with personal and peculiar interest the record of your action on the occasion of the wreck of the steamship Hanalei on November 22.

There has come to be accepted in the public mind a very high standard of behavior on the part of wireless operators in times of danger. This has arisen from the uniformly fine behavior of such operators on such occasions. To this admirable rule your coolness and unselfish courage at the time of the wreck of the vessel on which you were employed form no exception.

You are specially to be commended for the ingenuity and persistence with which you maintained communication with the shore during the day and night following the wreck. It is no more than your due that this should be recognized and it is a pleasure to me so to do.

I indorse and approve your commendation of your assistant, Adolph J. Svenson, who showed a fine unselfishness throughout that trying time, and who was lost.

Yours very truly,

(Sig) WILLIAM C. REDFIELD,

Secretary.

"OLD CAPE MAY"

Professional wireless men of long service well remember the feeling that existed between Marconi and United operators in the days before the latter company's assets were purchased by the Marconi interests. The late Neil McIntyre, who penned the verses "Old DF" which appeared in the December issue, refers to this in "Old Cape May," a composition he entitled "A Misuse of Kipling's Mandalay," which we publish on the opposite page. The spirit of his text will be better understood by explaining that the opening of Cape May station and the Virginia Beach plant represented Marconi's first commercial invasion of the Southern coast. Only one operator was employed, as few Marconi-equipped boats (call letters beginning with M or D) passed in that direction then and both shore stations were still in an experimental stage. Mr. McIntyre's "Percy boy" was Percy Morris, stationed at Cape May, whose supposed preference for tune A restricted operations to a wave length of about 300 meters. Tune B was the Marconi designation of the 600 meter wave length used for distances greater than 50 miles.

OLD CAPE MAY

On the beach of Old Virginia near the broad Atlantic Sea
There's a bran' noo wireless station an' the plant is run by me.
Tho' I works well to the S'uth'ard, the Head Office writes to say,
"Go a'ead, you blawsted Scotchman—start to workin' of Cape May."
So I'm callin' of Cape May—
An' a jammin' of HA—
Yus, they all stops workin' wireless while I'm callin' of Cape May.
Oh, Percy, boy! I say!
Have you only got tune A?
For I never gets no answer when I'm callin' of Cape May.

I'm sick of doin' nothin' an' vain tappin' of the key,
Nor I never 'ears no calls wot start wiv either "M" or "D,"
Tho' I talks wiv the United to keep cunnin' in my 'and;
An' they *jaws* a lot 'bout wireless—but wot do they *understand?*
Just a hot-air-shootin' band;
Gawd! wot *do* they understand!
The beast I'm after is of quite another brand.
So I'm callin' of Cape May
Ev'ry bloomin' night and day.
And maybe in the bye-and-bye some day I'll get Cape May.
Oh, Percy, boy! I say,
'Ave you only got tune A?
For I never gets no answer when I'm callin' of Cape May.

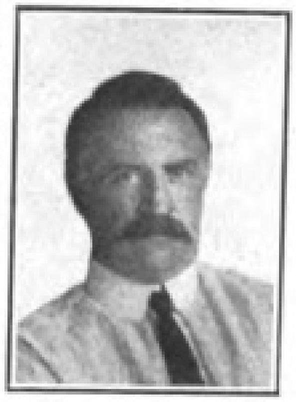
L'ENVOI.

Just give us some more aerial an' a valve apiece an' then
We'll make this coast Gehenna for the bold United men:
Wiv a set of storage batt'ries an' a 4 KW. set,
I could make this ether tremble like it's never trembled yet.
An' I'll work wiv Old Cape May;
Yes, by Jingo! Ev'ry day,
An' we'd 'ave 'em all a-guessin' an' they'd know we're 'ere to stay.
Yes, I'll work wiv old Cape May
(If you'll just do as I say)
MSY will sound like thunder when I'm callin' of Cape May.

(Oct. 6th, 1910.)

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION



It doesn't always follow that a man who is once a skeptic is always a skeptic. Nor is it true that because he is incredulous about some things that he discredits all. The accuracy of these statements is borne out by reference to the autobiography of William W. Ward, manager of the operating department of the Marconi trans-Atlantic station at Belmar, N. J. There is nothing to show that Ward ever evinced a decided general propensity to be incredulous. Yet he was once a skeptic—a skeptic regarding wireless, of which he now is such a staunch supporter.

His lack of belief, however, worked out both to his advantage and that of the art, for the element of doubt which entered into the matter was responsible for starting him on the path which led him to become the devoted wireless disciple that he is today. This seeming paradox is explained by the fact that his skepticism induced him to be curious regarding the means employed to flash messages across great distances without the means of wires. Then his curiosity turned to intense interest and finally he became ambitious to become a wireless man. All of which goes to prove that even skepticism has its profitable side.

His views today regarding his life work are contained in the following statement: "I believe the opportunities in wireless are greater than ever for intelligent youths and the future of the art looks very promising."

Ward, who, with the exception of A. H. Ginman, general superintendent of the Pacific Coast Division, is said to be the oldest operator in the American Marconi Company in point of service, was born in Sydney, Cape Breton Island, in 1870. When he was thirteen years old he entered the cable service of the Western Union at Canso, N. S. Here he had an opportunity to study telegraphy and in 1887 he was offered a position in the employ of the French Cable Company in New York City. One year afterward he accepted an offer to enter the service of the Commercial Cable Company, where he remained for fourteen years. During the last seven years of his service he represented the Commercial Company on the Cotton Exchange. He resigned his position in September, 1902, to enter the commission business.

His work as a wireless man began not long afterwards when he obtained employment with the Marconi Company. He was first sent to Babylon, L. I., where the Marconi Company at that time had a station. This was in July, 1903. Two weeks afterward he was transferred to Sagaponack, L. I., as manager of the station at that point. He was at the Marconi station at Sagaponack at the time of the Republic and Titanic accidents in which wireless was employed so advantageously. He was also detailed at the station when the Princess Irene grounded a short distance from Sagaponack.

The Measurement of the Strength of Wireless Signals*

By E. W. Marchant, D.Sc., M.I.E.E., David Jardine,
Professor of Electrical Engineering in the University of Liverpool

THE amount of energy received by a wireless antenna, when audible signals are received in a detector, is so small that the accurate measurement of the strength of these signals requires apparatus of very great sensitiveness. It has been estimated by Austin that the smallest power that can be detected in a receiving antenna with a heterodyne receiver is about 150 micromicrowatts, while for strong signals, such as would give good commercial working, the power is about 60,000 micromicrowatts. In order to obtain good quantitative results, which can be used for absolute measurements, it is very desirable that the aerial should be of definite form, and should be as free from obstructions (such as buildings and towers) as possible. The results obtained from stations not favorably situated are valuable from the point of view of giving comparative results, but are of no use for absolute values. The other essential for the receiving system is a satisfactory earth connection. Many examples may be cited of the effect a variable earth resistance may have on the strength of received signals; one of the most interesting is a case quoted by one of the engineers of the Marconi Company, Mr. Gilmour, of a station in Spain where the signals were weak on certain days in the dry weather, but were greatly improved by pouring water over the earth plates. In order to obtain consistent results it is necessary that the resistance should be as constant as possible. When the earth is made by plates buried in a fairly insulating non-porous rock, the earth is usually fairly constant, but in porous ground, where the climate is such that there are long periods of wet weather followed by long periods of dry weather, the earth resistance may easily vary within wide limits. Where water pipes are available a good plan is to make the earth connection to them either direct or by having a large earthed plate laid on the ground connected to them. For accurate work the earth resistance of the aerial should be checked by observations of the decrement, by some of the well-known methods for estimating this quantity. For accurate measurement of signals of known wave length the receiving circuit for the signals must be weakly coupled to the aerial. This is essential if proper selectivity is to be obtained. The coupling on the receiver circuit should not be much more than 5 per cent., and, generally, the weaker the coupling the better. The Marconi multiple tuner should be an exceedingly useful appliance in connection with accurate tests of this kind, though the author has had no experience of its use for this purpose. In order to obtain strong signals in the secondary circuit it is necessary, if the coupling is weak, that the decrement of the secondary circuit (see Fig. 1) should be made as low as possible, otherwise the signal strength will rapidly diminish as the coupling is weakened. In order to reduce this as far as possible the secondary circuit should not be made of too fine wire. For ordinary purposes it is desirable to use wire of about No. 24 S. W. G. The arrangement of the coils to provide the necessary variable coupling may be any of the ordinary types, either with one coil sliding on a frame inside the other or with one coil arranged so that it will turn inside the other, an arrangement similar to that used in many forms of standard variable inductance. The most suitable form of detector depends

* From "The Year Book of Wireless Telegraphy and Telephony," 1914.

to a large extent on individual preferences. Those who have used them speak highly of the liquid barretter; the author, from the experience he has had with these detectors, is inclined to think that they are not the most reliable for accurate and continuous measurements. The Fleming valve detector, or audion, is not suitable for quantitative tests, since the small variation in the amount of air in the bulb due to the heating of the glass appears to affect its sensitiveness. Most experimenters use some form of crystal detector, of which the best known is the perikon, in which two crystals, one

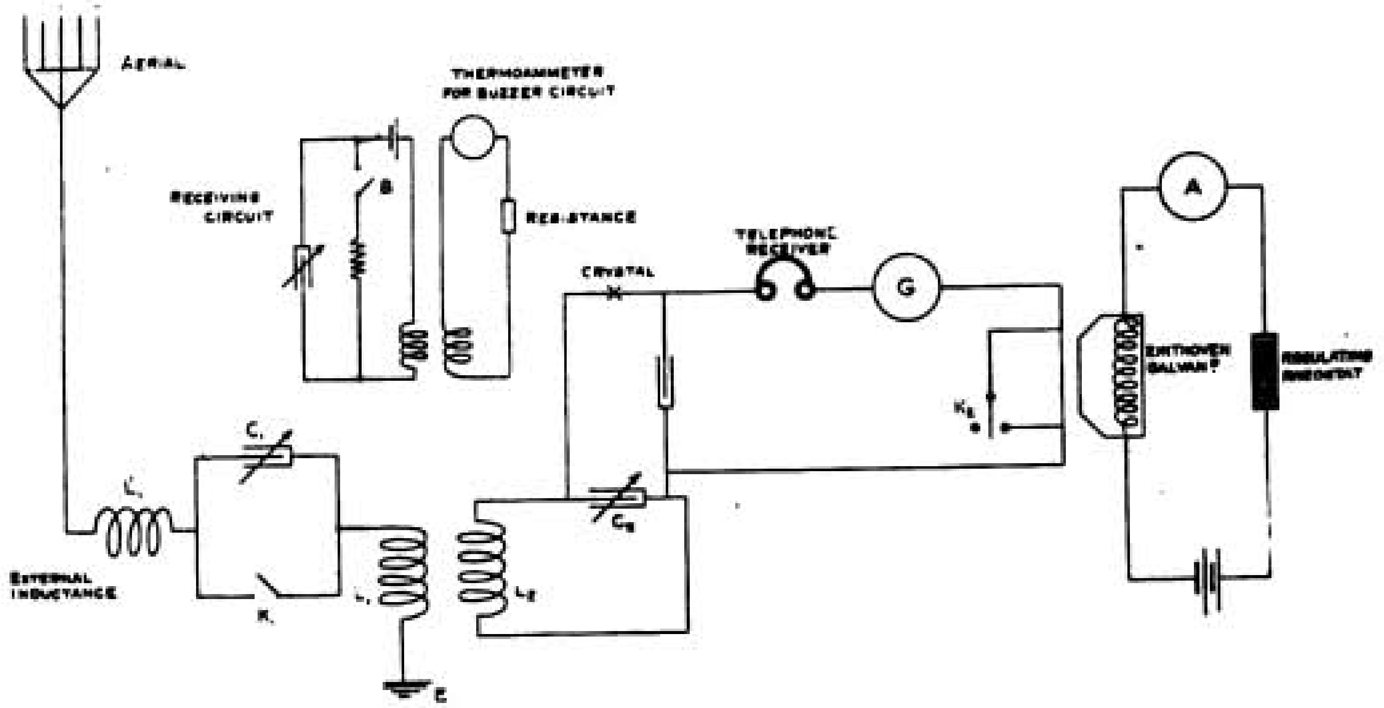


Fig. 1.

of zincite and the other of chalcopyrites, are connected in series with a block condenser across the condenser of the secondary receiving circuit. The arrangement of this detector is shown in Fig. 1. Another excellent combination is zincite-bornite. The bornite—or, as it is often called in this country, erubisite—is not quite so hard as chalcopyrites, and though pieces of it may be found which give as great sensitiveness as the perikon, it does not last so well, and it is more affected by atmospherics. On high aerials, such as the Eiffel Tower, Com. Ferrié has said that crystal detectors are useless for accurate measurement, and he prefers, under these conditions, the liquid barretter.

The perikon detector gives a current in the circuit to which it is connected which is proportional to the square of the current in the oscillating circuit. This relation also holds good in detectors using zincite and bornite, and is interesting as it indicates that the action of this form of detector is largely thermal. A theory of this kind was put forward some years ago by Dr. Eccles, who has since developed it in several papers. In some determinations made in Liverpool between the current in an oscillating circuit supplied by a battery and buzzer, and the corresponding current in a detector circuit, the relation was found to be almost exactly a square law. These results are given in Fig. 2.

It follows from this that the galvanometer deflection with a crystal detector will be proportional to the power received on the aerial, and variation observed in the galvanometer will therefore give directly the amount of variation of absorption by the atmosphere. The current in the receiving aerial will be proportional to the square root of the galvanometer readings.

Attempts have been made to estimate the strength of signals received, by telephone measurements instead of by using a galvanometer, and it is evident that measurements made in this way would be much more convenient to carry out. Austin has suggested that the telephone should be shunted by a resistance, and the value of this resistance continuously reduced until the signals were inaudible in the telephone. The signal strength may then be represented by an audibility factor which is measured by the ratio of $\frac{R + Rs}{Rs}$ where R is the impedance of the telephone receiver to the spark frequency used, and Rs is the resistance of the shunt. Austin states that the strength of signals measured in this way is the same as when found by a galvanometer, i. e., that the loudness of a signal in a telephone, as measured by the shunt method, is exactly proportional to the deflection of a galvanometer placed in the same circuit. The shunted telephone method may best be carried out by using a resistance box in which all the resistances are controlled by a single dial arm. Thirty or forty studs are sufficient, giving degrees of audibility varying by 20 per cent. The inductive resistance of the telephone depends on the spark frequency. For example, with a 2,500 ohm. telephone and blocking condenser of 0.02 mf. and a spark rate of 1,000, the impedance is approximately 5,000 ohms. With low spark frequencies the "inductive" resistance approximates to the direct current resistance.

This method of measurement, though it gives excellent results in the hands of skilled experimenters, is one which is not as reliable as the galvanometer method. The readings obtained must clearly depend on the sensitiveness of the hearing of the individual making the test, and unless some standard of sensitiveness of ear is available such measurements are liable to wide variations from time to time. Also, it is difficult to determine exactly when sound becomes inaudible. The standard of audibility usually employed is that for which dots and dashes become indistinguishable from each other.

In making accurate measurements, therefore, some form of galvanometer would appear to be very advantageous, but this should always be used in series

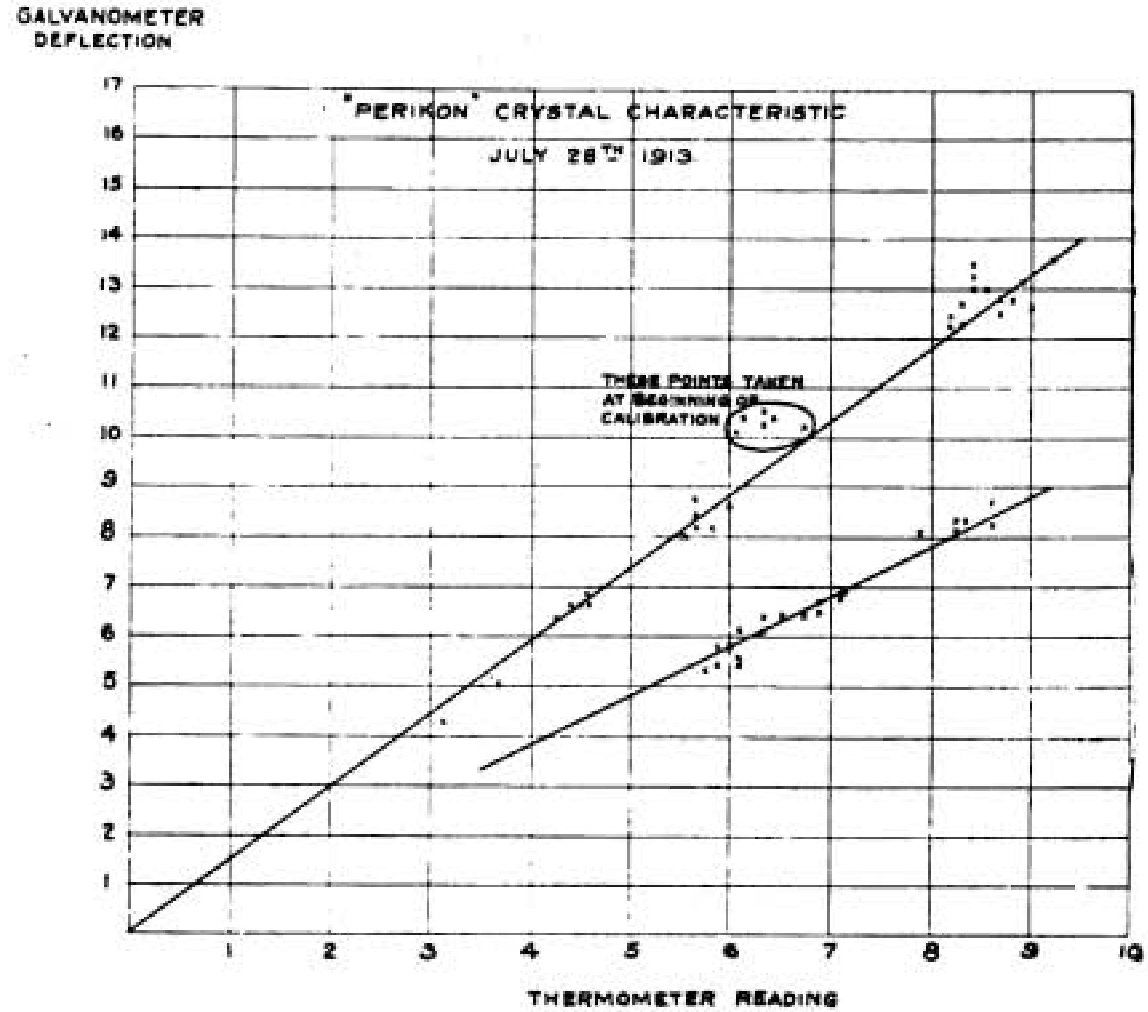


Fig. 2.

with a pair of receiving telephones, in order to ensure that the signal being measured is that which is desired. One of the greatest difficulties in obtaining exact measurements is the elimination of strays due either to atmospheric disturbances or to badly tuned amateur transmitting sets, and, unless precautions are taken to detect their in-influence, serious errors may be made in the measurements. The ordinary galvanometer, in order to obtain a sensitiveness great enough to measure the current, is usually designed for a fairly long period of swing. M. Abraham has designed a special form of moving coil galvanometer, however, which has great sensitiveness and a comparatively short period.

When the ordinary galvanometer is used, considerable difficulty often occurs in making measurements, and the readings may be spoilt by an atmospheric which comes in at the instant of making the test. A good deal may be done in the direction of eliminating atmospherics by suitable design of the receiving circuit; a very loosely coupled receiver with small decrement in the receiving circuit is much less affected by atmospheric disturbances than one in which tighter coupling is employed, but under the best possible conditions atmospherics are always liable to give trouble. The most satisfactory way of making measurements is to have a galvanometer of great sensitivity, and having a very short period of swing. The author has had the advantage, during the last year, of using an Einthoven, quartz fibre, or string galvanometer, with photographic recording apparatus, and has found this of great value for accurate measurement. The signals received are sent through this galvanometer as well as through the ordinary receiving telephones in series with a crystal detector; the motion of the quartz fibre corresponding with any signal is recorded on a moving photographic plate. A typical record for the signals received from the Eiffel Tower is chosen in Fig. 3. Not only does this device give an accurate record of the signal strength, but it also enables the variation in strength of individual sparks to be detected, and the strength of the received signal can be measured with considerable accuracy. The record so obtained shows at once the signal that is being measured and whether the amount of deflection is affected by atmospheric discharge. The accurate observation of signal strength may be expected to throw considerable light on the factors which are of importance in wireless signalling.

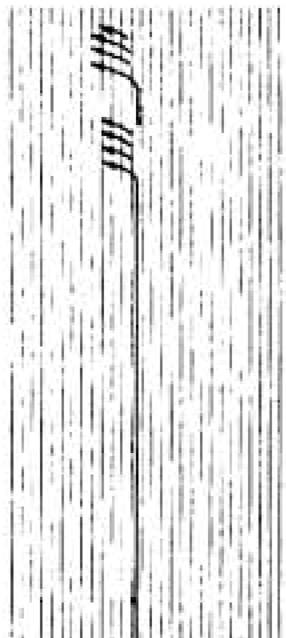


Fig. 3.—Record of Time Signal received in Liverpool from Paris, June, 1913.

Among the contrivances that have been used for observing wireless signals, an arrangement of a frog's leg detector working in conjunction with a crystal may be mentioned. Experiments have been made with this arrangement by M. Lefeuvre, of the University of Rennes, and were described recently by him (Fig. 4). The current from an electrolytic detector was sent through a pair of receiving telephones, and part of this current was shunted through the nerve-muscle preparation. The contraction of the muscle was recorded on a revolving drum. There was a time lag of about 1-100th of a second between the reception of the signal and the contraction of the muscle, but the response was quick enough to enable the Paris time signals to be distinguished. The long dashes gave for examples a series of contractions of about the same magniture, while the — . . . . signal gave a big contraction, followed by four smaller ones, lasting for a much shorter time. These records are mainly of interest in exhibiting the great sensitiveness of this arrangement for detecting small currents, and cannot be relied on to give accurate quantitative results.

Some observers — notably, Duddell and Taylor—in their original tests have used a thermoammeter of sufficient sensitiveness to measure the aerial current directly. With long-distance signalling the sensitiveness of this instrument has to be very great, as was shown earlier; and, further, it is exceedingly difficult with such an instrument to get a quick period of swing and at the same time great sensitiveness. When working on large aerials and on long wave-lengths the trouble with atmospherics becomes very serious, and such an instrument is not a satisfactory way of getting accurate records, except over short distances and with low aerials. It has the advantage of great simplicity, since in order to obtain comparable results, it is only necessary to obtain a measurement of the aerial currents; the coupling between aerial and secondary circuit and the decrement of the secondary circuit do not require to be taken into consideration.

A further difficulty in using this arrangement is to eliminate signals which it is not desired to measure. A considerable selectivity may be obtained by tuning the aerial to the received wave-length, but the selectivity so obtained is nothing like so great as that found with a weakly coupled receiving circuit. When working in almost any district in England at the present day, a considerable number of messages are always being received, and it is almost impossible at the present time to obtain measurements direct on the aerial, except on very long wave-lengths.

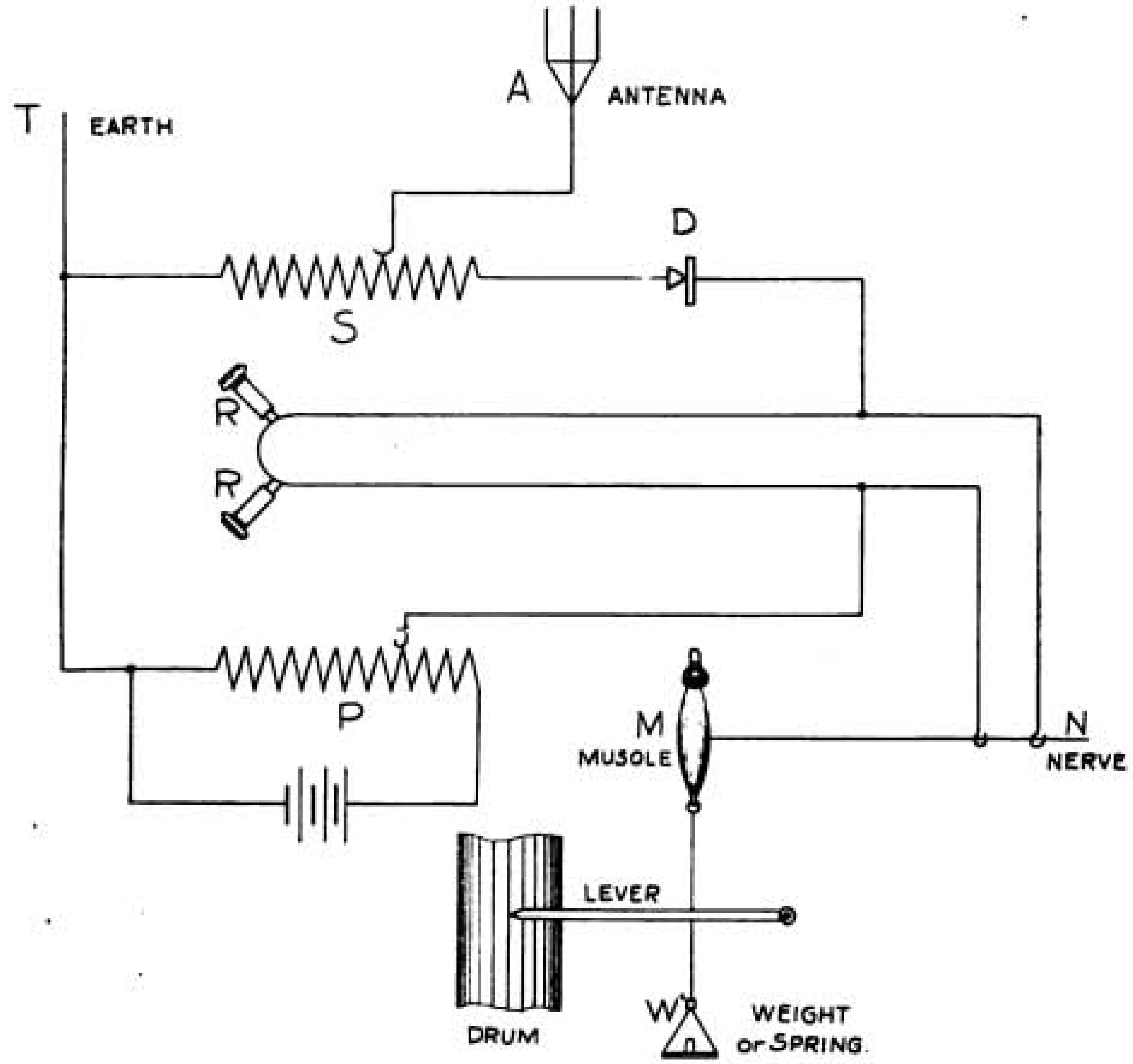


Fig. 4.

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 ofwhich present nothing new or original.

FIRST PRIZE TEN DOLLARS
A Device for the Elimination of Dead-End Losses

I desire to apologize to the readers of THE WIRELESS AGE for again bringing to their attention the matter of dead-end switches for receiving tuners. It may seem that the subject has become exhausted to a certain degree, but I believe that my design possesses sufficient originality to be of value to your amateur readers. I might state that I am fully aware that a simple disconnection of the dead-ends of a receiving tuner does not totally solve the problem of energy losses, but it helps, to say the least.

I have designed a single blade switch for the primary and secondary windings of a receiving tuner which by a single movement not only progressively connects in the circuit the several units of inductance, but simultaneously disconnects the unused turns, thereby simplifying the method of operation.

In my drawings (Figures 1 and 2), A is a small piece of insulating material which is fastened on the metal bar, B, by means of a small bolt or machine screw. The spring, C, is made of resilient metal shaped as illustrated and bent up slightly at I so as to allow bar B to pass through freely. Normally, spring C rests on and makes contact with tap D, connecting the end of one section of inductance to the beginning of the next.

In operation bar B passes spring under C which is raised so that it rests on A and at the same time the underside of B makes contact with tap D in the usual manner, thus disconnecting the remaining turns of the inductance from the section which is in use. Instead of filing a section out of bar B, a piece of sheet fibre, cut to size, can be fastened to the top side of B so that a metal strip much thinner than B would necessarily need to be, could be used. In fact a great many alterations can be made by the ingenious experimenter and the illustration is just for the purpose of explaining in a simple manner the principle of the arrangement.

FRANK ORTH, *New York.*

SECOND PRIZE, FIVE DOLLARS
A Break Key

Many articles have been published describing break-in systems. The majority of the articles give a system of connection, but neglect the actual construction of the break-in contacts. Break-in keys are as a rule complicated arrangements and with this idea in mind I designed one of simple construction. It is assumed that separate aerials are to be used for transmitting and receiving with this system.

Referring to my drawing, Figure 1A,

1B, 1C; an elevation is given in 1A, a plan in 1B and a diagram of connections in 1C. When the transmitting key is depressed the contacts, C and C¹, (Figure 1C) break the connection from the detector to the receiving tuner circuits, thereby protecting it from the energy due to electrostatic induction from the transmitter. Each time the transmitting key is raised the detector is connected to the receiving tuner, and is in a receiving position. A micrometer spark coil (Figure 1C), is connected across the primary winding of the receiving transformer to prevent high potentials from surging through the coil.

To construct this gap, first secure a piece of hard rubber 3/16 of an inch in thickness and ¾ of an inch in width. The length is dependent upon the key itself. Drill two small holes in the key lever between the pivot and the adjusting screw. Two small machine screws pass through these holes and hold the hard rubber strip firmly to the lever, leaving the adjusting screw and the lock-nut free.

Two pieces of spring brass, 1½ inches in length and ¼ of an inch in width, are now required. They are tapered slightly. Brass machine screws hold these and the hard rubber strip as shown. Connection is made to the spring brass strips by flexible cords and small copper lugs.

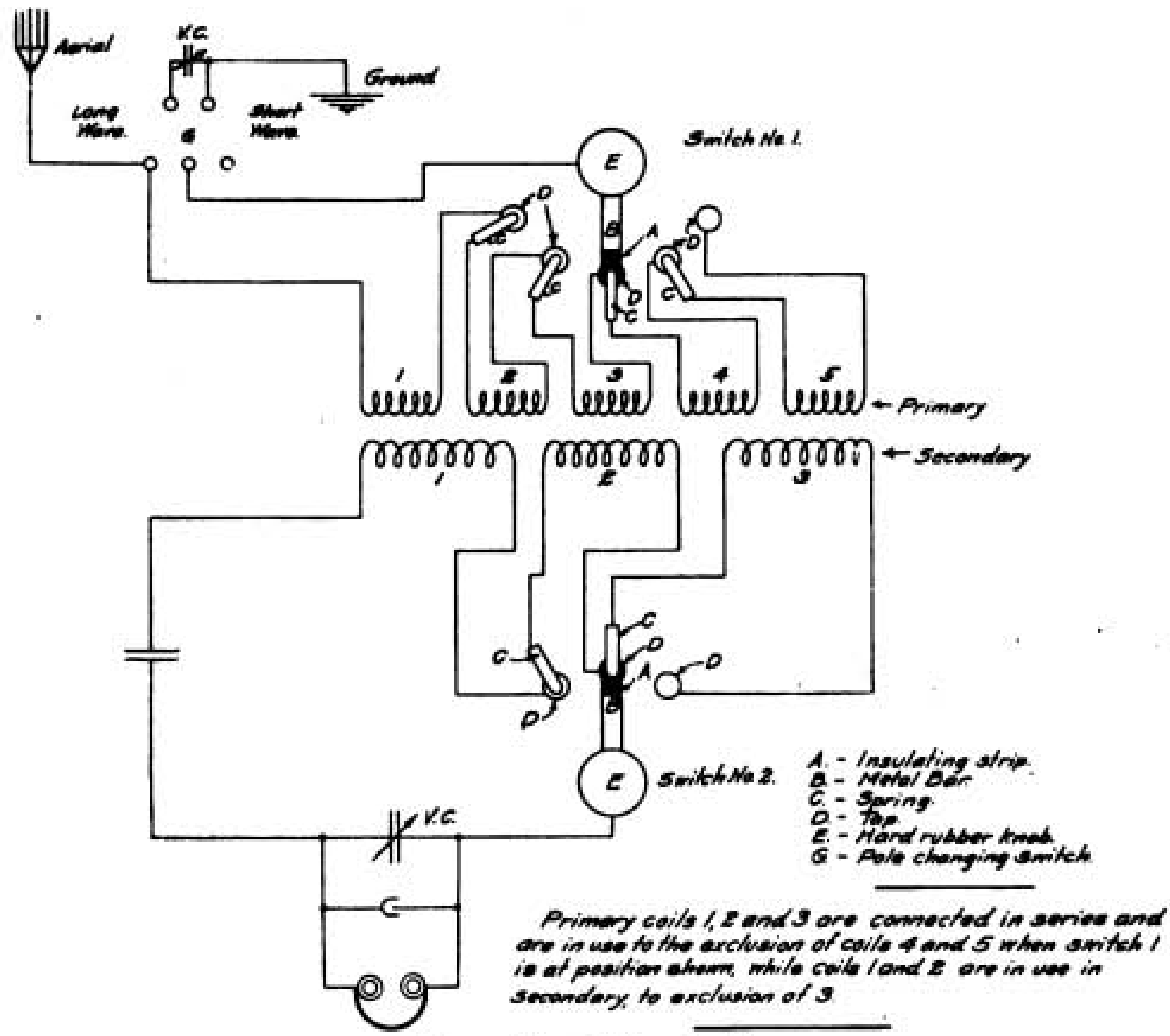


Fig. 1, First Prize Article

Two large binding-posts support ⅛-inch brass rods, completing the breaks. Connection is made to these by copper lugs under the binding posts.

To adjust the key, remove the brass rods and bend the brass strips slightly downward. When the rods are in place the contacts should just meet. This could be accomplished by a slight turn of the adjusting knob, A. The key can be adjusted so that the slightest movement of the lever will break the detector circuit.

I have found that with this key the detector always remains in the circuit

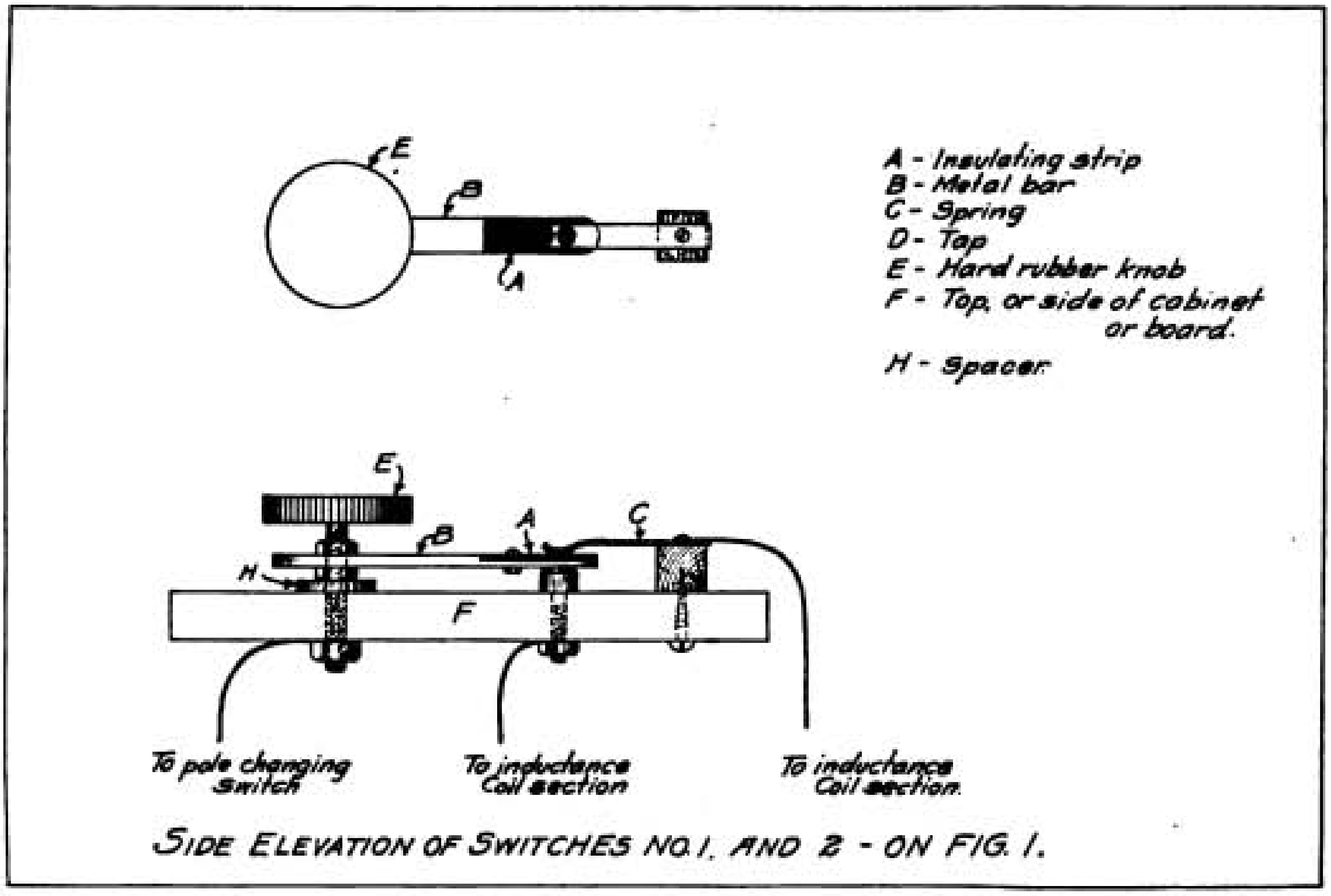


Fig. 2, First Prize Article

when transmitting. I have been interrupted by a weak dot from a transmitting station ten miles distant. The detector should be placed as close to the circuit as possible, making the leads short. The leads should be separated so as to reduce induction between them. The entire key is mounted on a marble base, giving a neat appearance.

IRVING FARWELL, *California.*

THIRD PRIZE, THREE DOLLARS
A Neat Portable Receiving Set

I recently designed a portable receiving set from materials which may ordinarily be found around the amateur shop and I believe the construction is such

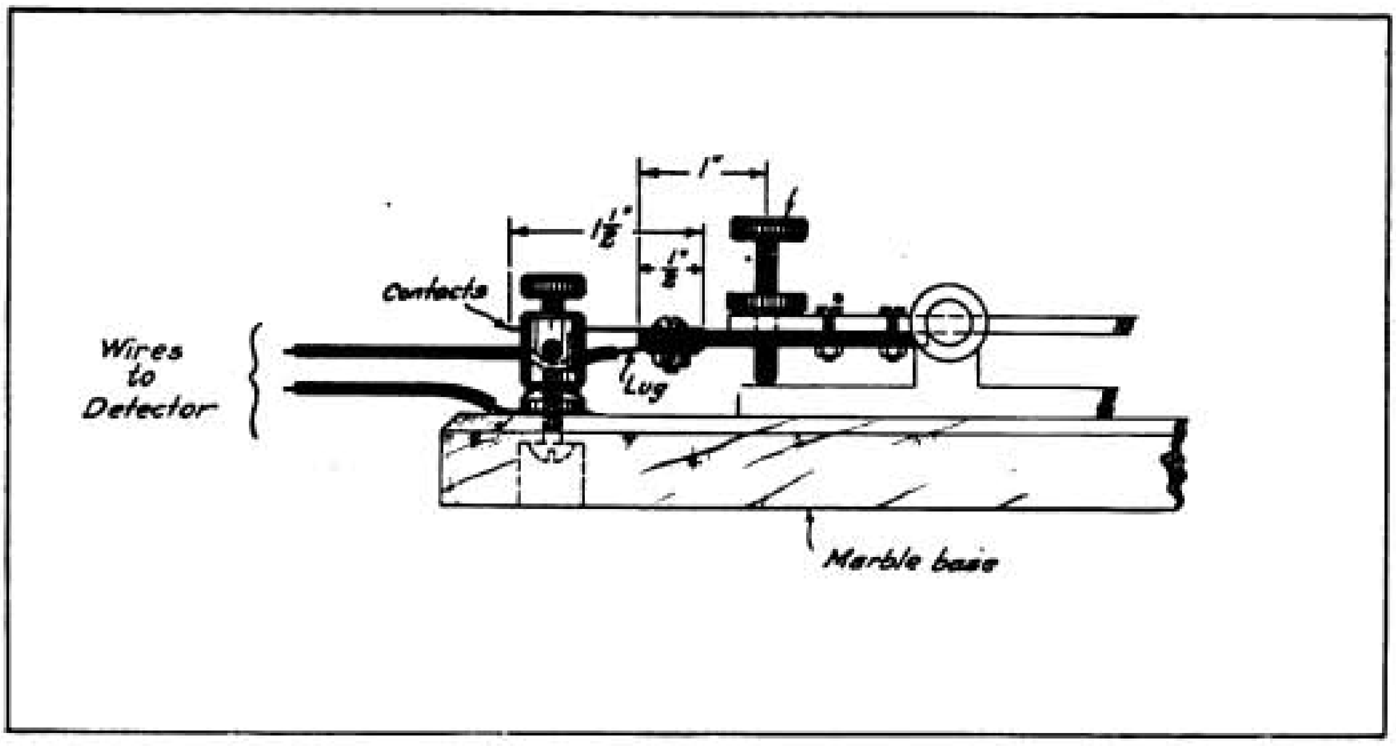


Fig. 1A, Second Prize Article

that it will appeal to boy scouts, for it is an ideal set for their work. With a good pair of telephone receivers and a moderate-sized aerial, messages may be received several hundred miles at night under favorable conditions. On one occasion I obtained a distance of 500 miles in the day time with just one wire 175 feet in length and fifty feet in height. The drawings accompanying my article show the different parts, also their locations.

The first thing to procure is the cabinet which measures 7¾ inches in length, 5¾ inches in width and 6 inches in depth. Oak or mahogany is of course preferable, but any kind of wood may be used. Its dimensions may be altered if necessary to suit the builder. A lock marked A and a strap, B, should be put on the cabinet in their respective places as shown in Figure 1.

Cut a piece of fibre ⅛ of an inch thick so that it will fit snugly inside the cabinet and come flush with the top. The fibre, which should be black, could be sand-papered so as to give it the appearance of hard rubber. After sand-papering apply a polish which gives it a bright color.

Now for the receiving transformer. Get two cardboard tubes, one 2¾ inches in diameter, and the other 2½ inches in diameter. The primary winding is made on the 2¾-inch diameter tube and has 105 turns of No. 22 S. C. C. copper wire, taking a tap off every turn for the first 5 turns; then a tap every 5 turns for the remaining 100 turns.

The first 5 turns are connected to a switch mounted on the top of a cabinet while the 20-point switch is mounted at the side as shown. The secondary winding is made with No. 28 S. C. C. wire on the tube, 4 inches in diameter and 4 inches in length. A loading coil may be mounted at the base of the box and connected to a switch as shown.

I shall not describe any particular form of detector as most amateurs have their so-called "pet" detector. I have obtained excellent results with galena.

A variable condenser marked C, may be secured to the inside of the cover, as shown in Figure 4, and is to be connected in shunt to the primary winding, as shown in the diagram of connections (Figure 5). A and G are connections to the aerial and ground of the receiving tuner (Figure 5).

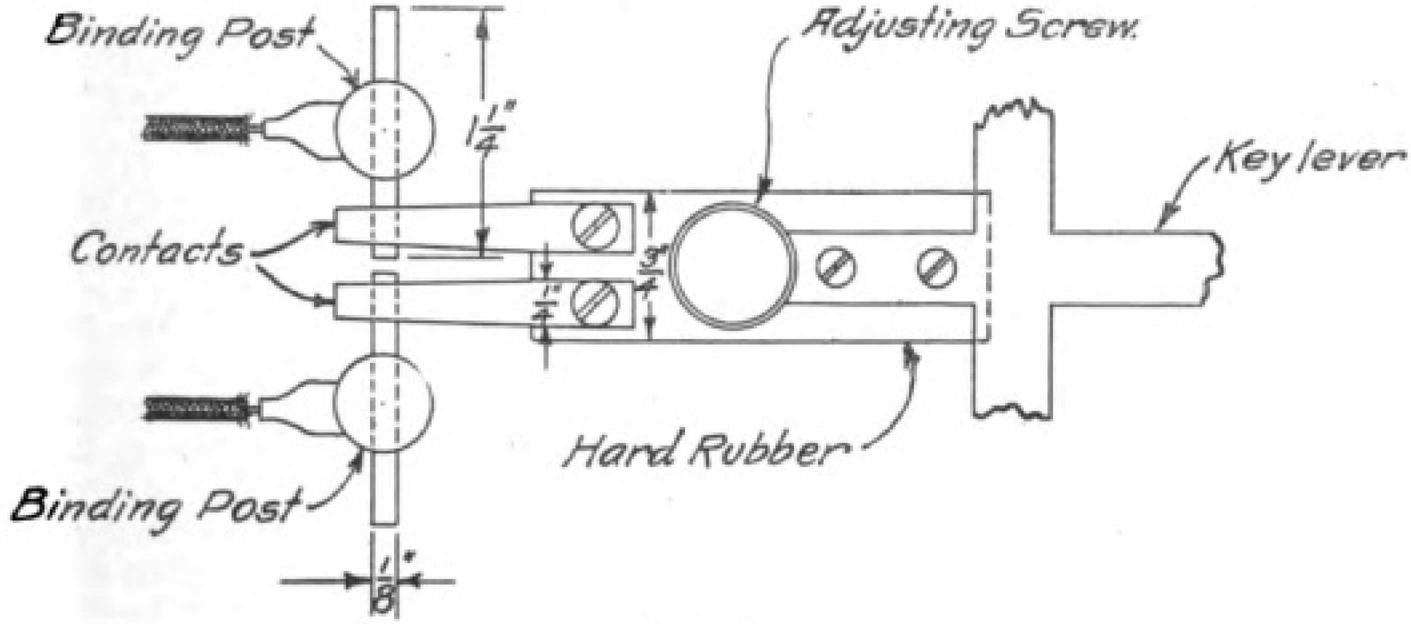


Fig. 1B
Second Prize Article

In Figure 4 G^1 is the switch for the secondary winding. H is the detector, I the connection for the telephone receivers and J the rod to vary the coupling of the secondary winding. The fixed condenser, K, is put inside the box or on the top if there is room.

The constructor may dispense with the variable condenser or loading coil and substitute a buzzer testing outfit, which has been fully described in previous issues of The Wireless Age. This buzzer outfit consists of an ordinary high pitch buzzer used for exciting a condenser shunted by an inductance coil.

For field work it might be more desirable to slightly enlarge the box, leav-

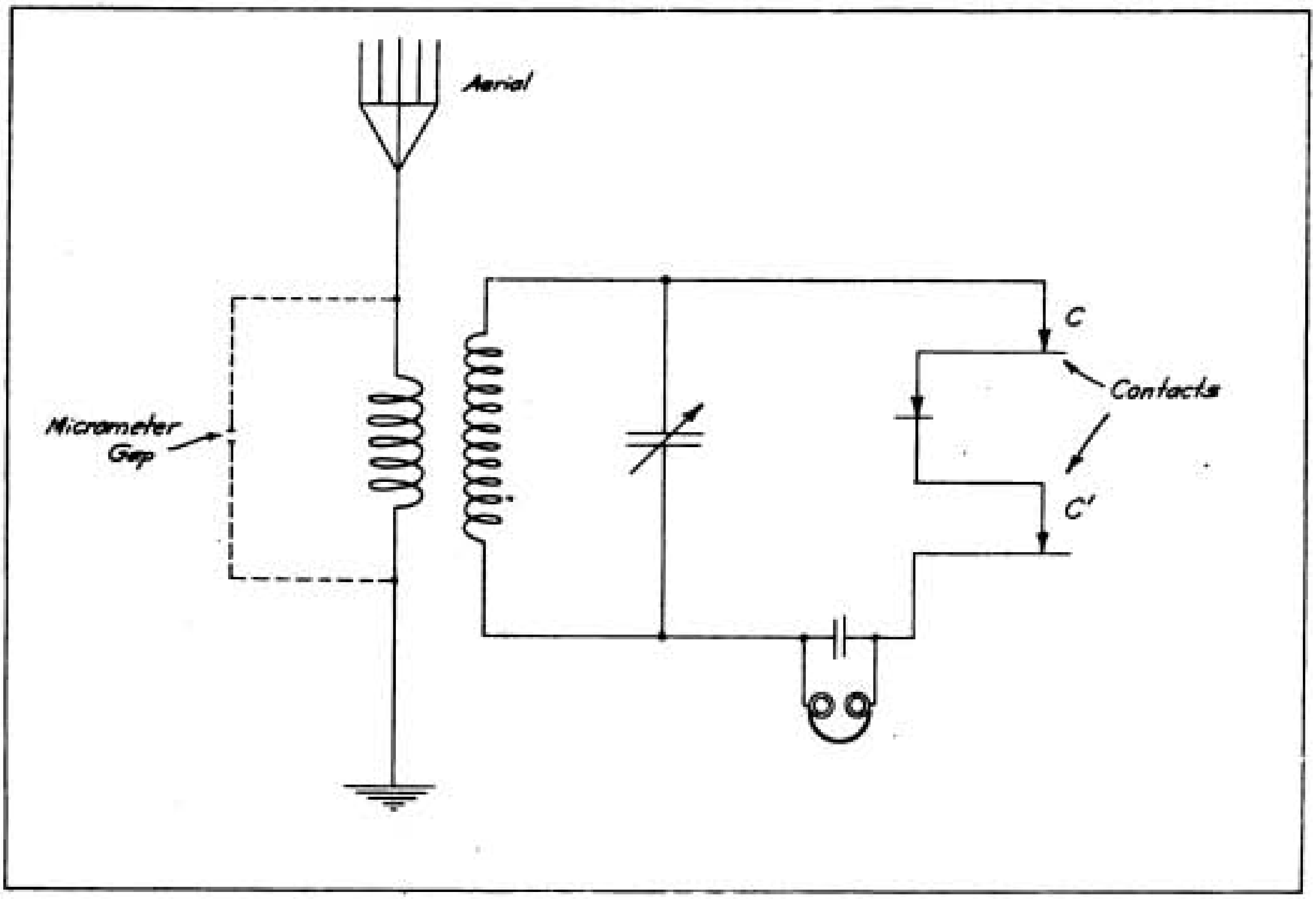


Fig. 1C, Second Prize Article

ing a compartment for holding the head telephones.

FRANCIS H. DEARDORF, *California*.

FOURTH PRIZE ARTICLE, SUBSCRIPTION TO THE WIRELESS AGE

An Efficient Electrolytic Interrupter

Several years ago there seemed to be a great demand for electrolytic interrupters. Descriptions of many designs were published in magazines at the time. However, at the present period comparatively few interrupters of this type are being used. This may be accounted for by the fact that the majority of the designs furnished gave practically no satisfaction. They consumed a great deal of current, thereby causing the lights in the power circuit to fluctuate; they spattered the electrolyte; they very often caused very serious "kickbacks"; they "blew" the spark coil; they were very inefficient and usually gave a rough low tone, which was extremely hard to read.

The following is a description of an interrupter of my design which I believe does not have any of the faults referred to, and will give a good clear tone at the receiving station. I have constructed quite a number of interrupters of this type and have advised others how to make them, but I have never heard of a single instance of the "blowing" of a coil or other troubles. Coupled with these advantages is simplicity of construction,

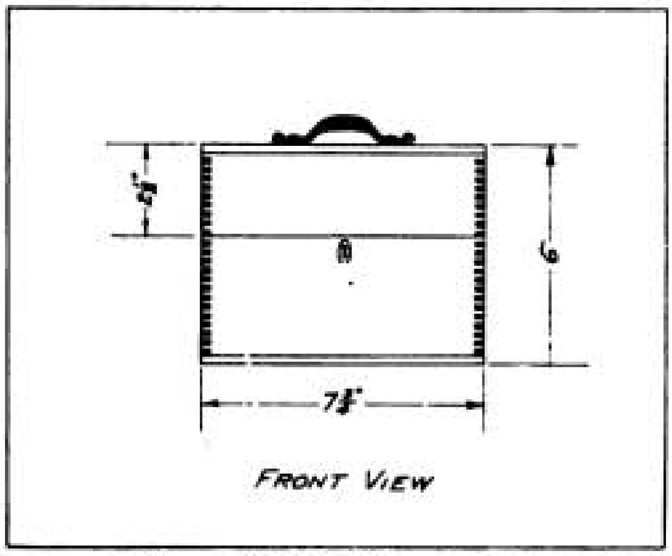


Fig. 1, Third Prize Article

which is most desirable. Any experimenter has the material required to make an interrupter of this type with perhaps the exception of the sulphuric acid. Only a few cents' worth of this is needed.

Referring to the accompanying sketch, Figure 1: Through the side of a 2 to 4 ounce bottle about $1\frac{1}{2}$ inches from the bottom, a small hole is drilled. This is done with a small three-cornered file, the end of which has been ground to a point on an emery wheel. The file is then placed in a brace and the hole in the bottle is drilled. Perhaps the first bottle will be broken, but after a little experience a hole can be drilled without difficulty. Keep in mind that the hole should be as small as possible.

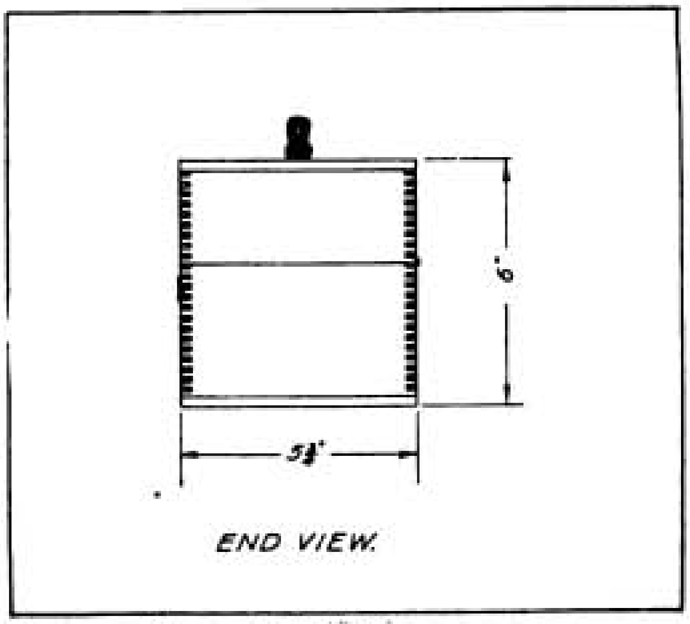


Fig. 2, Third Prize Article

A pint or quart Mason fruit jar, 10 inches of No. 6 Cu wire, a carbon from an old dry cell, a porcelain knob (or anything else that will prevent the wire from coming in contact with the carbon), and a solution of sulphuric acid are the remaining materials required. The correct proportions of the solution are best found by experimenting; usually about five parts of water to one of acid will fill the bill.

The drawing (Figure 1), shows how the interrupter is assembled. It is intended to be used on 110-volt current in series with the primary winding of the spark coil. No resistance or choke coil is needed. The hole in the small bottle gradually enlarges, but a new bottle will not be required for at least six months or a year.

PAUL R. GEIGER, *Michigan.*

HONORARY MENTION

A Receiving Detector of Simple Construction

I have tried practically all types of crystal detectors, made both from articles in THE WIRELESS AGE and other leading magazines of this country, but none can favorably compare, in my estimation, with the one I am about to describe.

Reliable and constant in action, it is a thoroughly robust instrument, hard to knock out of adjustment. Various minerals have been tried, but with indifferent success until tests were made with galena. Both long distance and accurate adjustment may be claimed for this detector stand.

By referring to the accompanying drawings a clear idea of the construction may be obtained. The size is not standard, but can be changed to suit the amateur's fancy. The materials were readily found around the shop.

" B. B." is a brass ball ⅝ of an inch in diameter and having a 3/16-inch hole bored through the centre. "T. T." is a brass tube, the outside diameter of which will slip inside the hole. It is then sweated in. The ends of "T. T." are cut directly opposite each other for a distance of ¼ inch down with a No. 1 jeweler's saw, in order to make a ⅛-inch rod slip through with good contact. The ⅛-inch rod is threaded to take an electrose knob. The other end is also cut down a distance of ¼ inch with a No. 1 jeweler's saw in order to hold a No. 30 wire for the "whisker."

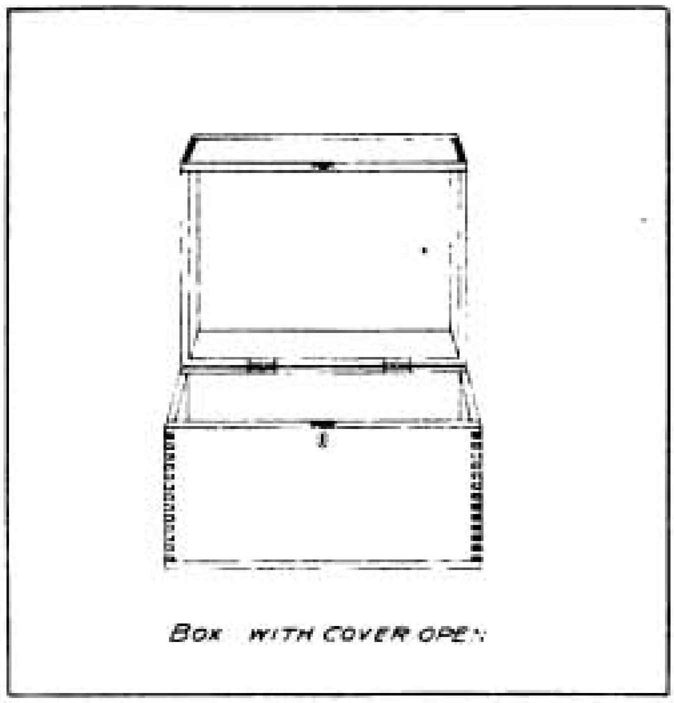


Fig. 3, Third Prize Article

The ball is suspended between two upright strips of brass 1 ¾ inches in length and ½ inch in width. These have a No. 4 hole drilled in the end so as to form a

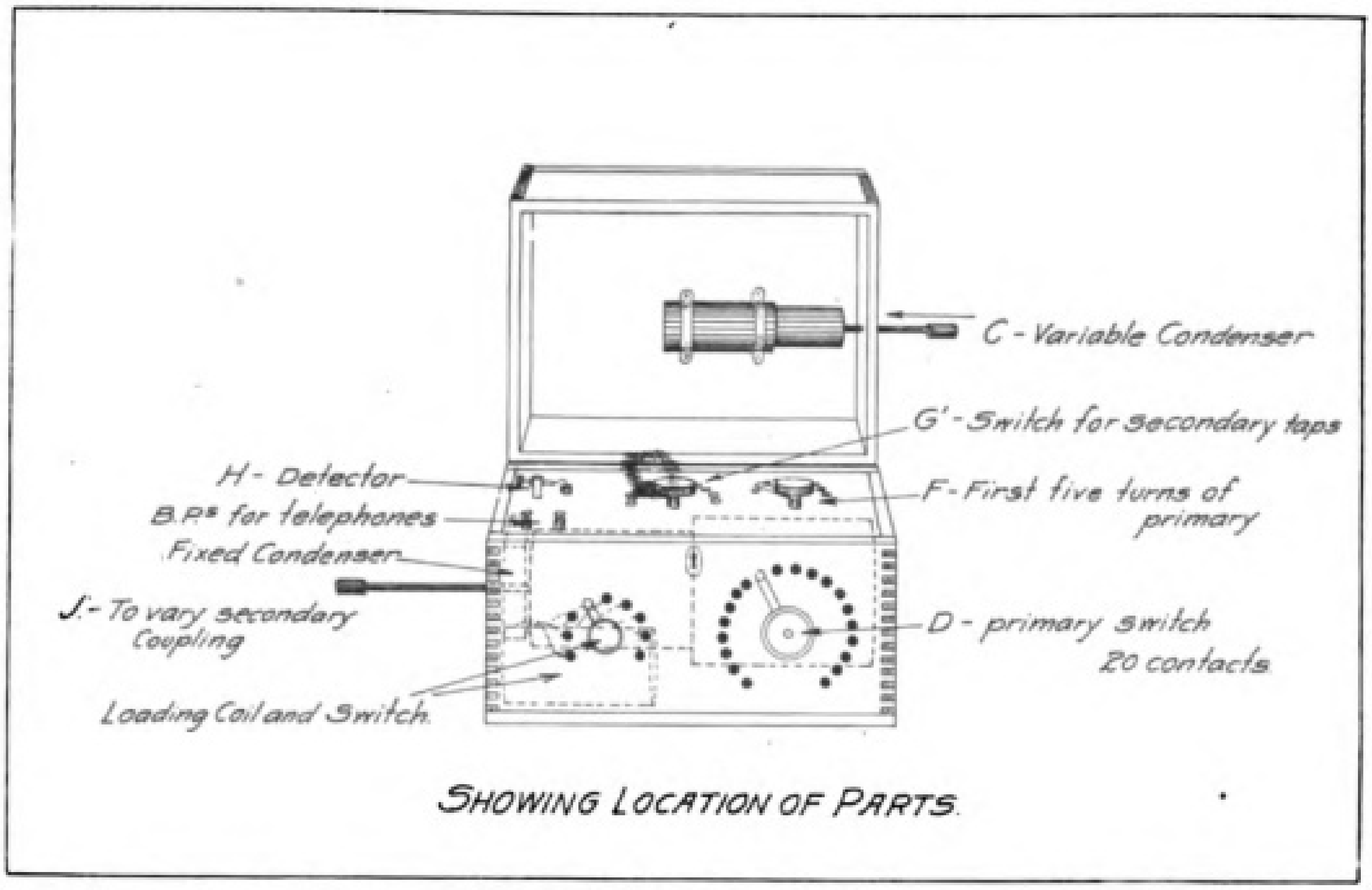


Fig. 4, Third Prize Article

socket for the ball. The strips are 1/32 of an inch thick and are screwed to a brass pillar 1 ¼ inches in length and ½ inch square. The strips are bent to hold the extra width of the ball. A cup can be mounted on the base and a good piece of galena held in by having a small screw inside of the cup.

When all is completed the detector can be mounted on a hard rubber base and it will be found that by rotating the ball and sliding the rod in and out by means of the knob, any desired point on the crystal can be located.

J. F. Bernard, *New York.*

HONORARY MENTION

"On Variable Condensers"

Did you ever notice how much more interest you take in wireless apparatus of your own construction? I am sure I do.

You go to work and design a good set and when it comes to the variable condenser your hands go up in despair with the thought that it is impossible for you to construct it; whereupon you go out and purchase one; but when the apparatus is completed and you compare the purchased variable condenser with the home-made equipment, you feel a dis-

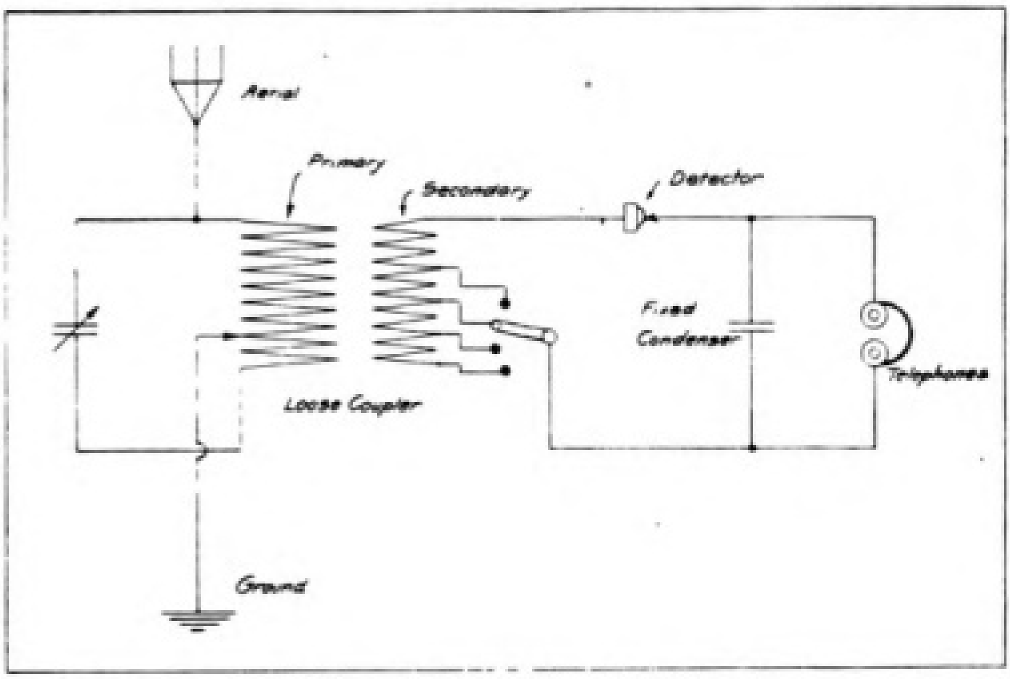
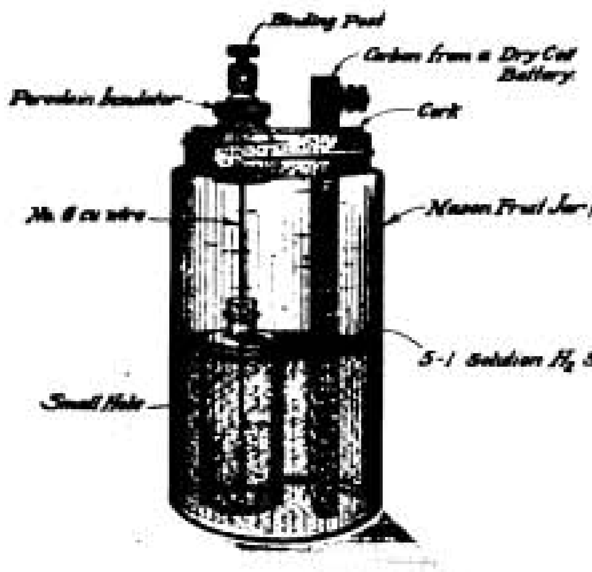


Fig. 5, Third Prize Article

tinct sense of having left something undone or a problem unconquered.

Well, if so, why don't you make one out of tin? Don't scoff at the idea of making one out of iron because it will



Drawing, Fourth Prize Article

work just as well as one made of any other material. I know what I am talking about for I have tried out such a condenser. I also have two variable condensers, both of popular make, right here on the table before me and I defy anyone to get better results out of them than out of the one I constructed myself.

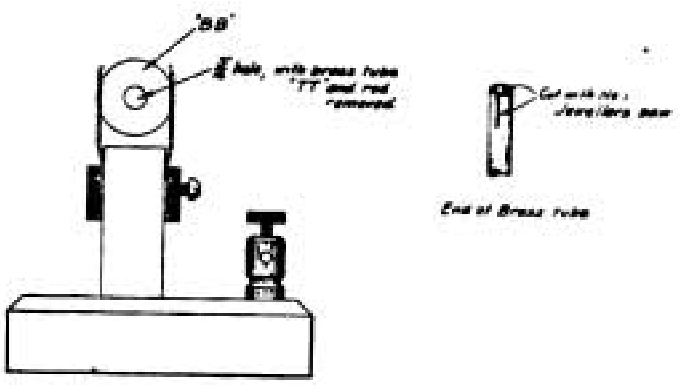


Fig. 1, Honorary Mention Article, J. F. Bernard

My condenser cost me 35 cents, which is for the stove bolt nuts that I use as separators. These nuts are 3/8 of an inch in diameter and 1/8 of an inch thick, which will space the plates a trifle less than 1/16 of an inch. The hole in them just passes an 8-32 threaded rod. The tin for the plates should be new and bright and may be smeared with vaseline to prevent rusting.

You may make the plates any size to suit your desires. Mine are 3½ inches in diameter for the stationary plates and 2½ inches for the rotary plates. My entire condenser has twenty-seven plates

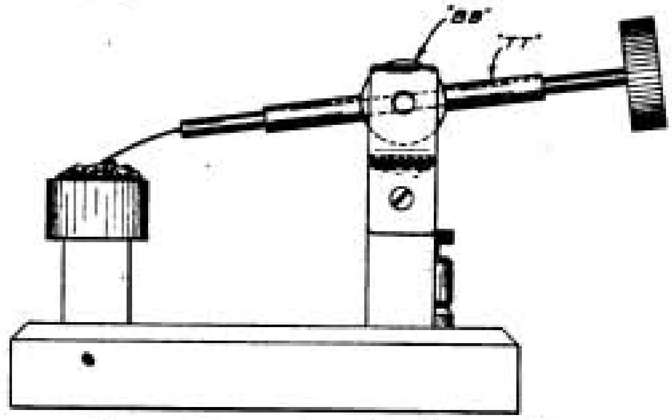
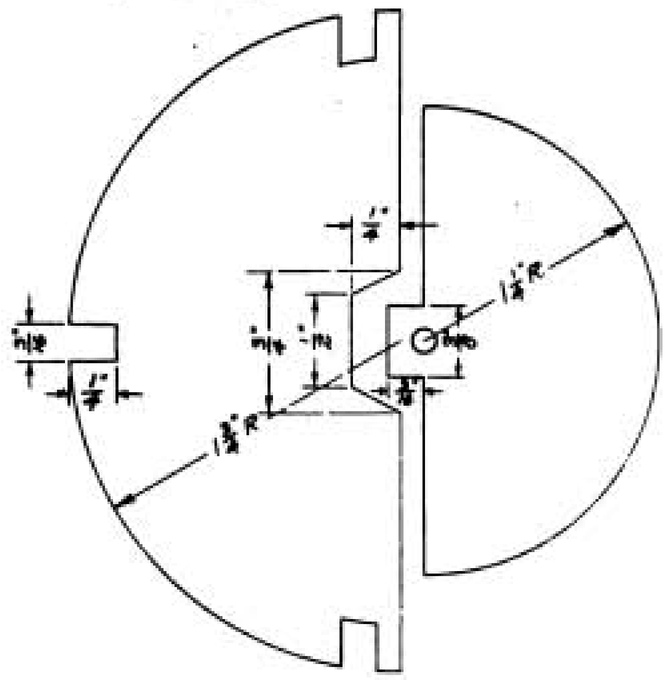


Fig. 2, Honorary Mention Article, J. F. Bernard

and the capacity of it seems to be rather higher than that of a popular condenser using the rotary sliding plate principle, which is ample for all ordinary uses.

I trust I shall not insult your intelligence by telling you how to construct a



Drawing, Honorary Mention Article, Leslie Long

condenser, but it may bother you to make the plates flat after they have been cut and punched. You can do this easily by placing them on a flat board and hammering them, beginning in the center and going towards the outside edge. Even if the plates are not flat they can be sprung slightly so that they do not touch after the condenser is assembled. Try it and see. My sketch shows the dimensions and shape of the stationary and movable plates.

LESLIE LONG, *Oregon.*

THE WAR

ERNEST · W · DEXTER
WIRELESS OPERATOR ON THE STEAMSHIP INDRADEO

WHAT WIRELESS MEN ARE EXPERIENCING AND THE INFLUENCE OF THE EQUIPMENT ON MODERN STRATEGY

FRESH from a cruise in hostile waters, Ernest W. Dexter, wireless operator on the British freight steamship Indradeo, arrived in New York recently on that vessel with a vivid story of how she had shown her heels in a long stern chase to a ship suspected of flying the German flag. His account of the Indradeo's voyage embraces many incidents, among them being the holding up of the freighter by warships.

The Indradeo steamed away from New York on May 15 for Gibraltar. Then she proceeded to Port Said through the Suez Canal and made her way to the coast of Sumatra, touching at a Dutch port. From there she steamed to Benang in the British Straits Settlement, off the west coast of the Malay peninsula. The war was then imminent, but hostilities had not yet been begun and the vessel pursued her course to Singapore and Shanghai unmolested.

It was after she had departed from Shanghai and was in the Yellow Sea that the European crisis came to a head. With it came a reminder to those on the Indradeo that warfare was the order of the day. It arrived in the shape of a cloud of smoke from the funnels of a steamship in the horizon astern of the British vessel. A glance through glasses at the other craft convinced the Indradeo's people that she was a ship to be avoided and preparations were made under the directions of the commander of the freighter—Captain T. R. Evans—to seek refuge off the Korean coast.

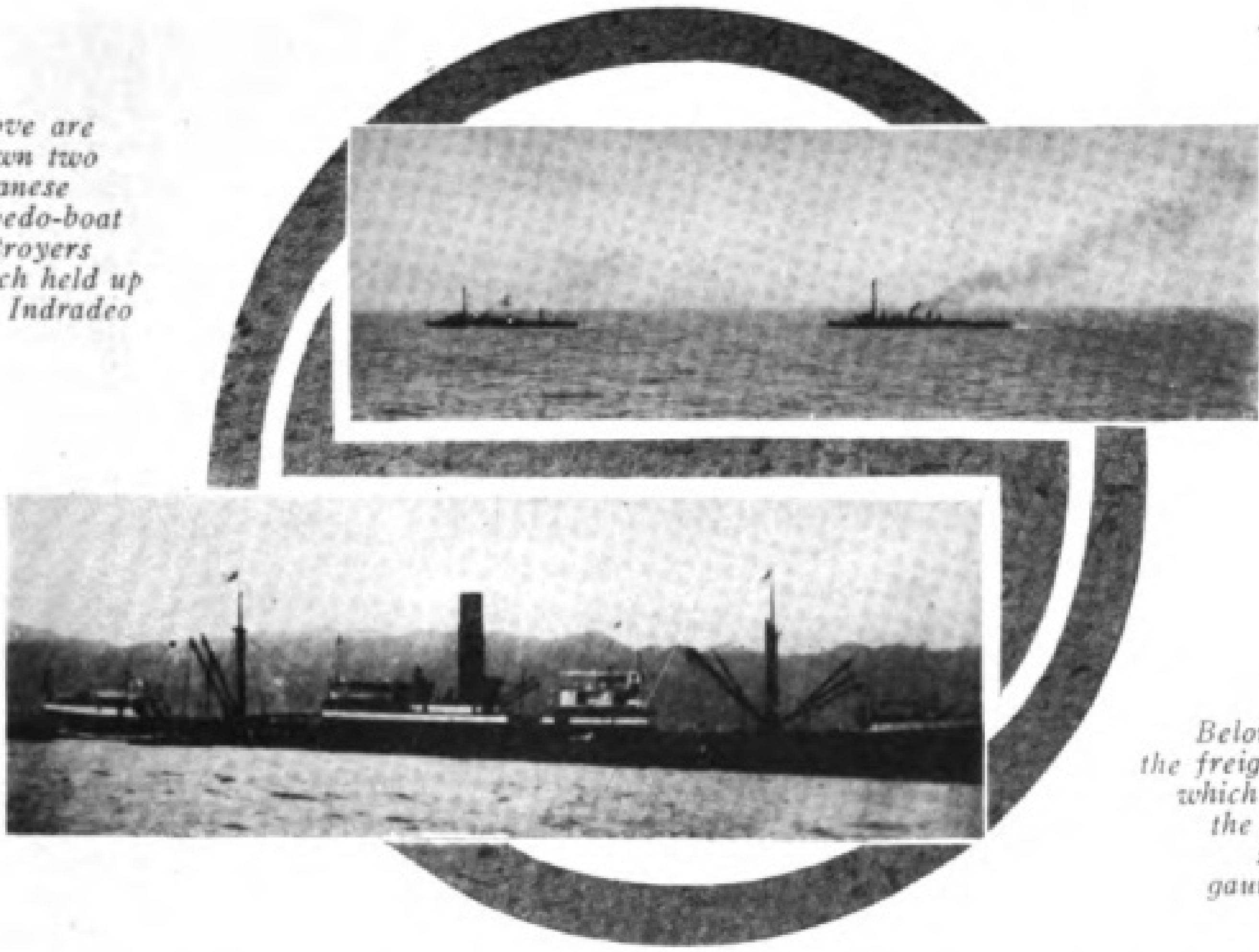
Under a full head of steam the Indradeo ploughed through the waves with the strange craft following. From time to time the course of the British vessel was changed in an effort to elude her pursuer. But the latter could not be shaken from her purpose and she kept her prow pointed in the direction of the Indradeo.

As darkness came on, paper was placed over the port holes of the British ship and orders were issued not to display any lights. During the chase the wireless was silent, the strange craft making no attempt to communicate with the Indradeo. Dexter had received instructions from Captain Evans not to send, but to keep alert for the reception of any messages.

torpedo-boat destroyers. They signalled to us to stop and we proceeded after we had given a satisfactory account of ourselves. After touching at Moji we went on to Yokohama. Here I heard considerable talk about the possibility of Japan having war with America, one man predicting that it would come within two years.

"We steamed back to Moji again from Yokohama and then started for the Philippines where my wireless was sealed up by officers of the American

Above are shown two Japanese torpedo-boat destroyers which held up the Indradeo



Below is the freighter which ran the war zone gauntlet

"We were running under such a high pressure of steam," said the wireless man, "that the heat from the funnels of the Indradeo melted the wire in my aerial. I soon repaired it, however."

It was not until the British vessel had reached a group of small islands off the coast of Korea that she lost sight of her pursuer. Then, the twenty-four hours' chase at an end, the Indradeo made her way to Chemulpo. There was no doubt in the minds of those aboard the vessel that her pursuer was a German ship.

"From Chemulpo we steamed toward Moji, Japan," said Dexter. "On our way we were held up by two Japanese

government. I was never permitted to forget that we were in the midst of warfare. I could hear warships talking with one another almost all the time, many of them being Japanese cruisers.

"While we were between the Philippines and Hong Kong we were stopped at night by a British destroyer which signalled for us to stop and then came alongside, playing her searchlight on us. One of the officers on the destroyer questioned us through a megaphone and, the answers he received being satisfactory, we were permitted to steam on.

"When we arrived at Hong Kong my wireless was dismantled by order of the British Admiralty to prevent interference. There was considerable activity at this port, all of the craft which entered being obliged to undergo inspection at the examination anchorage. One or two attempted to enter without stopping at the anchorage and shots were fired at them from the batteries on shore to enforce the orders.

"We steamed to Moji again from Hong Kong by way of Keelung in Formosa. In Keelung the fact that war conditions prevailed was again brought to my attention. During our stay at that port I witnessed some boat races and photographed them with my camera. I was seen doing so by Japanese soldiers who immediately questioned me. I had considerable difficulty in lulling their suspicions and escaping arrest."

In the course of her voyage the Indradeo touched at Honolulu. Here she found interned the German cruiser Geier, which was at her berth on the other side of the pier at which the Indradeo docked.

The last war adventure of the Indradeo occurred in the South Atlantic soon after she had passed through the Panama Canal. Here she was sighted by a British cruiser which signalled her to stop with flags and semaphore. The cruiser approached to a point within a quarter of a mile of the freighter, questioned her by means of signals. They were satisfactorily answered and the Indradeo continued her voyage.

Stories of mysterious wireless signalling on the Yorkshire coast by means of which the German cruisers were informed regarding the whereabouts of the British fleet, thereby enabling the kaiser's war craft to make their way under the cover of fog and darkness toward the shore and attack the towns of Scarborough, Whitby and the Hartlepools have been circulated throughout Great Britain. There have been reports also to the effect that smoke stacks and even house chimneys were used as secret wireless stations. Guglielmo Marconi, however, according to a newspaper dispatch from London, has little faith in the latter stories, and is quoted as having said that he did not believe that any wireless, to serve a useful purpose could be installed in that way. He declared that in any event it could not be a very dangerous apparatus and as the military authorities are alert it did not seem likely that concealed apparatus in active operation would be unearthed.

The same dispatch says that the direction-finder has found a new use, being employed by the War Office to detect the whereabouts of any wireless operated for the receipt or transmission of messages. The direction-finder was originally designed to enable the navigating officer of a vessel to take bearing of wireless telegraph stations with a view to finding the position of his ship or avoiding collisions with other craft.

In a newspaper dispatch from Panama it is asserted that the Canal Zone police recently discovered a wireless telegraph plant on top of a tall building in that city. The station was destroyed by the authorities, who declared that it was owned by a Danish West Indian negro. The British minister complained recently of the existence of a wireless station, giving its approximate location to the police. The latter located it after a search of several days.

A dispatch from Washington is to the effect that Lieutenant Crenshaw, naval radio officer in the Canal Zone, notified the Navy Department that the wireless of the British collier Protesilaus in Balboa harbor was dismantled by the Canal Zone police on December 10, after it was found that she had been sending code messages. A statement issued by the British Embassy in Washington declares that the Protesilaus received a wireless message from a British warship outside the three-mile limit. The port commander was requested by the captain of the collier to transmit the message to the British consul at Balboa to whom it was addressed. The port commander refused to allow the message to be transmitted and sealed the apparatus of the collier. The captain of the Protesilaus, it was brought out, had not been officially informed regarding the new wireless regulation, but notwithstanding the British officials conceded that the attempt to use wireless was improper.

How to Conduct a Radio Club

By E. E. Bucher

ARTICLE IX.

SINCE the passage of the United States radio laws governing the operation of the amateur wireless station there has been an insistent demand for a wave-meter of cheap construction having a fair degree of accuracy. That the market is not oversupplied may be accounted for by the lack of means for calibration. Many amateurs have been lead to believe that the wave-meter is a mysterious piece of apparatus far beyond their understanding. This is an erroneous impression, the fallacy of which should be known to all.

The new-comer in the amateur wireless field is at once confused by not having available a circuit of pre-determined wave-length with which he can make comparisons. For this reason he cannot get the best results out of his apparatus and therefore gropes about more or less in the dark.

The wave-meter is one of the simplest pieces of electrical equipment imaginable, consisting of a condenser connected in shunt to a coil of wire. If the capacity of the condenser or the inductance value of the coil is variable then the wave-length of that circuit is variable. The additional equipment required for making the measurement consists of a crystal detector and a pair of high resistance head telephones. It may be remarked that for amateur purposes a wave-meter having a variable condenser of the rotary plate type is more feasible than one employing a variable inductance.

Keeping in mind the amateur's needs, the writer recently made a series of measurements in the radio laboratory at the East Side Association Institute, New York City. He herewith presents the results for the use of members of radio organizations.

The coils and circuits which are described may be used as the secondary windings for receiving tuners or as a station wave-meter. In the first measurement a popular variable condenser of the Murdock type was calibrated against a standard by the substitution method. The resultant curve of capacity is given in plate No. 1. For example, division 20 on the condenser scale gives a corresponding capacity value of 0.001 Mfds.; division 92, 0.0005 Mfds., and so on. The 180th degree of the scale does not quite reach a value of 0.001 Mfds., but to be more accurate is 0.00098 Mfds.

Several condensers of the same type were checked against the standard and were found to be in remarkably close agreement. The amateur then who possesses one of these condensers may make free use of the curve for calibration purposes. Owing to slight variations in construction the capacity of other condensers of this type may not quite agree with the curve, but the experimenter making use of it is better off than the one working blindly. Two condensers of this type under test had identical values of capacity throughout the scale.

Similar tests were made with a small "Blitzen" variable condenser with which all amateurs are familiar. A curve of the capacity values corresponding to the scale readings are likewise given in plate No. 1.

Capacity Calibration of Murdock Condenser

TABLE NO. I

Division on the scale	Corresponding capacity in micro-farads
20	0.0001
34	0.0002
54	0.0003
72	0.0004

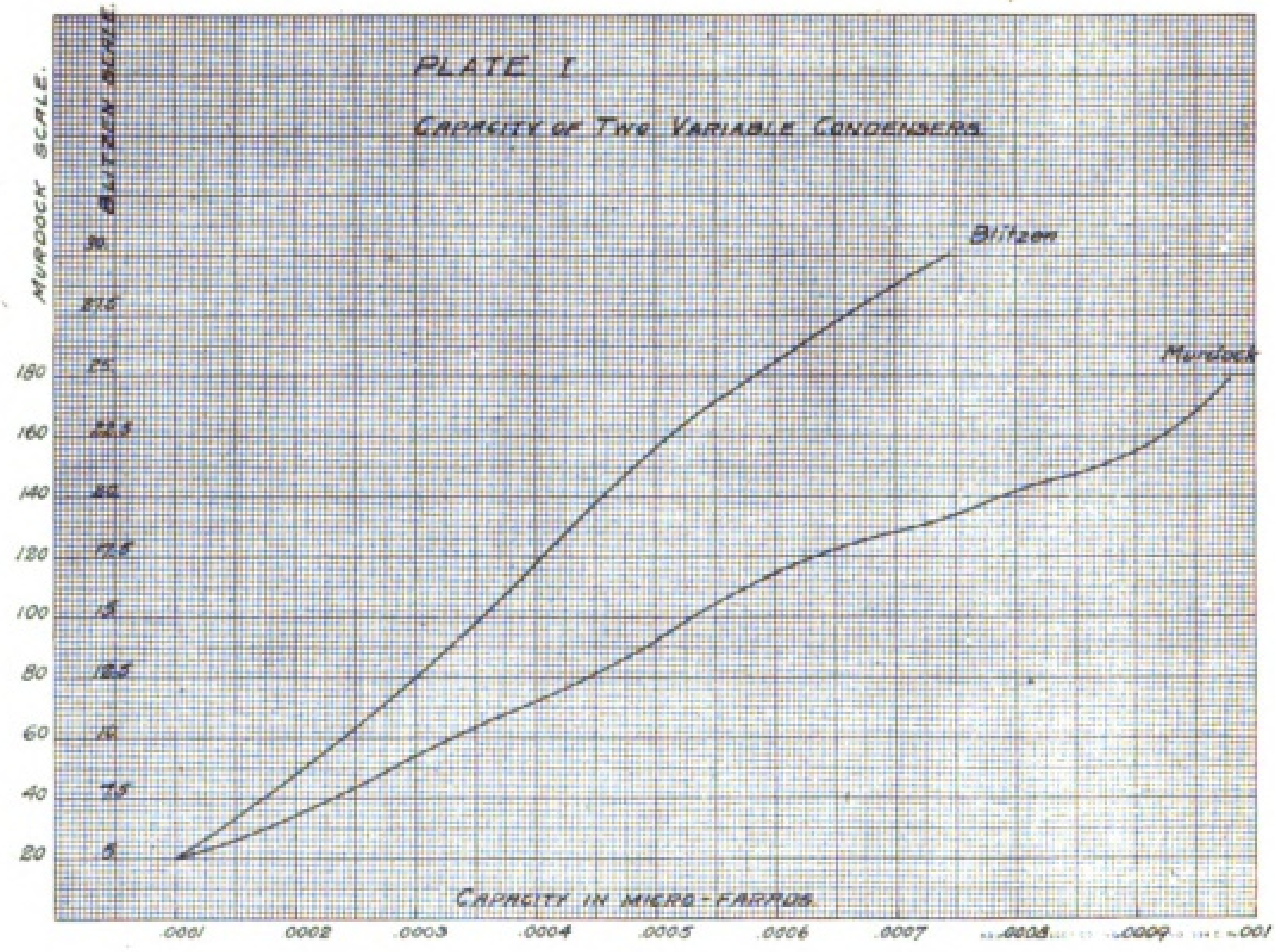


Fig. 1

92	0.0005
114	0.0006
128	0.0007
134	0.00073
145	0.00083
155	0.0009
180	0.00098

TABLE NO. 2

Similarly for the Blitzen condenser

Divisions on the scale	Corresponding capacity in micro-farads
5	0.0001
8.5	0.0002
12.5	0.0003
17	0.0004
22	0.0005
25.5	0.0006
27.5	0.00066
30	0.000745

Many requests are received for data on a coil and condenser (connected in shunt) for use as the secondary winding of a receiving tuner to have a range of wave-lengths up to and including 10,000 meters. It certainly contributes to the experimenter's pleasure to know the exact wave-length to which his detector circuit is set. It is then only necessary to make variations of the inductance in the antenna circuit until the desired station is heard. If the station (provided it is within range) is not heard, he is assured that the fault is not due to improper adjustment of the oscillatory circuits through lack of resonance.

To fulfill these demands a single layer of No. 30 S. S. C. wire was wound on a hard rubber tube having an outside diameter of exactly 6⅝ inches. It was wound for a distance of exactly 10 3/10 inches and the terminals brought to a standard condenser of known capacity. The capacity of this condenser was progressively varied and the wave-length of the circuit obtained as per the sketch (Figure 2), the crystal detector and head telephones being connected unilaterally as shown.

TABLE NO. 3

Wave-length of 10 3/10 inches coil in shunt to standard capacity

Capacity value in shunt	Corresponding wave-length in meters
0.00001	4,000

0.0001	4,750
0.0002	5,975
0.0003	7,250
0.0004	8,740
0.0005	9,425
0.0006	10,200
0.0007	10,750

The same coil used in the foregoing was then connected in shunt to the Murdock variable condenser and the following range of wave-lengths obtained:

TABLE NO. 4

Divisions on the Murdock scale	Corresponding wave-lengths in meters
14	4,000
24	5,000
36	6,000
46	7,000
66	8,000
84	9,000
128	10,750

The same coil shunted by the Blitzen condenser yielded the following range of wave-lengths:

TABLE NO. 5

Divisions on the Blitzen scale	Corresponding wave-lengths in meters
3	4,000
5.5	5,000
8.5	6,000
11.5	7,000
15	8,000
18	9,000
24	10,000

The amateur employing the foregoing tabulations is at once lifted out of the region of doubt and relieved of much anxiety. If the data given in tables No. 4 and No. 5 is plotted in curve form and then checked back against that in table No. 3 a slight variation may exist but for practical purposes may be ignored. Measurements by the substitution method are subject to the errors due to the "personal equation," and this must be taken into account for extremely accurate work.

Another coil made on a form exactly 3⅛ inches in diameter was wound closely with No. 26 S.S.C. wire for a distance of exactly 9¼ inches. The extreme terminals were shunted,

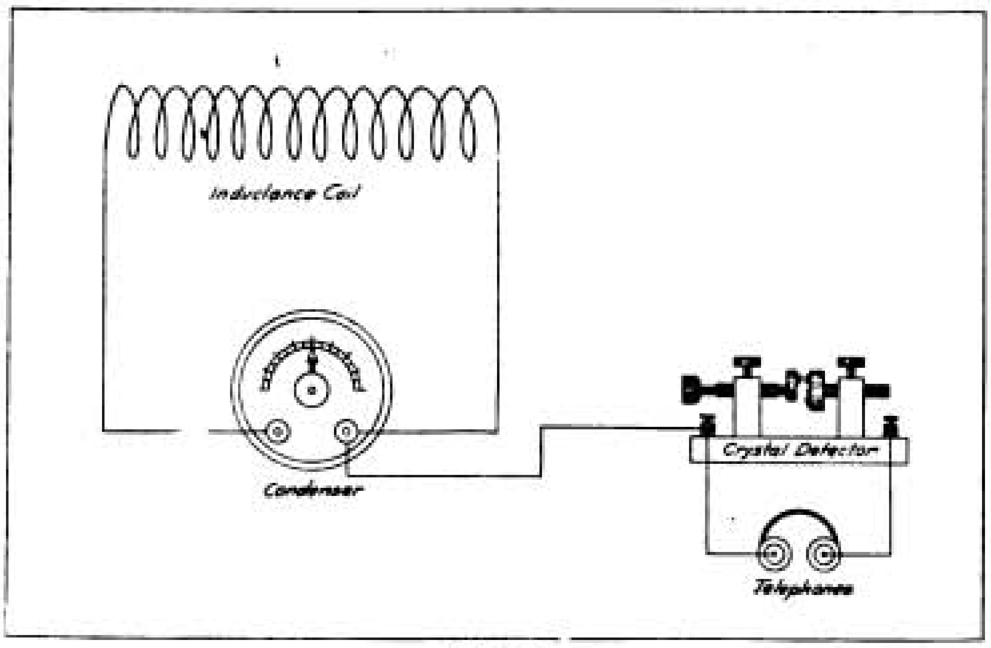


Fig. 2

first by a condenser of standard capacity, then by the Murdock condenser and finally by the Blitzen condenser. It was intended to furnish a circuit having a wave-length adjustment up to 4,000 meters. The coil so obtained may be employed as the secondary winding of a receiving tuner or as a station wave-meter.

The first measurement made was that of the natural wave-length of coil which was found to be 375 meters (not connected to earth). If all of this coil is used when receiving waves of 300 meters some energy absorption may be expected from the "dead-ends."

The following table gives the wave-lengths to be expected from the coil when shunted by a condenser of known capacity:

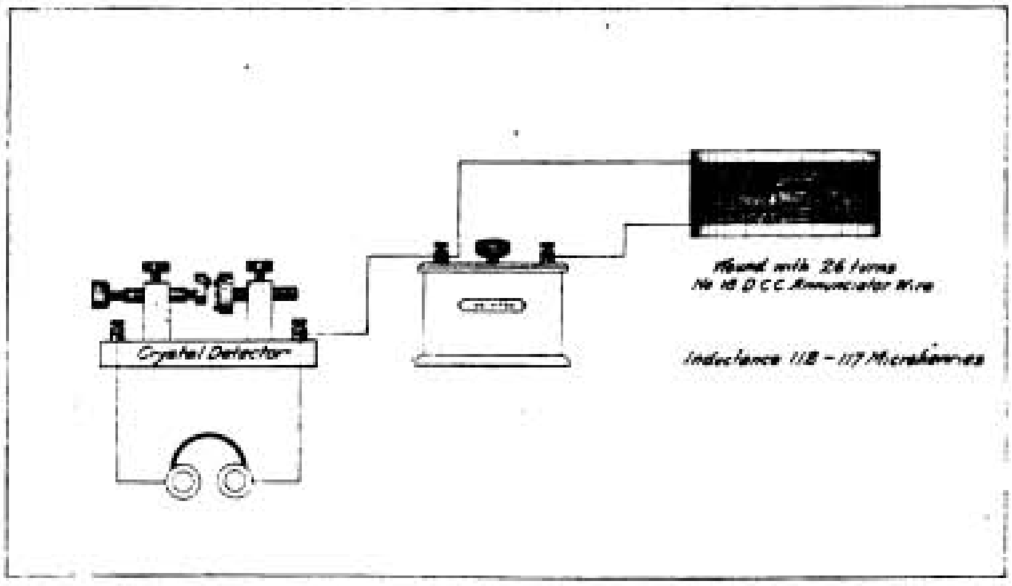


Fig. 3

TABLE NO. 6

Wave-length of coil 9¾ by 3⅛ inches with capacity in shunt

Capacity value in shunt	Corresponding wave-lengths in meters
0.00001	745
0.0001	1,530
0.0002	2,010
0.0003	2,470
0.0004	2,850
0.0005	3,180
0.0006	3,500
0.0007	3,800
0.0008	4,060

The same coil as used in the foregoing was connected in shunt to the Murdock variable condenser. It yielded the following range of wave-lengths:

TABLE NO. 7

Divisions on the Murdock scale	Corresponding wave-lengths in meters
8	1,000
20	1,500
34	2,000
56	2,500
82	3,000
107	3,500
139	4,000
180	4,500

The same coil shunted by the Blitzen afforded the following range of wave-lengths:

TABLE NO. 8

Divisions on the Blitzen scale	Corresponding wave-lengths in meters
2.5	1,000
5	1,500
8.5	2,000
13	2,500
19.5	3,000
25.5	3,500
30	3,740

An Amateur's Wave-Meter

The amateur may construct a wave-meter sufficiently accurate for private use on the following lines. When completed it may be operated from the calibration furnished in table No. 9.

An insulating form, 5½ inches in diameter, was wound closely with twenty-six turns of No. 18 D.C.C. annunciator wire having two extended terminals 10 inches in length. It was connected in shunt to the Murdock condenser as in Figure 3 and at various positions on the scale gave the following range of wave-lengths:

TABLE NO. 9

Scale readings on the Murdock condenser	Corresponding wave-lengths in meters
10	125
20	195
21	200
40	285
60	355
80	410
100	470
120	530
140	580
149	600
160	630
180	660

Here then we have a wave-meter of just the proper range for the elementary amateur station.

As a matter of experiment the same coil was connected in shunt to the Blitzen condenser. The combination gave the following range of wave-lengths:

TABLE NO. 10

Scale readings on the Blitzen condenser	Corresponding wave-lengths in meters
2.5	120
5	190
10	300
15	380
20	440
25	490
30	540

At a wave-length of 200 meters the capacity of the Murdock condenser is 0.0001 Mfds., hence the effective inductance L in Cms. is obtained by the following formula:

$$L = \frac{\lambda^2}{355^2 \times C} \qquad \text{(No. 1)}$$

Substituting

$$L = \frac{200^2}{355^2 \times 0.0001} = 112,612 \text{ Cms.}$$

or 112.6 microhenries.

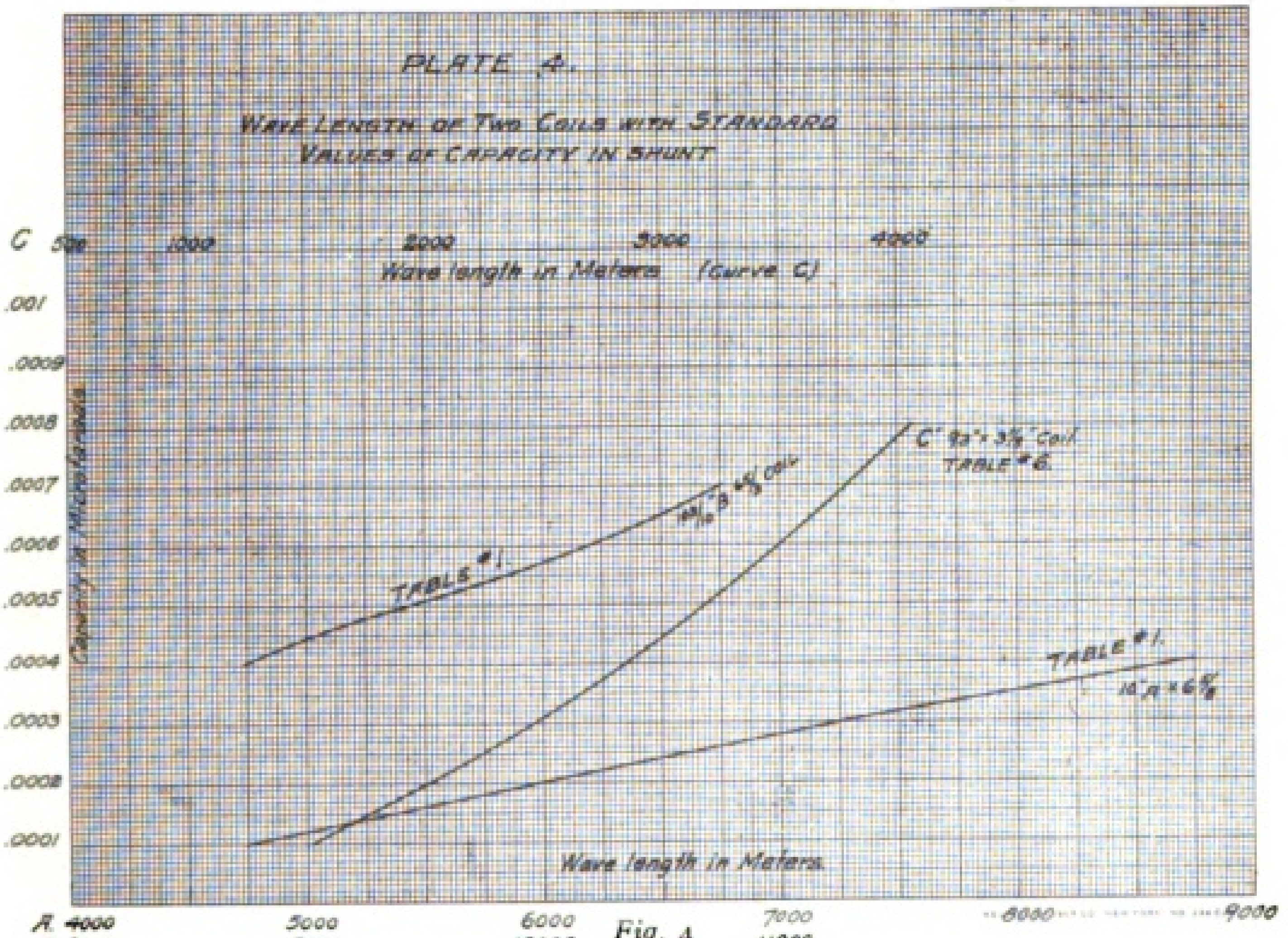


Fig. 4

The data given in tables No. 9 and No. 10 may be conveniently plotted in curve form and the intermediate values thus obtained.

If it is desired to obtain wave-length values up to and slightly above 600 meters with the Blitzen condensers the coil should have about thirty-four turns of wire instead of twenty-six.

The data given in tables Nos. 3 and 6 has been plotted in curve form in plate No. 4.

From the data given in tables No. 1 and No. 9 we are enabled to calculate the inductance of the coil used in connection with the wave-meter, Figure 3.

At a wave-length of 600 meters the capacity of the condenser is 0.00086 Mfds. and by the same formula (No. 1) the effective inductance is 117,850 Cms. or 117.8 micro-henries.

The experimenter will now understand how the effective inductance of a coil changes with each change of frequency.

The inductance of the other two coils described may be calculated in the same manner, using the wave-length data as tabulated.

In a future issue data on coils of other dimensions will be given.

(To be continued)

CONFESSIONS OF AN AMBITIOUS AMATEUR

WHAT wireless operator, starting as an amateur in the gentle art of manipulating a set, sitting up night after night endeavoring to untangle various messages, awakened in the early hours of the morning by the spectre of buzzy and scratchy sounds peculiar to wireless signals—what wireless operator has not, upon suddenly finding that he has copied in breathless silence a complete message, experienced a feeling of might, a feeling that he can now easily conquer the world, a feeling like Napoleon must have had at times!

Every licensed amateur has been through this. Every beginner will know it some time. I was thus affected, but I still believe mine was an exceptionally severe case. I well remember the day.

Certainly this great achievement must be celebrated, I reflected, but my bank account warningly announced festivities limited to pleasures procurable for two dollars and the celebration was abandoned.

My next thought was to improve my set, to invent a machine that would receive messages from all over the world and quite casually to acquire a reputation striven for by others for years. The records of great electrical engineers would apppear as a light of small power; two volts alongside mine of a thousand watt mazda. That would be nice.

My next step called for a considerable amount of brain work on my part. I considered the choice of two futures. I would first organize the largest wireless telegraph company in the world. Or perhaps I would invent a wonderful machine for the reception of wireless signals.

My intentions soon gravitated toward the latter ambition, for on due reflection I recalled the obvious fact that it would take capital to start a company and, as mentioned before, my available funds were twin dollar bills.

So I began preparations to facilitate the building of the receiver, without any definite plan in view except to complete it as soon as possible. I first installed in my room a kitchen table, a few old tools, numerous nails, a bottle of shellac, and a large bottle of witch hazel—the latter to be used as first aid to the injured—and various other articles to assist me in my researches. I hung a sign over the table with the word LABORATORY, and fastened to the door another adorned with a skull and cross-bones and the words ELECTRICAL LABORATORY—DANGER! 50,000 volts. My last effort in sign painting consisted of a large red cross affair suspended over the bottle of witch hazel. The room then wore a thoroughly satisfactory air of unsolved mystery. I was ready for work.

After three days of experimenting I ceased manoeuvers to ascertain the extent of my labors. I found that I had constructed three detectors of rather crude design and littered the floor with numerous pieces of coal which had been broken in an effort to discover a new crystal. I will not go into further detail on these three days of experimenting. Let it suffice to say that my sole contribution to contemporary science was vocal, with a partially squashed finger following poor aim with the hammer as its inspiration.

Just then a sudden idea possessed me and I was busy again. Advertised in the magazine on my table was a motor requiring 10 volts 3 amperes for its operation, and also a dynamo guaranteed to generate 50 volts 5 amperes. My idea was simple. I would, with the aid of eight dry cells, cause the motor to rotate, which would do the same good turn to the dynamo through a belt connection. As soon as the dynamo had acquired sufficient speed to generate the guaranteed 50 volts 5 amperes, I would hastily disconnect the batteries driving the motor, and in its place connect the leads from the dynamo.

Fully convinced that all electrical engineers would be confounded I prepared also to stop the contrivance, figuring that as the motor required but 10 volts 3 amperes while the dynamo generated a larger current the motor would speed up so rapidly that the outcome might be dubious.

Now if this could be done on a small scale it certainly could be accomplished on a larger one, and by forming a company (my ideas being still rather vague on this subject) it would be but a matter of days before I controlled a monopoly on electric lighting. This, of course, would put the Edison and other large electrical companies out of business, which was unfortunate.

But I must not be animated by that spirit of revenge which is occasioned at times by excessive light bills, I reflected—other companies could have the privilege of using my invention, with proper financial compensation.

In preparing to carry on experiments along this line I came face to face with a familiar and distressing detail: it would require capital to build the dynamo and motor.

I therefore restricted present operations to rolling down mv sleeves again and decided to let this matter rest for the time being, keeping it an absolute secret; both of which I accomplished, the latter only by exerting the greatest will-power, which am proud to say I possess in abundance.

Appreciating that I must not remain idle, however, as idleness dulls the mental faculties, I sought a way out of the difficulty. What I required was money, and I racked my brain for some get rich quick scheme. Days of deep thought on this subject brought no reasonable solution of the problem. Meanwhile my laboratory resembled the justly famed snow scene from Way Down East; it was littered with scraps of paper, once valued memoranda of money raising projects that had outlived their usefulness.

I resorted to this means of disposing of the omnipresent problem not so

Sparks were jumping everywhere; then they suddenly went out, as did every electric light in the house

much from intentions of a permanent record, but that I might keep every available particle of brain matter occupied with more important subjects.

You have tried no doubt to recall a certain name, or place, which has

I racked my brain in an effort to evolve a money-making scheme

a sign of some kind. In a moment I saw everything clear; I would start a company of my own, on a small scale, and gradually work up to the heights?

The details followed swiftly. Amateurs needed oscillation transformers to comply with the new law. The cheapest oscillation transformer on the market at that time was ten dollars. I would build one to be sold for eight, cost of material being about $1.59. Other devices would follow.

But even this was beyond my resources. Very reluctantly I faced the realization that I could not do this work alone. A friend finally consented to trust to luck and furnish half the capital, receiving therefor half of the profits, which I deemed a very generous arrangement and one which reflected redundantly to my credit.

We rented a small workshop from an acquaintance for five dollars a month (payable at the end of the month) purchased material for the two oscillation transformers and adopted the name Seco Wireless Apparatus Company, which was duly registered with fitting formality.

Work was started on a Monday morning and in three days two oscillation transformers were completed. At that rate we were losing money, as we had to sell the instruments to jobbers at four dollars, to be retailed at eight. However, by deducting the time occupied in intermissions for the regular half-hourly smoke, we figured we could build two a day. This looked cheerful when recorded on paper, and we were enthusiastic that evening.

But a more serious problem soon arose. Try as we might, we could not sell the instruments. Dealers conceded their irreproachable appearance until requested to buy them. After four days unsuccessful drumming we had letter heads printed, wrote two hundred forcible letters to amateurs in Brook-

slipped your memory. And you have given it up in despair, only to have it bob up when you least expect it. That is what happened to me.

I was dreaming about wireless, as I had been doing for two weeks, which I understand is not unusual with the wireless fiend who is nearing the saturation point. I was the president of the greatest wireless telegraph company in the dream world, sitting in my spacious office before a large mahogany desk. A number of stenographers were taking dictation on the various inventions on which I had yet to put the finishing touches, and my desk was covered with newspapers containing numerous articles informing the public of my wonderful inventions. Then something unusual occurred. All my previous dreams on wireless had ended in a terrible catastrophe, such as falling from an aerial support with great swiftness to the earth. This dream was different. A light came from somewhere; or maybe it was an omen, lyn, and spent all our reserve funds in stamps.

We did not receive one reply.

This considerably dampened my ardor, evaporated my great fatherly love, my ambition to assist amateurs, even my aim to try to modify the two hundred meter wave length law. I even considered employing my heavy influence to have the law changed, to insist that the allowable wave-length be reduced to one hundred meters. That would be a crushing blow.

The following day the Seco Wireless Apparatus Company closed its massive portals, the obsequies of the company being assisted by the turning of a key and a drizzling rain.

My pride was wounded, but my spirit could not be crushed. I remembered the jobber was to sell the instruments for eight dollars, and all he had to do was to wrap them up. Instantly I saw the advantages of being the jobber myself.

There was rent of a store to consider, however, and my reserve fund had been completely consumed in the support of the Seco Wireless Apparatus Company.

I therefore decided to use the next week in experimenting on my station—installed by a friend for due compensation—and add a little more knowledge to the abundant supply I had already acquired, if such a thing was possible.

I found, quite to my surprise, that if I disconnected the wire that ran to the water pipe I could still receive signals, quite faintly it is true, but nevertheless I could read them. On the other hand, if in addition I took off the wire going up on the roof, I could hear absolutely nothing. I also learned all about pushing a little dingus up and down a spool of wire; but what bothered me the most was, what I believe is called a variable condenser. By looking closely at its construction I found the two sets of plates were in no way connected to each other, and was very much puzzled as to how a signal could get across. So I took a piece of wire and fastened it between the two sets of plates, after which the signals passed to my phones. I prided myself on this, as anyone could put metal plates close to each other, but it remained for me to show the signal how to get to the other side. It was an advance in economic efficiency.

After a period of a month, in which I made still more revolutionary discoveries, I concluded to send messages myself, but on an instrument of some power. I therefore constructed a condenser of tinfoil and glass, made a spark gap, borrowed a key and bought an electrolytic interrupter and an old 1 kw. transformer, at what unhesitatingly proclaimed itself a junk shop. I had by this time acquired the necessary knowledge of how to connect a sending set, using the house current as a source of energy for the two posts on the side of the transformer.

This done I stood in a statesmanlike pose, which I considered a fitting attitude, and with one hand thrust in my coat, the other on the key, endeavored

A truly terrific sparking sensation passed from my hair to my heels

to recall some suitable speech for this occasion. Becoming impatient to press the key, however, I decided to make the speech afterwards.

One final penetrating look assured me that everything was as it should be, and I pressed the key. Instantly there was a ripping sound and my beautiful condenser crashed down in a mass of blue flame. Sparks were jumping everywhere. Then the sparks as suddenly went out; so did every electric light in the house.

With that mental agility for which I am noted I recognized in a twinkling that Mr. Edison thought I was using too much current and had shut off the power. No; that couldn't be it; it seemed improbable that he would make others in the apartment suffer. Ah! It was an accident at the powerhouse.

Groping for a match I lit the gas and smiled easily at my coolness in the face of an accident. Then I waited for the lights to assume their accustomed glow, which they did at the end of some thirty minutes.

I decided then to press the key more gently another time, endeavoring to use as little current as possible.

Again the blue spark, but I feared not. I even laughed contemptuously. The next second the wire running diagonally across the ceiling and thence to the roof, dropped on my head. A truly terrific sparking sensation passed from my hair to my heels, and I found myself in a most unbecoming attitude on the floor, with a considerable pain in my head.

For an instant I thought I was blind as well. My fears were groundless; it was simply that lights had again foresworn their brilliancy. Arising slowly to my feet I tested the disposition of that wire very gingerly, first with a stick and later with a finger. I was surprised to find it had again resumed its normal behavior.

A little later the janitor laconically informed me that an electrician had been summoned to remedy the trouble with the apartment's lighting, and I, with great presence of mind, quietly dismantled my sending set. This was accomplished without mishap except that when I poured the liquid from the electrolytic interrupter into the bathroom basin it inconsiderately took the enamel with it. The following morning the pipe beneath the basin, whose function was to act as a drain, had silently disappeared as well, leaving no trace except a little stump sticking out of the floor.

When the investigating electricians arrived, however, there was nothing in my experimental laboratory nor any traces of research or red cross equipment. My bedroom disclosed nothing also, so after endeavoring to find the cause of the disturbance they sought apartments below, and left after charging five dollars for the investigation. It has always been my principle to be fair and just, and while there was, of course, no reason for me to believe I had in any way caused the trouble, I determined to pay this charge myself, in as short a time as possible. And I shall. Up to the present time, however, I have been unable to do this.

Nothing daunted by the episode just related, I later reassembled my transmitting set and improved the connections greatly by placing two 3-ampere fuses in the primary circuit, and by the construction of a break in system attached to the key. By pressing the key the gap received a spark of great intensity and volume, accompanied by a most businesslike sound, and at the same time my receiving set was disconnected. When I released the pressure on the key, the spark ceased, and also the businesslike sound, and the connection to my receiving set was complete for the reception of wireless signals.

This was not a high speed apparatus. It had a limited sending capacity of approximately ten words, at the end of which time one of the fuses usually ceased to perform its duty of conducting the current and announced its intention by a little spurt of smoke. I could send for at least one minute before replacing a fuse and—my sending being quite rapid—this slight inconvenience and expense was more than repaid by the size of my spark.

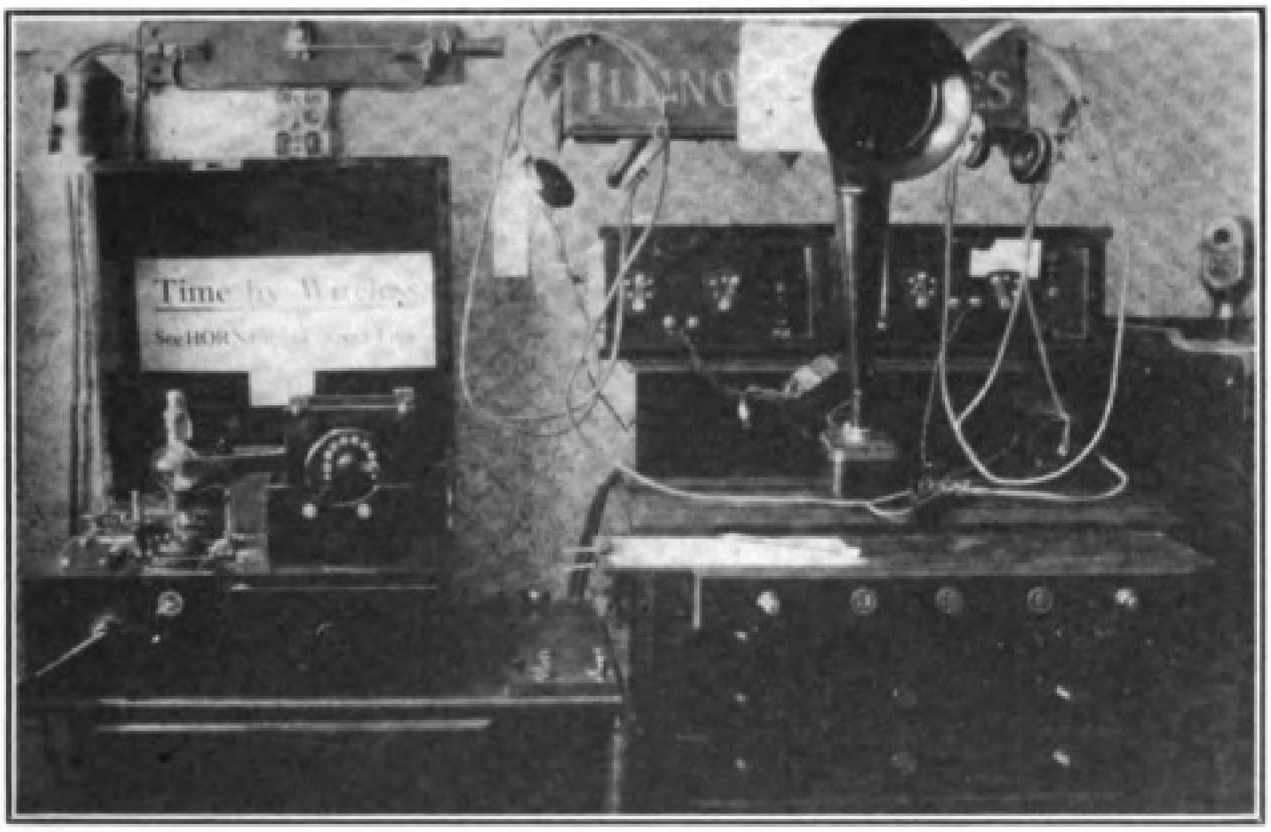
I completed my transmitting set by the connection of an oscillation transformer from the stock of the defunct Seco Wireless Apparatus Company, and constructed a wave-meter in an endeavor to ascertain the length of my wave. I found that this task required patience, for a fuse usually blew every fifteen seconds when the key was depressed for that length of time. Yet I finally succeeded, and discovered that the greater my distance with the wave meter from the oscillation transformer the higher my wave length became. I saw instantly that when operating the set I should place myself in as close proximity as safety would allow, and I felt quite satisfied that I was by this action reducing my wave length.

Two incidents which occurred simultaneously discouraged this belief. One was the receipt of a letter of warning from the government, estimating my wave at four times its allowable length, and arriving just about the time when my break-in system without cause or consent deflected the current directly into my receiving set and thence to myself, being that we were mutually coupled by the cord leading to the phones which rested in a jaunty position upon my head. I again experienced that terrible sparking sensation But the fuses which I had so deliberately abused returned good for evil by blowing promptly.

I have since lost much of my ambition to improve the present day types of apparatus and have sought more remunerative endeavor, yet every time I recall this incident I somehow feel that placing those fuses in the primary circuit was one of my best ideas.

Perhaps because it was my last one.

TRIPLE VALVE AMPLIFYING OUTFIT COMBINED WITH TELEPHONE



The accompanying photograph shows a triple valve amplifying outfit, combined with a loud speaking telephone, as constructed by N. O. Horner, of Cleveland, Tenn.. Although located several hundred miles from Arlington, the time signals may be heard at a distance of 30 feet from the horn. The circuits used are those published in the January, 1914. issue of The Wireless Age, in one of the articles of the series on "How to Conduct a Radio Club."

Another Amateur Fined

On November 24th Judge Wellborn, of Los Angeles, fined an amateur for operating a wireless station without a license. The defendant contended that because his apparatus had not been reported as interfering with commercial stations and because, in his opinion, he could not transmit beyond the boundaries of the state in which his station was located that his equipment did not require a license. The conviction was obtained on the ground that his station could interfere with interstate communication to licensed amateur stations in his vicinity, and the defendant was cautioned against further unlicensed operation.

Secretary Daniels' Annual Report

THE annual report of Secretary of the Navy Daniels, which was recently issued, touches upon several interesting phases of wireless telegraphy. He points out the value of the art and refers to the demonstrations of its worth brought out during the wars in Europe and Mexico. The necesssity for wireless between the United States and Western Canada is called attention to, Mr. Daniels declaring that additional high-power stations are needed for the present military system. He also refers to the wireless compass now in course of construction near the entrance to New York Bay and the one planned for Cape Cod. That division of the report dealing with wireless is in part as follows:

"The primary purpose of the naval radio establishment is a purely military one, and this has been emphasized by events in connection with our occupation of Vera Cruz and still more forcibly during the progress of the war in Europe; and while this feature of our equipment is one in which the naval service alone is directly interested, it is a matter of scant knowledge how great a part the naval radio establishment plays in everyday commercial life. An idea of this may be had from the statement that we have opened twenty-five stations to commercial business, and that every ship of the Navy is herself a commercial station, as all private messages handled are paid for by the senders. During the war in Mexico, when all land wire and cable communication between the United States and the southern part of Mexico was interrupted, the naval vessels on the west coast afforded the only means of quick commercial communication and soon began to handle a large business.

"In addition to the paid commercial business carried on by the naval radio stations the system renders a free service of inestimable value in the daily transmission from Arlington and other stations of the time signals from the Naval Observatory, thus enabling ships at sea, even though far beyond the range of transmission of their own equipment, to determine their exact chronometer correction. Even sailing vessels which habitually make long voyages and which have no power with which to operate a radio station of their own may, at trifling expense, be equipped to catch this signal. Our own naval ships have carried it far into the Mediterranean.

"But it is not the seafaring people alone who make use of this time signal. It is attracting great and growing attention throughout the country. Jewelers have installed receiving apparatus for the purpose of getting it, and many amateur receiving stations have been established for the receipt of the time and weather reports. A leading jewelers' trade magazine has informed the department that there are not less than 300 jewelers throughout the country who now receive the time signal by radio, and that the number may be expected to grow to about 3,000. The same journal says that although maritime interests may have been the primary reason for the erection of the Arlington station, it will benefit more people on land than at sea. It is a pleasure to record this evidence of the value of this service, as it is also a matter of pride that the first radio time signals ever sent out were from our own naval stations.

"Another interesting feature of this free radio service which should be of incalculable benefit to shipping is found in the radio compass now under construction at the Fire Island station, near the entrance to New York Harbor. This device is intended to send out radio signals of such a character that a vessel in a fog may get a close approximation of her bearing, or compass direction, from the station. By means of observations taken 5 or 10 miles apart it should be possible for the vessel to determine her actual position with fair accuracy. This is the first installation of this type to be made in this country; but a second installation of different type, though answering the same purpose, is projected for the station at Cape Cod. The signals sent out by the radio compass at Fire Island will necessarily be limited as to range, but the Cape Cod installation will allow of a ship calling the station in the usual manner from any distance within the ship's ordinary range and receiving a definite reply as to her bearing from the station. In the case of Fire Island the ship will determine her bearing from the character of the signals continuously emitted; for Cape Cod the station determines the bearing of the ship from her calling signal and sends the information back. If these installations prove as successful as anticipated, the radio operators of ships will become an important part of the navigating force.

"One of the most important parts of the naval system, from a public-service point of view, is the Alaskan branch. On account of their isolation the stations in this division are also the most difficult, though not the most expensive to maintain. Regarded merely as an aid to the important shipping in these waters, their value is very great. In addition they play an important part in the rapidly growing commercial business of inland Alaska. The Army cable is the only wire connection between western Alaska and the United States, except the very roundabout route through the Canadian northwest. This cable is laid in difficult bottom and is expensive to maintain. Its operation is frequently interrupted, and at such times the radio stations must be depended upon to handle the traffic. The performance of the radio stations has been very creditable in this work, but it is, of course, out of the question for the present few and rather low-powered stations to handle the entire traffic carried by the cable in the busy season. A medium high-power station to replace the small station at the Puget Sound Navy Yard and an additional station of the same type in Alaska are needed additions to the present military system, and such stations would practically solve the question of uninterrupted commercial communication with Alaska, allowing the abandonment of the cable with a great saving to the government and a much cheaper service to the public. With the building of the Alaskan railway the need for additional stations will become more urgent.

"These are features of our radio installation of more or less general interest, but the military feature is the one with which the department is more intimately concerned. In this field there has been an enormous advance during the past year, and much of this progress, perhaps the greater part, is due to the original work of the department. Commercial progress in the art has been notable, but it must be remembered that the naval problems in radio work have no parallel in commercial work; that foreign governments guard carefully their own discoveries and developments; and that therefore the Navy Department is dependent upon its own expert talent for military progress. For this reason it is very gratifying to be able to state that we have kept abreast of the times and have made material progress, and that our equipment is such as will place us in a position at least not inferior to the corresponding service of any foreign Government, if we do not, in fact, surpass it.

"The erection of the high-powered stations authorized for San Diego, Honolulu, Guam, Manila, and Tutuila has been delayed through inability to acquire title to the private property selected as a site at San Diego. With the present statutory limit as to cost it is impossible to build fully adequate stations unless the cheapest construction is resorted to. An absolutely necessary saving under the circumstances was offered by letting a single contract for the steel towers at San Diego, Honolulu, and Manila, but the delay in connection with the transfer of title at San Diego has delayed the whole chain. The title question has, however, just recently been favorably settled, and proposals for the towers, the largest single item of cost of each station, will be advertised this month. The rapid completion of the Panama Canal made it necessary to proceed with the canal station independently. Delay has been encountered there also, owing to delinquency of contractors, but the station is now rapidly approaching completion, and it is expected that the first tests of the installation will be held about March 1. In this one contract the direct saving to the Government, due to information resulting from experimental work, was sufficient to cover the total ordinary expenses for experimental work during a period of five years.

"The Naval Observatory has added to its record of achievement this year by determining directly the difference of longitude between Washington and Paris, and finds this difference of longitude between the official meridians of these capitals to be $5^h 17^m 36^s.658$.

"The velocity of transmission of radio signals given by these observations is 175,000 miles per second, which is probably the best value yet obtained, though owing to the distance (3,831 miles on a great circle) between the stations, which, compared with this velocity, is small, it is subject to a probable error of $\pm$ 16,000 miles per second.

"These observations constitute the first direct determination of the difference of longitude between Washington and Europe, and it is the first time that radio has been used for trans-Atlantic longitude determinations.. Independent observations were made by the United States and French Governments, each having two parties (which interchanged stations at the middle of the observations), one at the United States Naval Observatory and the other at the Observatoire de Paris, using the Navy radio station at Arlington (Radio, Va.) and the Eiffel Tower, respectively, for radio transmission."

HEWITT'S NEW INVENTION

Peter Cooper Hewitt, of New York City, has announced that he has completed the preliminary work on a new alternating current generator which is a development of his mercury-vapor lamps and rectifiers. Mr. Hewitt is quoted as having said that he had about finished a variation of the vacuum rectifier which would multiply the possibilities of wireless telegraphy and telephony.

He said that after he had found that if the air is exhausted from a tube in the bottom of which there is a small quantity of mercury and an electric current is then passed through the tube, a vapor is formed by the mercury which not only conducts electric current, but produces a number of extraordinary phenomena. He found that when the tube was connected with the wires of an ordinary telephone it would produce a loud roaring sound which made it impossible for persons to hear one another while speaking over the wire.

After several years' work, however, he overcame the noise in the tube. This was accomplished by careful adjustment of an inductance and a resistance coil through which the wire from the positive electrode passed to the battery; by changing the shape of the tube until he had gotten the positive electrode a certain distance from the negative electrode, and by making the negative electrode of a fine platinum point protruding a fraction of an inch above the mercury and capped with a tiny bit of mercury. Even then it would not work right, until he had made the positive electrode in the shape of a small disk with a hole in its center and placed the platinum needle directly under the hole. He then found that the current spread from all parts of the pierced positive disk simultaneously and entered the tiny platinum point noiselessly, and the problem had been solved.

Mr. Hewitt said that the most important phenomenon produced by the vapor tube is this: With the electrodes adjusted as they are in the receiving apparatus, an alternating electric current is transformed into a smooth direct current on passing through the vapor. This makes it possible to catch the wireless messages.

VESSELS EQUIPPED WITH MARCONI APPARATUS SINCE THE DECEMBER ISSUE

NAMES	OWNERS	Call Letters
Northern Pacific	Great Northern Pacific Steamship Company	WIM
Dacia	Edward N. Breitung	KGD
Welch Prince	Prince Line	YYM
Siamese Prince	Prince Line	YYN
Francis Hanify	J. R. Hanify Company	KRA
Charlton Hall	Isthmian Line	KLU
Chipana	New York and Pacific Steamship Company	YYQ
Calonia	Standard Oil Company of New Jersey	KSP
Wico	Standard Oil Company of New Jersey	KNN
Brilliant	Standard Oil Company of New York	KTI
Comet	Standard Oil Company of New York	KTJ
Perfection	Standard Oil Company of New York	KTN
Radiant	Standard Oil Company of New York	KTR
Vesta	Standard Oil Company of New York	KTS

THE SHARE MARKET

New York, January 19.

Trading is only moderately active in the outside market, but the brokers report a perceptible underlying strength attributed to the ease in money and the country's excellent credit facilities. Canadian Marconis are inactive but sellers have asked a fractional advance for their holdings. The English issues are apparently being held abroad and no sales are reported for the day. The demand for American Marconis is light and orders received since the reopening have been for small quantities. Today's trading in American shares was maintained at a slightly higher level than the prices reported in our last issue and the fractional advance is holding firm.

Bid and asked prices today:

American, 2⅝—3; Canadian, 1¼—1⅝.

Not traded in, but based on last quotation: English, common, 9—12; English, preferred, 8½—11½.

FIRE DESTROYS UNITED FRUIT COMPANY'S PLANT

The wireless plant of the United Fruit Company, at New Orleans, was recently destroyed by fire. The station, which was equipped with Marconi apparatus, had a radius of about 2,000 miles.

CONTRACT NEWS

The vessels of the Standard Oil Company have been re-equipped with Marconi apparatus following the sustaining of a preliminary injunction by United States District Court Judge Hough restraining the DeForest Radio Telephone and Telegraph Company, the Standard Oil Company of New York and Lee DeForest from manufacturing, selling or using wireless sets, held by the Marconi Wireless Telegraph Company of America to be an infringement of its patents.

The steamship Dacia of the Hamburg-American Line, which was recently purchased by Edward N. Breitung, of Marquette, Mich., and placed in American registry, has been equipped with a Marconi 2 k.w. set at Galveston, Texas. Newspaper dispatches from Washington say that the Dacia has been loaded with cotton at Galveston and will be used in trade to Europe. In that event it is declared that British warships will consider her transfer to the American flag illegal and seize her on the high seas. Another report is to the effect that she will not be interfered with.

SIACONSETT STATION RE-OPENED

The Siaconsett station of the Marconi Wireless Telegraph Company of America, which has been closed as regards the transaction of business since September 28 at noon, has been authorized to again receive and transmit messages through an order issued on January 16 by Secretary of the Navy Daniels. The station is one of the most important wireless telegraph points of communication on the Eastern coast of the United States, being extensively used to transmit and receive messages from shore to ship and from ship to shore. The order authorizing the reopening of the station followed the issuance by the Navy Department of new rules for the direction of messages and a statement by the Marconi Company that they were acceptable.

RESTRICTIONS ON HAWAIIAN MESSAGES REMOVED

The restrictions placed by the United States Government on coded wireless messages between this country and the Hawaiian Islands were removed on January 14. This action followed a conference held in Washington between representatives of the Marconi Wireless Telegraph Company of America and officials of the Navy Department at which it was arranged that the trans-Pacific service should be placed on the same basis as that on the Atlantic as regards censorship.

The new arrangement provides for the passing by the censor at San Francisco of all wireless messages originating in the United States with the exception of those from that city without censoring them. The censor at San Francisco will continue to pass on messages originating from that city, while the censor at Honolulu will pass on those coming from all other points in the United States. Patrons of the Marconi Company who wish to use codes other than Western Union, Lieber's. A, B, C, (5th edition), Atlantic Cotton, Scott's, Bentley's and Broomhall's can do so provided they furnish the company with copies of the code they wish to use either at its offices in San Francisco or Honolulu. This is necessary in order that the censors at the places where the messages originate may be provided with translations.

San Francisco and Honolulu were connected by wireless on September 24 last, the formal opening of the Marconi service between the two cities having taken place on that date. The Hawaiian station transmitted on October 16 a message announcing the arrival at Honolulu of the gunboat Geier. It was explained that the message was received as an ordinary news item and transmitted in the regular course of business in the absence of the censor. This explanation was accepted, but restrictions were placed on messages which remained in force until the conference between the Marconi representatives and the officials of the Navy Department.

RADIO INSTITUTE DINNER IN HONOR OF R. H. MARRIOTT

The members of the Institute of Radio Engineers gave a dinner at Mouquin's uptown restaurant, New York City, on the evening of December 23, in honor of R. H. Marriott. Mr. Marriott, who is a United States radio inspector and has had his headquarters in New York City, has been transferred to Seattle, Wash. John S. Stone, president-elect of the Institute, had been selected as toastmaster, but as he was prevented from attending the dinner by illness, Dr. Alfred N. Goldsmith, editor of the Institute Proceedings, presided in his place. Dr. Goldsmith paid a tribute to Mr. Marriott, speaking of him as the man to whom more than any one else the Institute owed its growth. Among the speakers were Messrs. Farnsworth and Hogan. Mr. Farnsworth talked briefly regarding Mr. Marriott's effort to maintain interest in the old Wireless Institute and Mr. Hogan spoke on "Who Invented Radio."

Included among those present were: J. C. Gregg, Charles W. Taussig, E. H. Armstrong, Edward B. Pillsbury, George B. MacMahon, Julian Barth, David Sarnoff, George B. England, Frank H. Fay, William H. Priess, Guy Hill, W. D. Terrell, and Roy A. Weagant.

The menu was as follows:
(Note: We are enjoined from serving courses at a frequency exceeding 250 per second.)
Automatic Starter to Order.
Rat-tail of Non-adjustable Bare Bluepoints for Bivalve Detectors
Gumbo Electrolyte in Insulating Container of fixed capacity.
Portable Submarine Equipment in Dielectric.
Brush Dischargers. Oval Insulators Sans-Filet of Bass.
Pocker Ultraudion Detector, Spud Type.
(Licensed for Use in Dining-room only.)
Vol-au-Vent of Jiggers, with Spherical Electrodes.
Fancy Sleet, with Plain Aerial.
Etherized Chicken, on Switchboard with Protective Devices.
Cohered Low Temperature Cream, with Spade Electrodes.
High Powered Cheese.
Radiation from Tree Antennae
Ungrounded Coffee.
(Note: Saturation point should not be exceeded. Avoid examining tikker.)

MARCONI STAFF ENTERTAINED

A luncheon was given by the Marconi Wireless Telegraphh Company to the members of its office staff in room 3104 in the Woolworth Building, New York City, at 12 o'clock, noon, on December 24. The invitations, in the form of a facsimile marconigram, read as follows:

"The pleasure of your presence is requested December twenty-fourth at twelve o'clock in room 3104, Woolworth Building.

"Refreshments. Music. Dancing

"THE OFFICERS OF THE MARCONI COMPANY.

"R. S. V. P."

The arrangements for the event were in charge of Miss L. Horton and Edward B. Pillsbury. The reception committee consisted of Miss Mary Quinn, Mrs. M. Nichols, Harold Gallison, David Sarnoff, R. S. Harlan and J. H. Tingle. As the guests entered the room they were presented to Edward J. Nally, John Bottomley, George S. De Sousa and Frederick M. Sammis. About 150 persons attended the luncheon. After the luncheon dancing was enjoyed.

Canadian Amateur Plants Dismantled

Canadian amateurs have been compelled to temporarily dismantle their radio telegraph stations on account of the war, according to George H. Barnes, of Stanbridge. The Dominion Government, by Order in Council No. 2030 of August 2, sent out orders to all licensed amateur stations to close down. With the co-operation of local police they have located and dismantled the unlicensed plants as well.

Irwin Tells of Airship Journey

John R. Irwin, superintendent of the northern district, Pacific Coast Division, of the Marconi Wireless Telegraph Company of America, took a prominent part in the entertainment given on "Wireless Jack Irwin" night at the Press Club in Seattle, Wash., on December 3. The program included a recital by Mr. Irwin of his adventures on the Wellman airship America when an attempt was made to fly across the Atlantic Ocean. His narrative was illustrated by pictures flashed on a screen. A comic sketch called "This Is the Life," depicted Mr. Irwin.

RESULTS OF THE INSTITUTE ELECTION

At a meeting held on January 6, in Fayerweather Hall, Columbia University, the Institute of Radio Engineers announced the election of the following officers:

President, John Stone Stone; vice-president, George W. Pierce; treasurer, Warren F. Hubley; secretary, David Sarnoff. Managers to serve a three-year term are Louis W. Austin and John Hays Hammond, Jr.; managers for the two-year term, Robert H. Marriott and Guy Hill; managers for the one-year term, George S. Davis and Roy A. Weagant. Appointed by the Board of Direction as managers: Emil J. Simon, John L. Hogan, Jr., and Lloyn Espenschied.

Marconi Men

The Gossip of the Divisions

Eastern Division

Operator Lever of the Neches is en route to Europe. The Neches has been chartered by the American Red Cross and is carrying a cargo of food to Belgian refugees.

F. J. Schmitt and W. F. Dillon, senior and junior respectively of the City of St. Louis, have been assigned to the newly-equipped Oceana, running from New York to Bermuda. Schmitt, who has been on the St. Louis for three years, says he feel as though he were leaving home.

L. R. Schmitt has been assigned as senior operator to the St. Louis, to succeed F. J. Schmitt.

C. C. Langevin, of the Marconi School of Instruction, has been assigned as second operator on the City of Corinth, a British vessel, running to India. S. J. Ellis has been assigned to the City of Delhi, making the same trip. It is not likely that these vessels will return until next summer.

F. C. Justice and R. W. Rice have exchanged details, Justice going to the City of Augusta as senior and Rice taking Justice's place on the Nacoochee.

A. B. Robinson, who recently entered the Marconi service, has been assigned to the Austrian Prince, an English vessel.

A. E. Voightlander, of the Jamestown, has temporarily replaced A. Schweider on the Creole. Schweider is taking a short vacation. C. N. Robinson is senior operator on the Creole.

W. H. Davis rejoined the El Sol as first operator when she went into commission. His second is W. S. E. Hanks.

W. S. Fitzpatrick and L. C. Brundage are on the Morro Castle as first and second respectively.

A. I. Yuter is back on the Monterey as first. S. Kay is second man.

W. G. Hake, formerly of the Southern Division, has been assigned to the El Dia as senior. G. O. West, of the Marconi School of Instruction, is junior.

R. R. Squires, formerly senior on the El Dia, has been assigned to the Ango of the French Line, which is bound for French ports.

R. Duna has been assigned to the Alabama.

C. E. Stevens has succeeded A. E. Voightlander on the Jamestown as second man.

James Devenport and R. H. Fleming are now first and second on the El Oriente, respectively.

J. J. O'Brien has been assigned to the Charlton Hall, a newly-equipped vessel. She is a one-man ship.

The Radiant has been re-equipped. Sidney Tonner, formerly employed by the Marconi Company, but now in the service of the Standard Oil Company, has been taken over with the vessel.

F. Rosenzweig has been assigned to the Comet, which has been re-equipped.

L. L. Beard is now on the Northwestern.

A. Bald has been assigned to the Calabria, an English vessel, relieving W. V. Moore, who has taken Bold's place on the Philadelphia of the American Line.

F. J. Murphy has resigned from the service.

C. D. Riley, who recently returned from a long trip on the Bantu, has been assigned to the Dacia, a newly-equipped vessel, which is scheduled to steam for Rotterdam.

J. J. Kaleta has taken the place of William Gruebel on the Iroquois.

J. G. Porter is now on the Currier. He succeeded E. K. Oxner, who was temporarily assigned as senior operator to the City of Atlanta.

D. J. Surrency is now senior operator of the Matura. His junior is D. Recchia.

William Kaiser is operator on the Rio Grande.

E. I. Quigley and William Travers

rejoined the Bermudian when she went into commission.

C. A. Werker has been promoted, having been appointed senior operator of the Sabine.

N. Ribler has been transferred to the Guantanamo, which carries only one operator.

Southern Division

Senior Operator H. C. Hax and Junior Operator F. A. Lafferty will report aboard the Great Northern on January 20th. She will sail about January 27th for San Francisco, making several stops in the Canal Zone. The Great Northern is the largest ship of its type ever built in this country, being a 27,000-ton ship.

S. Cissenfeld, assistant operator at the Baltimore station, recently made a two weeks' trip to Boston on the Juniata, in place of Operator C. R. Robinson, who was absent because of illness.

Operator J. H. McCauley was recently transferred from the Suwanee to the Rappahannock at Newport News, Va. The Rappahannock steamed for Bordeaux, France. Operator Walter Osterloh relieved McCauley on the Suwanee.

Operator C. H. Warner has been transferred from the Merrimack to the Rando, which departed from Baltimore for Rotterdam. Operator Clement Murphy relieved Warner on the Merrimack.

Operator Herman A. Miller was recently transferred from the Nantucket to the Mexicano, relieving Operator W. P. Grantlin. Grantlin relieved Operator F. A. Nelson, who has been transferred from the Gloucester to the Virginia Beach, Va., station. Miller's place was taken by Operator W. F. Vogel of the Virginia Beach station.

Operator D. Levin has been transferred from the Ontario to the Cretan. The latter has been chartered by the Ocean Steamship Company to ply between New York and Savannah, Ga. Operator I. F. Larrimore has been assigned as junior operator on the Cretan.

Operator E. McCauley, who has been absent on a two weeks' sick leave, has relieved D. Levin on the Ontario.

Operator H. G. Hopper has been assigned to the Gloucester. He relieved H. E. Wagner, who enlisted in the United States Navy.

Operator L. H. Gilpin recently relieved G. H. Fischer for one trip. Fischer spent the week with his parents in Philadelphia.

Operator P. H. Singewald has relieved Operator Walter Neumann on the Dorchester. Neumann is ill from pneumonia.

Operator J. F. Buck recently relieved H. L. Dempsey on the Somerset for one trip. Dempsey was absent owing to the death of a member of his family.

Operator C. Sorensen relieved W. Batchelder on the Persian for the first week in January, giving Batchelder an opportunity to visit his home.

Constructor Murray is in Newport News reinstalling the apparatus in a new and larger room on the Jefferson, of the Old Dominion Line.

The United States torpedo boat destroyer Downes was on a trial trip from January 3 to 9. Operator E. Thornton was in charge of the wireless equipment.

The Northern Pacific has been fitted by Constructor Morris at Philadelphia.

Thirty-five employees of the Southern Division have received increases in salary, the increase taking effect January, 1915.

For making the largest increase in sales per trip of the Ocean Wireless News, over the previous month, H. L. Dempsey, of the Somerset, has been awarded the second prize of $3 for December.

Pacific Coast Divison

H. Dickow, assistant on the Adeline Smith, has been transferred to the H. T. Scott, a one-man detail. He has been succeeded on the Adeline Smith by H. R. Davis.

F. Wiese has relieved W. R. Lindsay, as assistant aboard the Aroline.

E. S. Fayle, assistant aboard the Admiral Schley, was recently granted a short leave of absence. He was temporarily relieved by G. J. Schmeling.

W. L. Baker, in charge of the Avalon station, recently began a month's vacation. C. Bowers, formerly of the Hermosa, was temporarily assigned as manager of the station.

L. C. Rayment is detailed on Barge 93, which has again gone into commission.

M. Waldon has relieved R. F. Harvey aboard the Captain A. F. Lucas, the latter having been transferred to the Fenwick.

O. B. Berry recently began a short vacation. N. J. Marthaler, formerly of the Saint Helens, took his place on the Centralia.

A. Konigstein has relieved D. R. Clemons, as assistant aboard the Congress, Clemons having been transferred to the President.

S. E. Miller, of the Topeka, is ill. He has been relieved by G. S. Bennett.

C. F. Fitzpatrick is in charge aboard the Col. E. L. Drake.

W. D. Collins has been detailed to the Grace Dollar, which was recently laid up.

D. M. Taylor is now senior operator aboard the Governor.

L. V. R. Carmine has been assigned to the Canadian steamer Hazel Dollar.

G. Jensen has been assigned to the Laqua, which is engaged in salvage work at Cedros Island.

The J. A. Chanslor is again in commission; C. T. Nichols is in charge.

T. M. Prior has been granted a leave of absence, his place, as second aboard the Stetson has been filled by J. T. Brady.

On the eve of his departure for the Orient, J. F. Woods injured his hand, and his place, as assistant aboard the Manchuria, was taken by H. G. Austin. Woods is now on a leave of absence.

R. N. Jensen and R. W. Baer have been assigned as first and second, respectively, aboard the Multnomah.

E. T. Jorgensen has been transferred from the Sierra to the Matsonia.

J. J. McLevey and F. W. Murphy will leave for the Far East on the Mexico City.

T. A. Churchill is on his way to Panama aboard the Newport.

S. J. Morgan has relieved H. L. Edling on the Paraiso. Edling is on a vacation.

H. Long has been assigned to the Pleiades.

A. C. Berntswiller recently relieved J. M. Switzer, as purser and operator aboard the Redondo, for one voyage.

The Santa Cruz recently left for New York via the Canal, with M. O. Smith in charge of the wireless.

A. M. Quasdorf is temporarily holding down first trick at KPH, with E. D. Bryant and A. W. Peterson as second and third trick men, respectively.

C. C. White has been assigned to the Saint Helens. The vessel is making a trip to South America.

A. A. Dezardo was recently assigned to the Speedwell with J. F. Parenti as assistant.

C. E. McNess has been assigned as assistant aboard the Santa Clara.

Retla Alter has relieved M. Walden as assistant on the Willamette.

J. W. Morrow and D. G. Mathison have been selected as first and second, respectively, on the Yosemite.

W. J. Manahan, of the Construction Department, has been transferred to the same department in the Seattle district.

O. B. Moorhead, who has been assisting in the construction of the 25-k.w. station at Ketchikan, Alaska, has returned to San Francisco, the new station having been completed. He reports that with the small 5-k.w. set, which was intended for marine work, no difficulty whatever was met with in communicating with Eureka or North Head—a distance of 800 miles—in daylight, any day.

G. Kendrick, of the Construction Department, has resigned.

Seattle Staff Changes

C. F. Trevatt is now in charge of the Mariposa.

R. V. Harris is on the Cordova, relieving H. F. Reagan, who is on a vacation.

J. E. Johnson has been assigned to the Admiral Evans, relieving Neil McGovern, who went south on the Humboldt.

W. C. Chamberlain has been relieved by J. C. Meade on the Humboldt and is now assigned to the Construction Department.

H. W. Barker, of the Construction Department has been transferred to the Bolinas Engineering Department.

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MARCONI WIRELESS TELEGRAPH COMPANY

OF AMERICA

WOOLWORTH BUILDING

233 BROADWAY, NEW YORK

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American Building, Baltimore, Md.

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917 Decatur St., New Orleans, La.

E. C. Newton...............*Superintendent*

Great Lakes Division

Schofield Bldg., Cleveland, Ohio

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

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

H. C. S., Los Angeles, Cal.:

You have been misinformed regarding the Arlington station. It does not send out press matter. It does, however, send out the Weather Report and Time Signals at stated periods.

We are not aware that the Arlington station is engaged in trans-Atlantic work.

The wave-length for the Time Signals is 2,500 meters and for other communications about 4,000 meters.

WNU is the high power station of the Tropical Radio Telegraph Company, at New Orleans, La. It is equipped with Marconi apparatus.

The power of the Fort Sam Houston, Tex., set is 10 k. w. We have no record of the wave-length, but like other sets of the Signal Corps it is undoubtedly variable for a considerable range.

The call letters JRW and JOV are not listed.

Perhaps your receiving apparatus is better suited to the wave-length of the Key West station than that of the Arlington station, hence you receive better signals from the former station. The wave-length of the Key West station is about 1,600 meters.

* * *

H. W. T., Lancaster, Pa., writes:

Ques.—(1) Is it possible to hear Berlin, Germany, or Eiffel Tower, Paris, at this point? The conditions here are such that I can, if necessary, erect an aerial two miles in length. There are no hills to the east, but a small one to the west. What instruments are necessary in order to hear Berlin, Germany, and Eiffel Tower, Paris?

Ans.—(1) We suppose you refer to the Telefunken station at Nauen, in Germany. If so, this station works at certain intervals, using undamped oscillations. It is possible to hear these signals at night time in the United States with an antenna 2,000 feet in length and from thirty to forty feet from the earth. You require, however, a receiver which is adapted to the reception of undamped oscillations. While you may secure results with the Poulsen tikker, far better results are obtained with special valve circuits, the details of which are not available for publication. On the other hand the station at the Eiffel Tower in Paris emits damped oscillations which may be received with a special valve circuit or with a triple audion amplifier. An article on the amplifier appeared in the January, 1914, issue of The Wireless Age. An audion circuit suitable for the reception of undamped oscillations is disclosed in United States patent 1,113,149.

The wave-length of the Nauen station is 9,400 meters. The transmitting apparatus makes use of the Count Arco step-up transformer system for generating undamped oscillations.

The wave-length of the Eiffel Tower station when sending press matter is about 2,500 meters. The signals are occasionally readable in the U. S. A.

* * *

W. E. M., Pittsburg, Pa., asks:

Ques.—(1) Kindly inform me where I can get an article on the audion amplifier. Everybody in this part of the country is intensely interested in the one step amplifier and we have not been able to find an article that explains it thoroughly in the making or construction.

Ans.—(1) Note in the January, 1914, issue of The Wireless Age, the article entitled "How to Conduct a Radio Club." Numerous articles have appeared from time to time on the audion and also comment on the audion amplifier.

* * *

M. W. C., Norwich, Ct., writes:

Ques.—(1) I have noticed in The Wireless Age the advertisement of the Year Book of Wireless Telegraphy and Telephony for 1914. Please tell me if I can find in it a complete diagram that will cover the following, or if not, in what book I can find it: Draw a complete diagram of a ship wireless telegraph installation showing the main transmitter, auxiliary transmitter, emergency transmitter, sources of power, receiving set, all ammeters, voltmeters, aerial ground and charging circuit for storage batteries.

Ans.—(1) There are no diagrams in the Year Book for 1913 or 1914 covering this query which is virtually a government examination question. In the October, 1913, issue of The Wireless Age under the title "Operators' Instructions," Chapter IV, a complete answer to your query is given. Chapters I, II and III were published in the Marconigraph. Additional information regarding commercial circuits is given in succeeding issues of THE WIRELESS AGE. These should be carefully noted, particularly the January, 1915, issue of THE WIRELESS AGE, which gives a complete circuit diagram of one of the latest types of transmitting equipment.

* * *

A. S., San Antonio, Tex., asks:

Ques.—(1) Please tell me the wave-length of an aerial composed of four conductors of 7-strand No. 22 copper wire, spaced 2½ feet apart. Lead-in from center is ninety feet in length. The aerial is seventy-five feet in height and 100 feet in length. What is the capacity of this aerial?

Ans.—(1) About 350 meters. The capacity, roughly, is about 0.0004 Mfds.

Ques.—(2) Please tell me the receiving range of the following instruments with the aerial referred to: Navy type receiving transformer (3,000 meters), 2,000-meter loading coil, Holzer-Cabot 3,000-Ohm receivers, galena detector, two Blitzen variable condensers and one fixed condenser.

Ans.—(2) 400 miles in daylight to 1,200 miles at night time.

Ques.—(3) What are the dimensions of a 2,000-meter loading coil for use in the above?

Ans.—(3) A loading coil 12 inches in length and 2 inches in diameter wound with No. 22 wire should give the desired results.

Ques.—(4) What are the dimensions of a standard 100-ampere, 600-volt switch for lightning protection?

Ans.—(4) A commercial switch of this capacity has the following dimensions: slate base, 12 inches in length by 2½ inches in width, ¾ of an inch in thickness; length of the blade and handle over-all, 8½ inches; thickness of the blade, ⅛-inch; width of the blade, 1 inch.

* * *

W. K., Philadelphia, Pa.:

The aerial you describe in your first query has a wave-length of about 325 meters. Its capacity is about 0.0004 Mfds. and the inductance 72,000 cms.

This aerial is too small for the efficient reception of the longer wave-lengths—say 10,000 to 16,000 meters. If you expect to receive from stations using these wave-lengths you should have a receiving aerial at least 1,000 feet in length, which may consist of a single wire.

The dimensions for a receiving tuner to fit your *present* aerial are as follows:

The primary winding should be made on a form 6 inches in diameter by 18 inches in length and wound closely with No. 26 D. S. C. wire. The secondary winding should be 10 inches in length, 6½ inches in diameter and wound closely with No. 30 D. S. C. wire. If this secondary winding is shunted by a condenser of .002 Mfds. capacity, it will afford wave-length adjustments in the secondary circuit up to 16,000 meters. We cannot, however, guarantee any degree of efficiency with this tuner for the reasons above stated.

Regarding your fourth query in reference to induction apparently caused by a nearby power-house: perhaps this interference comes in over the lighting wires to your house. As a matter of test, pull the meter switch and see if the humming noises disappear. If so, then put two 1.0 Mfd. condensers in series across the switch and earth them at the middle point. Perhaps these inductive noises reach your receiving station through the telephone wires. You cannot ground these wires except through a condenser of very small capacity. It should have a value of not more than 0.00001 Mfd., popularly known as the "postage stamp" condenser. Often one of these "postage stamp" condensers will completely eliminate the inductive influences operating on a receiving station via the telephone lines.

* * *

C. W., Norristown, N. J., writes:

Ques.—(1) My antennae consists of two lengths of No. 14 copper wire; each piece is 140 feet in length of the inverted "L" type, 45 feet above the ground and 25 feet above the house top. The wires are spaced 10 feet apart. My two lead-ins are of aluminum. I am situated in practically the highest place in town; open country extends for a distance of two miles, hills surround at that distance. Receiving from a distance is my aim. I have the following instruments:—"Loose-coupler" with loading coil, fixed condenser, silicon detector and 2,000-Ohm head set. The ground is made to water pipe in the cellar, using stranded wire to reach the pipe. I have been forced to make several twists with it in order to get to the pipe. My instruments are connected with stranded lamp cord. The aerial runs north and south. What is my approximate day and night range?

Ans.—(1) Your daylight range is approximately 50 to 100 miles and during the winter months your night range may be 1,000 to 2,000 miles.

Ques.—(2) According to my reasoning, this aerial should be directive toward the south. NAA is the only station I have heard in that direction. Have heard him on the 600 and 2,500-meter wave-lengths. Yet to the north I have received WSL, WNT, WHB, WHI and NAH. How do you explain this?

Ans.—(2) The average amateur station in this section of the country has this experience, often finding it much easier to read stations on the northern coast than those situated south. That you hear the signals from Arlington is easily explainable. This station is of high power and therefore may be heard under adverse conditions. Unless there is some severe local obstruction, you should be able to hear the naval station at Key West, Fla., and the

Marconi station at Miami, Fla.; the latter has a night range of 1,800 miles.

Ques.—(3) Would the addition of two more 140-foot wires to the antenna increase my receiving range?

Ans.—(3) It is very doubtful. Two wires would slightly increase the capacity of an antenna, but would decrease the inductance and the resistance. Experiments have shown that there is no advantage in using more than two wires for receiving purposes.

It is not in keeping with the policy of this magazine to answer your fourth query.

Ques.—(5) Is a four-slide tuning coil a better device than a two-slide? How does it compare with a "loose-coupler?"

Ans.—(5) A four-slide tuner, if properly understood, allows one to vary the degree of coupling, quite as readily as with the inductively-coupled type of tuner. One of the sliders should be connected directly to the detector terminal and the second slider through a condenser to the other terminal of the detector. The third slider should be connected to the earth lead and the fourth to the aerial. If you will plot an elementary circuit of this method of connection you will observe that the values of inductance in use in the detector circuit and in the antenna circuit may be separated giving a small value of coupling which may be altered as desired.

* * *

F. V. E., Portsmouth, Va., inquires:

Ques.—(1) When using a variable condenser in series with the aerial for the reduction of wave-length in a receiving set, does increasing the capacity of the condenser raise or lower the wave-length?

Ans.—(1) An increase of capacity will increase the wave-length.

Ques.—(2) Please give a diagram of connections for a double grid, double filament audion bulb; also please state the advantages of this type over the single grid type.

Ans.—(2) A diagram is unnecessary. Please observe that the two grids are connected together and also the two plates, so that except for the method of construction, the connections are no different than those employed with the audion using a single grid and plate. The double grid, double plate audion does not give better signals, when used alone, than a single audion, but when employed in a three-step amplifier, it shows considerable improvement over the audion of the ordinary type. The double grid, double plate audion is likewise better suited for the reception of undamped oscillations than the type employing a single grid and single filament.

Ques.—(3) Can you tell me what station has the call letters BBB or B? I have heard this station communicating with WST and MMM. The BBB station communicates with MMM in the Spanish language.

Ans.—(3) MMM is the station of the Cuban government at Morro Castle. WST is the Marconi station at Miami, Fla. We have no record of the station BBB or B. but perhaps you can obtain this information by writing to the manager of the Marconi station at Miami, Fla.

Ques.—(4) Do the high voltage cells in an audion set ever become exhausted? I notice that in the commercial audion sets no provision is made for renewing the high voltage current. I suppose they use dry batteries.

Ans.—(4) The high voltage cells, on the average, will last about eight months and if it becomes necessary to renew them the cells should be removed from the box and new ones installed.

* * *

F. I. T., Gilman, Ill., asks:

Ques.—(1) Will a second-grade commercial operator have a chance to get a position in the Marconi service next summer?

Ans.—(1) Operators with second-grade licenses are employed now and then when men with first-grade certificates are not available. Your query carries us too far into the future; definite promises cannot be made.

Ques.—(2) Transmitting on a 200-meter wave-length and using 110 A. C., 60-cycle current for power with ¼ k. w. transformer, three one-quart Leyden jars for secondary condenser, oscillation transformer and rotary gap making 500 R. P. M., having 8 points on rubber disc, please tell me how far I should be able to transmit?

Ans.—(2) The set will possibly have a range of thirty miles. You have not given us the dimensions of the aerial with which it is to be employed. Your rotary gap should revolve more rapidly; a speed of 2,000 R. P. M. will improve the note.

Ques.—(3) What should I use in connection with a two-slide tuner, 800 meters, Blitzen 0.0008-Mfd. rotary condenser, fixed condenser and 2,000-Ohm superior telephones to get Arlington's signals? Please publish diagram of connections.

Ans.—(3) A diagram is unnecessary; you require a loading coil three times the length of the two-slide tuner, but otherwise having the same dimensions and the same size wire. Connect the aerial lead to one slider of the tuner and the earth wire to one end of the coil. A wire should be led from this same end, through the fixed stopping condenser, to one side of the crystal detector. The other side of the crystal detector is connected to the second slider. The telephones should be shunted across the fixed condenser.

Ques.—(4) Please give a list of high power stations that communicate with Port Arthur, Tex. (WRU).

Ans.—(4) This station communicates with vessels at sea and Galveston, Tex.

Ques.—(5) What is the natural wave-length of an aerial 75 feet in height at one end and 40 feet at the other, composed of four wires 100 feet in length, each strand being three No. 20 B. S. gauges twisted together.

Ans.—(5) About 280 meters.

* * *

G. C. C., New Rochelle, N. Y., writes:

Ques.—(1) I am slightly troubled with an inductive effect hum in the telephone receivers from the 60-cycle house current. This hum is only audible when using a DeForest amplifier on an audion detector. It is a slight noise and only affects very long distance signals, as "NAX" (Colon). This hum can be cut out by touching the ground connection with one or two fingers of the hand by the operator who has the telephones on to receive. I have tried all the methods suggested in your valued publication at different times, but to no effect. It is very difficult to keep one's hand on the ground connection all the time and I wonder if you could offer any suggestion for accomplishing a like result.

I am using a standard hook-up. "Loose-coupler" (well insulated); condenser in ground circuit for short waves; condenser around secondary for tuning; loading coils in primary and secondary for long waves; standard audion hook-up and standard amplifier. My aerial is *not* parallel to *any* light wires outside the house. Wiring of the house is run in metal conduit. If I cut the A. C. current off from the house at point where it comes to meter the induction stops.

Ans.—(1) Practically all stations which are surrounded by alternating current power wires experience this trouble. Try grounding one side of the telephones direct to the earth. If your audion is properly hooked up this should not affect the strength of signals. If it does try earthing one of the telephone leads through a small condenser. Since cutting off the current from the house completely eliminates the inductive noises, it is undoubtedly caused by the A. C. wiring. You should try joining two 1.0 Mfd. condensers in series, earthing them at the middle point. Then connect the entire unit across the A. C. line switch where the current enters the meter. This will help or possibly wholly eliminate the trouble.

While the wiring of your house is in a metal conduit, perhaps this conduit is not properly connected to earth. You might examine it and, if not, see that it is properly connected to the main line water pipes.

* * *

H. P. G., Portsmouth, Va., asks:

Ques.—(1) Please tell me how many turns of wire on a tube 5¼ inches in diameter are necessary for the inductance coil or a wave-meter whose variable element is a condenser of 7 fixed plates, 6 inches in diameter and 6 rotary plates, 5 inches in diameter, spaced 1/32 of an inch apart, to tune to wave-lengths between 200 and 600 meters.

Ans.—(1) Twenty-six turns of No. 18 D. C. C. annunciator wire connected to the condenser described will give the range of wave-lengths desired.

Ques.—(2) Will the audion respond to a continuous wave system as well as the tikker?

Ans.—(2) Yes, if properly connected. The details of this circuit are not available for publication. The audion constitutes an exceedingly sensitive detector for undamped oscillations, giving results far in excess of the Poulsen tikker.

Ques.—(3) Please give a diagram of the audion used as an amplifier with a detector requiring no battery.

Ans.—(3) The January, 1914, issue of THE WIRELESS AGE contains a diagram of connections for a detector using battery current. With no battery current in the detector circuit the operation of the device is not satisfactory. However, the connection shown in the January issue gives excellent results. Use the connection shown in the January issue, eliminating the potentiometer and battery.

Ques.—(4) What is the advantage of the double grid and plate audion and how should one be connected?

Ans.—(4) See the answer to the second query of F. V. E., Portsmouth, Va., in this issue.

Ques.—(5) What station is WIR?

Ans.—(5) It is not listed.

* * *

C. B., Pontiac, Mich., asks:

Ques.—(1) Where can I buy a Fleming valve bulb and what is the price?

Ans.—(1) The Marconi Wireless Telegraph Company of America, 233 Broadway, New York City. Quotations on request.

Ques.—(2) What battery voltage should be used on the valve detector?

Ans.—(2) Some valves require 4 volts and others 12.

Ques.—(3) Is a variable condenser necessary to properly tune the valve? If so, what capacity is necessary?

Ans.—(3) A variable condenser is not absolutely necessary. A condenser of small capacity is generally connected in shunt to the secondary winding of the receiving tuner.

* * *

R. W. H., Durham, N. H., writes:

Ques.—(1) Is there an audion company which sells the detectors bearing that name? If so, what is the name and address of it, so that I may obtain a catalog?

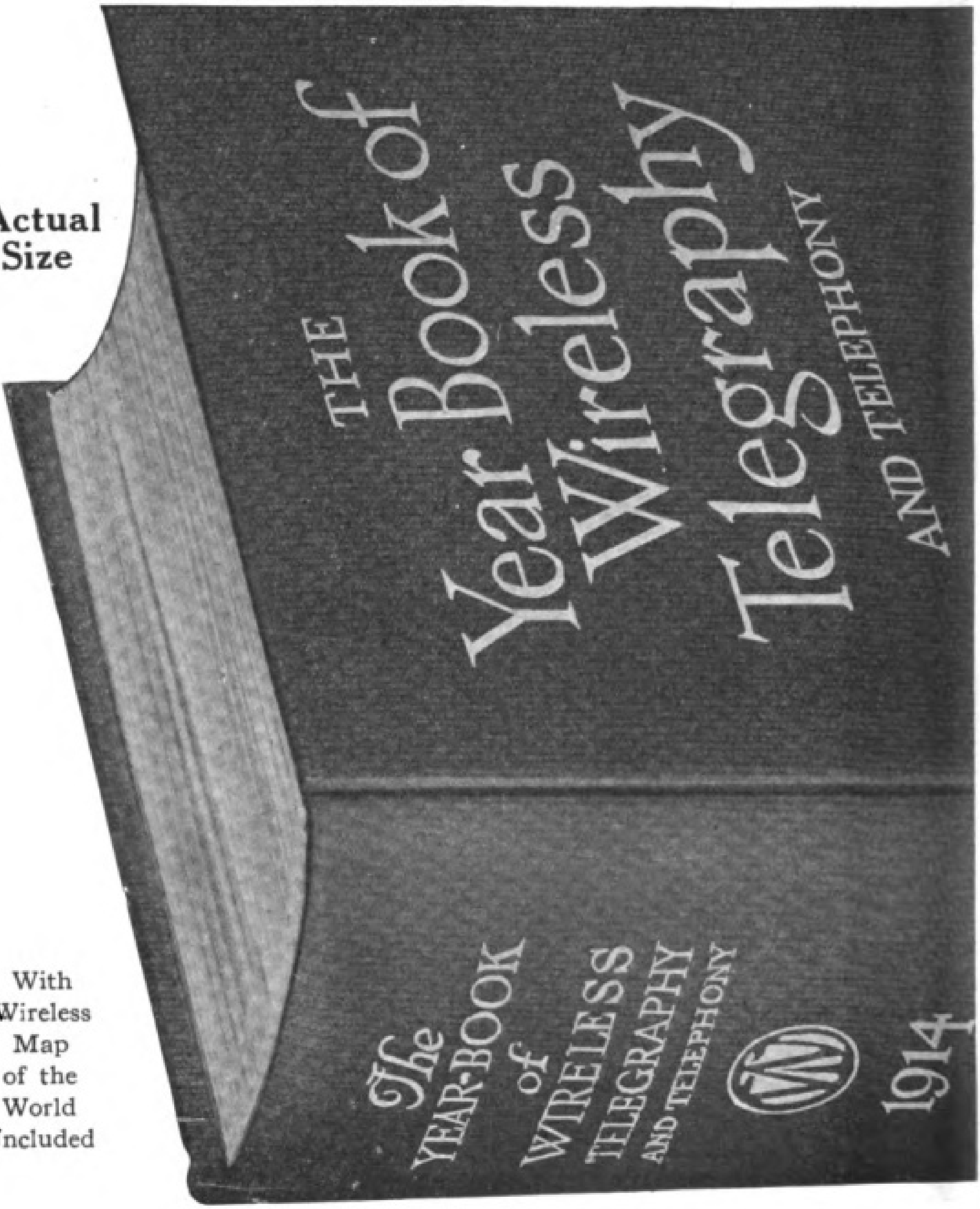
Ans.—(1) Several amateur supply houses can furnish you with audion detectors as made by the Radio Telegraph & Telephone Company of New York.

Ques.—(2) I have an aerial consisting of three wires, each 200 feet in length, a lead-in 140 feet in length and a ground wire 35 feet in length, and I intend to use the William B. Duck Company's flexible step-up transformer, which is rated at approximately 1 k. w. What is my wave-length and what size condenser should I use in series with the aerial to reduce the wave-length to 200 meters? What are the formulas for these two facts?

Ans.—(2) The natural wave-length of this aerial is about 500 meters. It is too long for satisfactory operation on a 200-meter wave. The lowest value to which it could be reduced would be about 285 meters.

THE BOOK

Actual Size



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